Florida Department of Education

CTE Curriculum Frameworks

Transportation, Distribution & Logistics

Rule 6A-6.0571, F.A.C.
Effective May 2025

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
Program 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
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 five credits.

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

The following table illustrates the secondary program structure:

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

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

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.

CTE Standards and Benchmarks	
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.
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.

CTE Standards and Benchmarks
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.
02.13 Prepare vessel to take on fuel and lube oil.
02.14 Prepare to take on water aboard vessel.

CTE Standards and Benchmarks
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 voltmeter 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.
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.

CTE Standards and Benchmarks	
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.
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.

CTE Standards and Benchmarks
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.

CTE Standards and Benchmarks	
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.
07.12	Lubricate, adjust, and make minor repairs to engines and equipment.
08.0	Perform net fisher duties. The student will be able to:

CTE Standards and Benchmarks	
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.
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.

CTE Standards and Benchmarks	
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.

CTE Standards and Benchmarks
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.
12.08 Tighten panel box fittings to prevent vibration.
12.09 Clean keel cool strainers.

CTE Standards and Benchmarks
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.

CTE Standards and Benchmarks
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.
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.

CTE Standards and Benchmarks
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.
14.03 Administer first aid to control bleeding.
14.04 Administer CPR

CTE Standards and Benchmarks
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.
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.

CTE Standards and Benchmarks	
	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 because 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.
	19.03 List the advantages and disadvantages of business ownership.
	19.04 Identify the risks involved in ownership of a business.

CTE Standards and Benchmarks
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.

Florida Standards for English Language Development (ELD)

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

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

Career and Technical Student Organization (CTSO)

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

Florida Department of Education
Curriculum Framework

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
Course Length	Multiple credits
Teacher Certification	Refer to the **Course Structure** section
CTSO	SkillsUSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and 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.

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

Course Structure

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

The following table illustrates the secondary course structure:

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

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

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.

Florida Department of Education
Student Performance Standards

Course Title: **Transportation, Distribution and Logistics Cooperative Education OJT**
Secondary 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.
02.04 Demonstrate acceptable business ethics.

Additional Information

Special Notes

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

Career and Technical Student Organization (CTSO)

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

Florida Department of Education
Curriculum Framework

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
Course Length	1 credit - Multiple credits
Teacher Certification	Refer to the **Course Structure** section
CTSO	SkillsUSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to provide students with learning opportunities in a prescribed program of study within the 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 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	CT

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

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.

Career and Technical Student Organization (CTSO)

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

Florida Department of Education
Curriculum Framework

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

Secondary – Career Preparatory	
Program Number	9503100
CIP Number	0652020301
Grade Level	9-12
Program 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
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 credits.

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

The following table illustrates the secondary program structure:

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

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

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

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 – Standards 15.0 – 29.0 are associated with this course.

15.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
16.0 Develop an awareness of microcomputers.
17.0 Demonstrate an understanding of networks.
18.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
19.0 Use presentation applications to enhance communication skills.
20.0 Use spreadsheet applications to enhance communication skills.
21.0 Use database applications to store and organize data.
22.0 Use electronic mail to enhance communication skills.
23.0 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.
24.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.

25.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
26.0 Develop awareness of computer languages, web-based & software applications, and emerging technologies.
27.0 Demonstrate an understanding of basic html by creating a simple web page.
28.0 Demonstrate comprehension and communication skills.
29.0 Use social media to enhance online communication and develop an awareness of a digital footprint.

30.0 Demonstrate an understanding of warehouse operations.
31.0 Demonstrate an understanding of storage and control operations.
32.0 Demonstrate an understanding of protection skills.
33.0 Demonstrate an understanding of economics.
34.0 Demonstrate an understanding of career readiness.
35.0 Demonstrate employability skills.
36.0 Demonstrate competencies in a specific career.
37.0 Demonstrate career acquisition.
38.0 Demonstrate career retention.
39.0 Demonstrate integrated learning and life skills.
40.0 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.

CTE Standards and Benchmarks	
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.
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:

CTE Standards and Benchmarks	
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.
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.

CTE Standards and Benchmarks	
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.

CTE Standards and Benchmarks	
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).
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.

CTE Standards and Benchmarks	
	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.
	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.

CTE Standards and Benchmarks	
	07.11 Apply and manipulate text boxes.
	07.12 Proofread documents by validating content using 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.
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.

CTE Standards and Benchmarks	
	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 online 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.
	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.

CTE Standards and Benchmarks	
	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:
	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.

CTE Standards and Benchmarks	
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 core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information based society. Digital 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

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 – 29.0) have been placed in a separate document. To access this document, visit: Digital Information Technology (8207310)

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.

CTE Standards and Benchmarks	
30.0	Demonstrate an understanding of warehouse operations. The student will be able to:
30.01	Identify and discuss the characteristics, purpose and importance of warehouse operations and supply chain management.
30.02	Define material handling logistics as it applies to the warehousing function.
30.03	Describe procedures for using computerized warehouse data.
30.04	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.
30.05	Define movement in a warehouse and identify the various locations within the warehouse where planned efficient movement of materials takes place.
30.06	Explain channels of distribution.
30.07	Discuss safety regulatory requirements and procedures.
30.08	Explain the importance of storage in a warehouse.
30.09	Define control as it applies to warehousing.
30.10	Explain the relationship between physical structure and protection.
30.11	Identify various types of equipment available to enhance the efficient movement of materials within a warehouse.
30.12	Identify the various types of loading docks and cross docking.

CTE Standards and Benchmarks	
30.13	Define the term "peaks and valleys" as it applies to warehouse activity.
30.14	Explain the importance of staging and JIT.
30.15	Identify the primary types of hand-operated pieces of warehouse equipment.
30.16	Identify the important characteristics of industrial trucks.
30.17	Explain the concept of "balancing" as it applies to counterbalanced lift trucks.
30.18	Define the term *narrow aisle* as it applies to fork trucks.
30.19	Identify warehouse documents (e.g., pick tickets, special orders, inventory forms).
30.20	Display and interpret inventory screens, receive, inspect, and stock inventory.
31.0	Demonstrate an understanding of storage and control operations. The student will be able to:
31.01	Explain the concepts involved in determining the best method for storage and the equipment needed to facilitate a cost effective and efficient warehouse.
31.02	Identify the factors that are involved with the calculating and estimating of the storage area needed for retention of materials in a warehouse.
31.03	Identify the possibilities and combinations of systems and equipment that can be used for storage areas in a warehouse.
31.04	Define the following storage related terms: Size, Volume, Density, Pallet, and Case.
31.05	Define the terms packaging, SKU, stacking frame, term "Logistics Execution Systems" (LES), signage and signposting, "real time" and barcoding.
31.06	Explain how the volume of materials, space usage, and control affect the design of storage space in a warehouse design.
31.07	Explain various inventory control methods and their importance.
31.08	Identify and analyze various warehouse storage systems.
31.09	Identify the two key issues in planning block stacking.
31.10	Identify the basic configuration for pallet rack.
31.11	Explain the concept of control in the broadest possible context and the importance of keeping track of materials and goods.
31.12	Identify the various types of technologies developed over the years to keep track of goods within the warehouse.

CTE Standards and Benchmarks
31.13 Identify various labeling and packaging schemes available for securing and tracking the movement of items through a warehouse.
31.14 Define the components of an LES.
31.15 Explain the importance of addresses in signage.
31.16 Define information-filled labeling.
31.17 Identify key magnetic devices used in automatic data capture.
31.18 Define radio frequency identification (RFID).
31.19 Explain the importance of automation in warehousing.
31.20 Identify the value of emerging technologies related to warehouse operations.
32.0 Demonstrate an understanding of protection skills. The student will be able to:
32.01 Identify the role that protection plays in the total concept of "warehousing".
32.02 Identify the various forms of unit load formation equipment that is used for protecting materials.
32.03 Identify the types of load containment materials which include the machinery that dispenses them.
32.04 Situations where they are most advantageously used.
32.05 Explain the following: the need and means for protecting warehouse personnel and materials as they go about their duties.
32.06 Identify the advantages and disadvantages of open-air or soft wall warehousing for protection of warehoused items.
32.07 Compliance issues.
33.0 Demonstrate economics. The student will be able to:
33.01 Demonstrate understanding of goals, resources and structure of an organization.
33.02 Understand the concepts and contributions of entrepreneurship.
33.03 Compare and contrast the advantages and disadvantages of the various forms of business ownership.
33.04 Understand economic principles affecting business cycles and the workforce.
33.05 Analyze possible solutions to specific business problems.

CTE Standards and Benchmarks	
33.06	Apply economic decisions related to personal financial affairs, the successful operation of organizations and within a global economy.
33.07	Understand the role of a consumer, producer, saver and investor in the market system.
33.08	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.

CTE Standards and Benchmarks	
34.0	Demonstrate an understanding of career readiness. The student will be able to:
34.01	Explain the importance of life-long learning.
34.02	Evaluate/research occupational interests.
34.03	Demonstrate attitudes/ethics needed for career success.
34.04	Assess personal strengths, talents, values and interests to appropriate jobs and careers to maximize career potential.
34.05	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.
34.06	Evaluate postsecondary training opportunities related to career interests, including certification, licensing, apprenticeships, college, and military options.
34.07	Relate and identify career interests and transferable skills necessary for opportunities in the global workforce.
34.08	Develop an individual career plan and portfolio.
34.09	Analyze needs of business and industry on labor and economic trends.
34.10	Describe the changing roles including non-traditional occupations in the workplace.
35.0	Demonstrate employability skills. The student will be able to:
35.01	Identify and utilize resources used in a job search (e.g., newspaper, Internet, networking).

CTE Standards and Benchmarks	
35.02	Discuss importance of drug tests and criminal background checks in identifying possible employment options.
35.03	Identify steps in the job application process including arranging for references and proper documentation.
35.04	Identify procedures and complete documents required when applying for a job (e.g., application, W-4, I-9).
35.05	Prepare a resume (electronic and traditional), cover letter, letter of application, follow-up letter, acceptance/rejection letter, and letter of resignation.
35.06	Demonstrate appropriate dress and grooming for employment.
35.07	Demonstrate effective interviewing skills (e.g., behavioral).
35.08	Describe methods for handling illegal interview and application questions.
35.09	Discuss state and federal labor laws regulating the workplace (e.g., Child Labor Law, sexual harassment, EEOC, ADA, and FMLA).
35.10	Identify positive work attitudes and behaviors such as honesty, compassion, respect, responsibility, fairness, trustworthiness, and caring.
35.11	Describe importance of producing quality work and meeting performance standards.
35.12	Identify personal and business ethics (e.g., preventing theft, pilfering, and unauthorized discounting).
35.13	Demonstrate orderly and systematic behavior by creating and maintaining a personal planner.
35.14	Identify qualities typically required for promotion (e.g., productivity, dependability, responsibility).
35.15	Identify how to prepare for job separation and re-employment.
35.16	Create and maintain a career portfolio (e.g., resume, letters of recommendation, awards, evidence of participation in school/community/volunteer activities, employer evaluations).
36.0	Demonstrate competencies in a specific career. The student will able to:
36.01	Demonstrate job performance skills as outlined in the training plan
36.02	Exhibit effective workplace safety practices including use of protective devices
36.03	Display an acceptable level of productivity and quality control
36.04	Demonstrate effective written and oral communication and listening skills when interacting with customers, co-workers, and managers
36.05	Demonstrate decision making and problem-solving processes and techniques used in the workplace.

CTE Standards and Benchmarks	
	36.06 Demonstrate acceptable work habits and conduct in the workplace as defined by company policy
	36.07 Demonstrate an understanding of the company's vision and mission statements.
	36.08 Demonstrate an understanding of the company's goals and objectives
	36.09 Demonstrate familiarity with the company's products and services
	36.10 Demonstrate the ability to identify authority, rights, and responsibilities of both employers and employees
37.0	Demonstrate career acquisition. The student will be able to:
	37.01 Participate in work-based learning opportunities such as: mentoring, cooperative work, job shadows, apprenticeships and internships.
	37.02 Demonstrate effective oral and written communication skills necessary for employment.
	37.03 Demonstrate job search skills using a variety of resources.
	37.04 Apply the decision-making process to the various stages of the work life cycle.
	37.05 Identify and demonstrate employability skills including job search, selection, the interviewing process, proper dress and presentation.
	37.06 Compare and contrast compensation packages that include varying levels of wages and benefits.
38.0	Demonstrate career retention. The student will be able to:
	38.01 Demonstrate positive personal qualities and self-management skills (i.e., time management, organization, punctuality and attendance).
	38.02 Describe how productivity, work ethic and quality affect job stability.
	38.03 Demonstrate communication team building and leadership skills.
	38.04 Demonstrate personal health and workplace safety procedures.
	38.05 Identify biases, harassment and discriminatory behaviors impacting job success and advancement.
	38.06 Acknowledge and respond to constructive criticism and employment evaluation.
	38.07 Understand the importance of following company policy and procedures and the legal ramifications of labor laws impacting employment.
	38.08 Understand the role of compromise in conflict resolution.
39.0	Demonstrate integrated learning and life skills. The student will be able to:

CTE Standards and Benchmarks	
39.01	Demonstrate the integration and application of academic and occupational skills in school, work and personal lives.
39.02	Use communication, mathematical and technical skills to compare compute, and analyze complex information.
39.03	Discuss how personal choices, experiences, technology, education/training and other factors correlate with earning a living.
39.04	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.
39.05	Compare and contract strategies for personal finance and risk management.
39.06	Demonstrate the ability to set, monitor and achieve clearly defined goals.
40.0	Demonstrate technology and information. The students will be able to:
40.01	Apply knowledge of technology to identify and solve problems.
40.02	Identify and evaluate how information technology developments have changed the way people work.
40.03	Select, apply and troubleshoot software and hardware as they apply to a variety of work applications.
40.04	Describe how new developments in varied fields or technology affect the job market and the level of worker ‘s responsibilities.
40.05	Analyze the ethical issues surrounding access, privacy, and confidentiality of information in emerging technologies.
40.06	Explore current and future positions and career paths in the field of technology.
40.07	Identify job tasks that presently are and will be in the future performed in the specified occupation (training plan).
40.08	Create a training plan indicating competencies mastered.
40.09	Maintain a record of employment hours and wages for auditing and budgetary purposes (e.g., timecards, budget sheets).
40.10	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.

Florida Standards for English Language Development (ELD)

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

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

Career and Technical Student Organization (CTSO)

SkillsUSA and Florida Technology Student Association (FL-TSA) are the co-curricular 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 course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **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
Program Length	6 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 planned sequence of instruction consisting of six credits.

It is **strongly recommended** that the scope, sequence, and course recommendations be followed.

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:

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

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

National Standards

Programs identified as having Industry or National Standards to the corresponding standards and/or benchmarks for the Automotive Maintenance and Light Repair program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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 strongly recommended 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 prepares 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:
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
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
01.02	Demonstrate knowledge of appropriate automotive industry certifications.	
01.03	Identify and define career opportunities in the automotive service industry.	

CTE Standards and Benchmarks		Priority Number
01.04	Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).	
01.05	Identify appropriate emergency first aid procedures.	
01.06	Utilize and demonstrate safe procedures for handling of tools and equipment.	ASE
01.07	Identify and use proper placement of floor jacks and jack stands.	ASE
01.08	Identify and use proper procedures for safe lift operation.	ASE
01.09	Utilize proper ventilation procedures for working within the lab/shop area.	ASE
01.10	Identify proper procedures for safe pit usage.	
01.11	Identify marked safety areas.	ASE
01.12	Identify the location and the types of fire extinguishers and other fire safety equipment.	ASE
01.13	Demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.	ASE
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.	
01.20	Identify and describe typical automotive lubricants and lubricant properties.	
01.21	Identify and describe typical automotive seals and gaskets.	
01.22	Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	ASE
01.23	Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.	
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

CTE Standards and Benchmarks		Priority Number
	01.25 Locate and demonstrate knowledge of Safety Data Sheets (SDS).	ASE
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
	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
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
	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 Demonstrate use of the three C's (Concern, Cause, and Correction).	ASE
	03.05 Review vehicle service history.	ASE
	03.06 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	ASE
	03.07 Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.	
	03.08 Determine the presence of a Tire Pressure Monitoring System (TPMS).	
	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.	
	03.13 Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.	
	03.14 Use proper chemicals for cleaning and lubrication.	

CTE Standards and Benchmarks		Priority Number
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.	
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.	
03.28	Check manual transmission fluid level; note unusual conditions; service as required.	
03.29	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.	
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.	

CTE Standards and Benchmarks	Priority Number
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.	
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 tires according to industry standards.	
03.49 Reinstall wheel; torque wheel fasteners to specification.	
03.50 Check wheel bearings for play and other signs of wear.	
03.51 Perform a visual inspection of a brake drum system.	
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.	
03.57 Perform slow/fast battery charge.	
03.58 Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.	

CTE Standards and Benchmarks		Priority Number
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
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
04.08	Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.	
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
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

CTE Standards and Benchmarks		Priority Number
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
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 strongly recommended 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:
EE = Electrical/Electronic Systems

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

CTE Standards and Benchmarks		Priority Number
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
05.02	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1

CTE Standards and Benchmarks	Priority Number
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
05.05 Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1
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
05.09 Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.	P-1
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.	
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
05.21 Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures.	P-2
Starting System	

CTE Standards and Benchmarks	Priority Number
05.22 Perform starter current draw tests; determine necessary action.	P-1
05.23 Perform starter circuit voltage drop tests; determine necessary action.	P-1
05.24 Inspect and test starter relays and solenoids; determine necessary action.	P-2
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
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
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
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
05.38 Verify operation of instrument panel gauges and warning /indicator lights; reset maintenance indicators.	P-1
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 strongly recommended 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 prepares 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:
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**
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
06.02	Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1

CTE Standards and Benchmarks		Priority Number
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.	
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
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
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
06.23	Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings,	P-1

CTE Standards and Benchmarks		Priority Number
	center pins/bolts and mounts.	
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
06.27	Describe the function of suspension and steering control systems and components, (i.e. active suspension, and stability control).	P-3
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
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.	
06.33	Measure caster; adjust as needed.	
06.34	Measure front wheel toe; adjust as needed.	
06.35	Center the steering wheel using mechanical methods.	
06.36	Measure rear wheel toe, adjust as needed.	
06.37	Measure thrust angle.	
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
06.40	Rotate tires according to manufacturer’s recommendations including vehicles equipped with tire pressure monitoring systems (TPMS).	P-1
06.41	Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.	P-1

CTE Standards and Benchmarks		Priority Number
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
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
07.02	Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).	P-1
07.03	Install wheel and torque lug nuts.	P-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.	
Hydraulic System		
07.06	Describe proper brake pedal height, travel, and feel.	P-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
07.10	Identify components of hydraulic brake warning light system.	P-3
07.11	Bleed and/or flush brake system.	P-1
07.12	Test brake fluid for contamination.	P-1
07.13	Diagnose pressure concerns in the brake system using hydraulic principles (Pascal’s Law).	

CTE Standards and Benchmarks		Priority Number
Drum Brakes		
07.14	Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P-1
07.15	Refinish brake drum and measure final drum diameter; compare with specification.	P-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
07.20	Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.	P-1
07.21	Remove, inspect, and/or replace brake pads and retaining hardware; determine necessary action.	P-1
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
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
07.26	Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-1
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
07.29	Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer’s recommendation.	P-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

CTE Standards and Benchmarks	Priority Number
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
07.35 Check operation of brake stop light system.	P-1
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

Florida Department of Education
Student Performance Standards

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

It is strongly recommended 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 prepares students for entry into the automotive workforce or into post- secondary training. Students 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:
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
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,	P-1

CTE Standards and Benchmarks		Priority Number
	and technical service bulletins.	
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.	
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
08.05	Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	P-2
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
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
09.02	Perform engine absolute manifold pressure tests (vacuum/boost); document results.	P-2
09.03	Perform cylinder power balance test; document results.	P-2
09.04	Perform cylinder cranking and running compression tests; document results.	P-2
09.05	Perform cylinder leakage test; document results.	P-2
09.06	Verify engine operating temperature.	P-1
09.07	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1

CTE Standards and Benchmarks		Priority Number
Computerized Controls		
09.08	Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable.	P-1
09.09	Describe the use of the OBD monitors for repair verification.	P-1
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
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
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
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
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.	
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

CTE Standards and Benchmarks	Priority Number
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
10.12 Describe the operational characteristics of a hybrid vehicle drive train.	P-3
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
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
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.	
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
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

CTE Standards and Benchmarks	Priority Number
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
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 strongly recommended 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 prepares students for entry into the automotive workforce or into post- secondary training. Students 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:
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
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
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.	
12.05	Identify and interpret engine concern; determine necessary action.	
12.06	Locate and interpret vehicle and major component identification numbers.	
12.07	Diagnose engine noises and vibrations; determine necessary action.	
12.08	Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.	
12.09	Perform engine vacuum tests; determine necessary action.	
12.10	Perform cylinder power balance tests; determine necessary action.	
12.11	Perform cylinder cranking and running compression tests; determine necessary action.	
12.12	Perform cylinder leakage tests; determine necessary action.	
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
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
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

CTE Standards and Benchmarks	Priority Number
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
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
12.25 Inspect auxiliary coolers; determine necessary action.	P-3
12.26 Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
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
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
13.04 Identify and interpret electrical/electronic system concern; determine necessary action.	
13.05 Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures.	
Battery Diagnosis and Service	
13.06 Perform battery conductance test; determine necessary action.	

CTE Standards and Benchmarks	Priority Number
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
Charging System Diagnosis and Repair	
13.08 Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.	P-1
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
13.10 Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.	
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
13.12 Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine needed action.	P-2
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.	
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, sunroof, sun shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, cruise control, and auto dimming headlamps); determine needed repairs.	P-3
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
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
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
13.19 Describe body electronic systems circuits using a scan tool; check for module communication errors (data bus systems); determine needed action.	P-3
13.20 Describe the process for software transfer, software updates, or reprogramming of electronic modules.	P-3

CTE Standards and Benchmarks	Priority Number
13.21 Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.	
13.22 Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action.	
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
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
14.05 Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2
14.06 Inspect steering shaft universal joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.	P-2
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	

CTE Standards and Benchmarks		Priority Number
14.16	Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
14.17	Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
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
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
14.22	Inspect, remove and/or replace short and long arm suspension system coil springs and spring insulators.	P-3
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
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
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
14.31	Check toe-out-on-turns (turning radius); determine needed action.	P-2
14.32	Check steering axis inclination (SAI) and included angle; determine needed action.	P-2
14.33	Check rear wheel thrust angle; determine needed action.	P-1
14.34	Check for front wheel setback; determine needed action.	P-2

CTE Standards and Benchmarks	Priority Number
14.35 Check front and/or rear cradle (sub-frame) alignment; determine needed action.	P-3
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
14.38 Measure wheel, tire, axle flange, and hub run out; determine needed action.	P-2
14.39 Diagnose tire pull problems; determine needed action.	P-2
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
15.02 Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals).	
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
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
15.11 Inspect, test, and/or replace components of brake warning light system.	P-3
15.12 Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination	

CTE Standards and Benchmarks	Priority Number
valves.	
Drum Brake Diagnosis and Repair	
15.13 Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.	P-1
15.14 Install wheel, torque lug nuts, and make final checks and adjustments associated with drum brakes.	
Disc Brake Diagnosis and Repair	
15.15 Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pulsation concerns; determine needed action.	P-1
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.	
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
15.19 Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine needed action.	P-3
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
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
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 strongly recommended 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:

Automotive Maintenance and Light Repair 6 prepares students for entry into the automotive workforce or into post- secondary training. Students 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:
HA = Heating and Air Conditioning
EP = Engine Performance
AT = Automatic Transmission/Transaxle
MD = Manual Drivetrain and Axles

HA Task List:	
P-1 =	12
P-2 =	12
P-3 =	4
Total	28

EP Task List:	
P-1 =	13
P-2 =	12
P-3 =	7
Total	32

AT Task List:	
P-1 =	5
P-2 =	6
P-3 =	2
Total	13

MD Task List:	
P-1 =	11
P-2 =	8
P-3 =	4
Total	23

CTE Standards and Benchmarks		Priority Number
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
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
16.04	Identify refrigerant type; select and connect proper gauge set/test equipment; record temperature and pressure readings.	P-1
16.05	Leak test A/C system; determine needed action.	P-1
16.06	Inspect condition of refrigerant oil removed from A/C system; determine needed action.	P-2
16.07	Determine recommended oil and oil capacity for system application.	P-1
16.08	Using a scan tool, observe and record related HVAC data and trouble codes.	P-3
16.09	Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.	
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
16.13	Determine need for an additional A/C system filter; determine needed action.	P-3
16.14	Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; determine needed action.	P-2
16.15	Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine recommended oil type and quantity.	P-2
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

CTE Standards and Benchmarks	Priority Number
16.18 Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.	P-2
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.	
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.	
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
16.28 Diagnose HVAC system clutch control systems; determine needed action.	P-2
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
16.30 Inspect and test HVAC system control panel assembly; determine needed action.	P-3
16.31 Inspect and test HVAC system control cables, motors, and linkages; determine needed action.	P-3
16.32 Check operation of automatic or semi-automatic HVAC control systems; determine needed action.	P-2
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

CTE Standards and Benchmarks		Priority Number
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
17.02	Diagnose abnormal engine noise or vibration concerns; determine necessary action.	P-3
17.03	Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine necessary action.	P-2
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
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
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.	
17.14	Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.	
17.15	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.	
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
17.18	Check for module communication (including CAN/BUS systems) errors using a scan tool.	

CTE Standards and Benchmarks		Priority Number
Ignition System Diagnosis and Repair		
17.19	Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns; determine needed action.	P-2
17.20	Inspect and test crankshaft and camshaft position sensor(s); determine needed action.	P-1
17.21	Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as needed.	P-3
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.	
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair		
17.24	Check fuel for contaminants; determine needed action.	P-2
17.25	Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; determine needed action.	P-1
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
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
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
17.32	Inspect, test, service and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; determine needed action.	P-2
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
17.34	Inspect and test electrical/electronically operated components and circuits of secondary air injection systems; determine needed action.	P-3
17.35	Inspect and test components and hoses of the evaporative emissions control (EVAP) system; determine needed action.	P-1

CTE Standards and Benchmarks		Priority Number
17.36	Diagnose emissions and drive-ability concerns caused by the catalytic converter system; determine needed action.	P-3
17.37	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.	P-2
17.38	Inspect and test mechanical components of secondary air injection systems; perform necessary action.	
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.	
17.42	Inspect engine oil and/or filter for condition and determine necessary action.	
17.43	Identify hybrid vehicle internal combustion engine service precautions.	
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
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
18.05	Perform lock-up converter system tests; determine needed action.	P-3
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,	P-1

CTE Standards and Benchmarks		Priority Number
	solenoids, sensors, relays, terminals, connectors, switches, and harnesses; demonstrate understanding of relearn procedure.	
18.11	Diagnose electronic transmission control systems using a scan tool; determine necessary action.	
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
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.	
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
19.02	Check fluid condition; check for leaks; determine needed action.	P-1
Clutch Diagnosis and Repair		
19.03	Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action.	P-1
19.04	Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; determine needed action.	P-1
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
19.08	Measure flywheel runout and crankshaft end play; determine needed action.	P-2
19.09	Describe the operation and service of a system that uses a dual mass flywheel.	P-3

CTE Standards and Benchmarks		Priority Number
19.10	Remove and reinstall manual transmission/transaxle.	
19.11	Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.	
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.	
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.	
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
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
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		

CTE Standards and Benchmarks	Priority Number
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
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
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.

Florida Standards for English Language Development (ELD)

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

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

Career and Technical Student Organization (CTSO)

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

Florida Department of Education
Curriculum Framework

Program Title: **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
Program Length	7 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3051 – Motorboat Mechanics and Service Technicians
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 seven credits.

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

The following table illustrates the secondary program structure:

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

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

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 encompasses 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.

CTE Standards and Benchmarks	
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.
01.06	Read, interpret, and apply service manuals.
01.07	Identify the safe use of paints, chemicals, fiberglass, and compounds
01.08	Demonstrate, apply, and provide evidence of safely using paints, chemicals, fiberglass, and compounds.
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.
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.

CTE Standards and Benchmarks	
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.
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).

CTE Standards and Benchmarks
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.
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.
03.02 Explain a galvanic series.
03.03 Explain the theory for using given materials in boat repair activities.
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.
04.02 Identify types of two-stroke cycle engines.
04.03 Locate engine serial and model numbers.
04.04 Set up and use precision measurement tools.
04.05 Drill and remove broken studs and install helicoils.
04.06 Demonstrate appropriate heating techniques and skills.
04.07 Identify engine assemblies and systems.
04.08 Disassemble engines.
04.09 Remove, clean and inspect heads for cracks, warpage and damaged spark plug threads.

CTE Standards and Benchmarks
04.10 Diagnose head problems by use of the visual inspection method.
04.11 Diagnose head problems by use of the compression tester method.
04.12 Diagnose head problems by use of the stethoscope method.
04.13 Remove, clean and inspect piston rods and assemblies.
04.14 Measure out-of-round of pistons and cylinders.
04.15 Hone cylinders.
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.
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.
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.).
05.02 Sketch and label the parts of total fuel systems.
05.03 Service fuel lines and primer bulbs (vacuum test).

CTE Standards and Benchmarks
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.

CTE Standards and Benchmarks	
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.
06.03	Locate and identify electrical circuit components.
06.04	Sketch a typical circuit using a single wire system.
06.05	Test storage batteries using proper industry recognized battery testing equipment.
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.
06.11	Remove and replace gauges or indicating lights.
06.12	Remove and replace fuel-sending units.
06.13	Diagnose gages and accessory system troubles using voltmeters, ammeters or detached sending units.

CTE Standards and Benchmarks
06.14 Sketch typical circuits such as those for auto bilge pumps or navigation lights.
06.15 Locate opens, shorts and grounds.
06.16 Demonstrate proficiency in applying industry standard wire terminal practices.
06.17 Demonstrate proper installation of 2 position and 3 position battery switches.
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.
07.02 Locate manufacturers' I.D. plates.
07.03 Mount control boxes at the helm.
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.
07.08 Lubricate shafts, install propellers and fasten both securely.
07.09 Check for proper levels.
07.10 Check manufacturers' specifications.
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.
07.15 Remove and replace running lights.

CTE Standards and Benchmarks
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.
08.02 Set up and use ohmmeters.
08.03 Set up and use a DVA tester or equivalent.
08.04 Set up and use spark testers.
08.05 Set up and use timing lights.
08.06 Set up and use multi-meter.
08.07 Locate and identify parts of capacitor discharge ignition systems.
08.08 Locate and match electrical units by their symbols on a wiring diagram.
08.09 Sketch and label complete C/D ignition systems.
08.10 Check coil resistance, shorts, and grounds with an ohmmeter.
08.11 Check stator windings with an ohmmeter.
08.12 Check sensor coils, charge coils, ignition coils and shorts to ground with a DVA tester or equivalent.
08.13 Check power packs with an ohmmeter and a DVA tester or equivalent.
09.0 Maintain and repair outboard fuel systems. The student will be able to:
09.01 Identify the major types of carburetors.
09.02 Check and adjust throttle.
09.03 Identify and service different types of EFI/DFI systems.
09.04 Identify air cleaners.

CTE Standards and Benchmarks	
	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.
	10.02 Identify the skills needed to be a parts specialist.
	10.03 Demonstrate appropriate computer skills.
	10.04 Demonstrate knowledge of different parts and accessories.

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.

CTE Standards and Benchmarks
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.
11.02 Identify types of four-stroke cycle engines.
11.03 Locate engine serial and model numbers.
11.04 Identify engine assemblies and systems.
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.
11.07 Disassemble engines and inspect parts.
11.08 Clean and inspect heads for cracks, warpage, and damaged spark plug threads.
11.09 Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin.
11.10 Adjust valves.
11.11 Remove and inspect camshafts and lifters.
11.12 Clean and inspect lifters for wear.
11.13 Time valve drive assemblies.

CTE Standards and Benchmarks
11.14 Reassemble engines.
11.15 Inspect oil seals.
11.16 Inspect/replace timing belt/chain.
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.
12.02 Disassemble charging systems and identify the components.
12.03 Perform stator and rectifier testing on charging systems.
12.04 Reassemble and test charging systems.
12.05 Set up and use ohmmeters.
12.06 Reassemble and test complete units.
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.
13.02 Locate and match electrical units by their symbols on a wiring diagram.
13.03 Sketch and label complete battery ignition systems.
13.04 Check coil resistance with an ohmmeter.
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.
14.02 Inspect components of recoil starters.
14.03 Reassemble recoil starters.

CTE Standards and Benchmarks
14.04 Identify components of electrical starting systems.
14.05 Bench test switches.
14.06 Troubleshoot starting systems using multi-meter.
14.07 Locate opens, short and grounds.

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.

CTE Standards and Benchmarks
15.0 Maintain and repair outboard lubrication systems. The student will be able to:
15.01 Identify the types and functions of lubrication systems.
15.02 Explain the principles of lubrication systems.
15.03 Identify and locate components of lubrication systems.
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.
16.02 Trace water flow through cooling systems.
16.03 Disassemble, examine for problems, and reassemble water pumps.
16.04 Remove, check, and replace thermostats.

CTE Standards and Benchmarks
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.
17.03 Refill lower gear cases with specified oil.
17.04 Determine propeller pitch diameter and hub type.
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.
18.06 Understand the process for removing and servicing cylinders and rams.
18.07 Adjust the trim and tilt.
18.08 Determine the differences between mechanical, electrical, and hydraulic shifting units.
18.09 Explain the shifting theory of the lower unit.
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.
19.03 Identify documents that may be required when applying for a job interview.

CTE Standards and Benchmarks	
	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
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.
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.
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:

CTE Standards and Benchmarks	
	22.01 Identify and locate fuel system components (fuel tanks, lines, filters, etc.).
	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.
	22.06 Remove and replace fuel-sending units.
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.
	23.02 Trace water flow through cooling systems.
	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.
	24.02 Explain the principles of lubrication systems.
	24.03 Identify and locate components of lubrication systems.
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.
	25.02 Sketch and label complete battery ignition systems.
26.0	Maintain and repair capacitor discharge ignition systems. The student will be able to:
	26.01 Sketch and label electrical symbols.
	26.02 Set up and use multi-meters.
	26.03 Set up and use appropriate test equipment.
	26.04 Set up and use spark testers.
	26.05 Set up and use timing lights.

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
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.
21.14 Understand the process for measuring the piston ring gap in cylinder bores.
21.15 Understand the process for installing and fitting piston pins.
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.
21.19 Install rings on pistons.
21.20 Measure and check crankshafts with a micrometer.
21.21 Check for end play.
21.22 Understand the process for checking bearing bores with a telescoping gage.
21.23 Reassemble engines.
21.24 Install oil seals.
21.25 Inspect/replace timing belt/chain.

CTE Standards and Benchmarks
22.0 Maintain and repair inboard fuel systems. The student will be able to:
22.07 Describe or demonstrate the process for removing, cleaning, inspecting and installing fuel tanks.
22.08 Vacuum test fuel system.
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.
24.07 Recognize and use only recommended oil.
25.0 Maintain and repair electronic ignition systems. The student will be able to:
25.03 Set up and use test equipment.
25.04 Set timing using a timing light

CTE Standards and Benchmarks	
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.
26.07	Locate and match electrical units by their symbols on a wiring diagram.
26.08	Check coil resistance, shorts and grounds with an ohmmeter.
26.09	Check sensor coils, charge coils, ignition coils and shorts to ground with appropriate test equipment.

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	
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.

CTE Standards and Benchmarks	
	29.03 Determine the methods needed to acquire needed resources.
	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.

Florida Standards for English Language Development (ELD)

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

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

Career and Technical Student Organization (CTSO)

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

Florida Department of Education
Curriculum Framework

Program Title: **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
Program Length	5 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA, FL-TSA
SOC Codes (all applicable)	49-2091 – Avionics Technicians
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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

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

The following table illustrates the secondary program structure:

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

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

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: www.faa.gov and www.eta-i.org

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 knowledge in Unmanned Aerial Vehicle Operations.
17.0 Demonstrate proficiency in digital circuits.
18.0 Demonstrate proficiency in fundamental microprocessors.
19.0 Demonstrate an understanding of workplace safety practices.
20.0 Demonstrate appropriate communication skills.
21.0 Demonstrate knowledge of basic avionics systems.
22.0 Conceive, design, and present an avionics project(s) that encompasses all the skills learned in the Avionics Systems program.
23.0 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.

CTE Standards and Benchmarks	
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	Identify the primary parts of an aircraft.
01.03	Describe how avionics systems integrate with aircraft airframe and propulsion systems.
01.04	Research and describe the certifications associated with the avionics maintenance technician.
02.0	Demonstrate skills in technical communications. The student will be able to:
02.01	Interpret electronic schematics
02.02	Write reports and make oral presentations.
02.03	Maintain test logs.
02.04	Write formal reports of laboratory experiences
02.05	Read and follow written instructions.
02.06	Answer and ask questions coherently and concisely
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.

CTE Standards and Benchmarks	
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	Identify sources of electricity.
04.02	Define voltage, current, resistance, power, and energy.
04.03	Apply Ohm's law and power formulas.
04.04	Read and interpret color codes and symbols to identify electrical components and values.
04.05	Measure properties of a DC circuit using an analog volt/ohm (VOM) meter.
04.06	Measure properties of a DC circuit using a digital multimeter (DMM).
04.07	Measure properties of a DC circuit using an oscilloscope.
04.08	Compute conductance and compute and measure resistance of conductors and insulators.
04.09	Apply Ohm's law to series circuits.
04.10	Analyze and troubleshoot series circuits.
04.11	Apply Ohm's law to parallel circuits.
04.12	Analyze and troubleshoot parallel circuits.

CTE Standards and Benchmarks	
05.0	Demonstrate proficiency in advanced direct current (DC) circuits. The student will be able to:
05.01	Apply Ohm's law to series-parallel and parallel-series circuits.
05.02	Verify the operation of series-parallel, parallel-series, and bridge circuits.
05.03	Troubleshoot series-parallel and parallel-series and bridge circuits.
05.04	Identify and define voltage divider circuits (loaded and unloaded).
05.05	Verify the operation of voltage divider circuits (loaded and unloaded).
05.06	Analyze and troubleshoot voltage divider circuits (loaded and unloaded).
05.07	Describe magnetic properties of circuits and devices.
05.08	Determine the physical and electrical characteristics of capacitors and inductors.
05.09	Define resistor-capacitor (R-C) and resistor-inductor (R-L) time constants.
05.10	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.
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.

CTE Standards and Benchmarks	
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 circuit.
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.
07.13	Analyze and troubleshoot AC inductive circuits.
08.0	Demonstrate proficiency in advanced alternating current (AC) circuits. The student will be able to:

CTE Standards and Benchmarks	
	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.
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.

CTE Standards and Benchmarks
11.02 Read and interpret aircraft drawings and blueprints.
11.03 Use of charts and graphs.

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.

CTE Standards and Benchmarks
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.
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.

CTE Standards and Benchmarks
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.
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 because of temperature extremes, chemical reaction, and moisture content.

CTE Standards and Benchmarks	
	14.02 Describe the types of corrosion and explain their effects on avionics equipment.
	14.03 Describe the preventative processes to reduce avionics corrosion.
15.0	Demonstrate proficiency in aircraft aerodynamic fundamentals. The student will be able to:
	15.01 Identify and describe the purpose aircraft flight controls and aircraft how they affect flight operations.
	15.02 Define the concept of weight and balance in aircraft to include arms, weights, moments, the Law of Lever, and the center of gravity.
	15.03 Describe the effects of installing equipment, modifying equipment, modifying airframe structures, and repositioning equipment on weight and balance.
16.0	Demonstrate knowledge in Unmanned Aerial Vehicle Operations. The students will able to:
	16.01 Demonstrate an understanding of the levels of direct and autonomous control currently in use for guiding, navigating, and controlling a UAV.
	16.02 Discriminate the various types of UAV payloads, power, and communications systems

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.

CTE Standards and Benchmarks
17.0 Demonstrate proficiency in digital circuits. The student will be able to:
17.01 Analyze and minimize logic circuits using Boolean operations.
17.02 Set up and operate logic probes for digital circuits.
17.03 Set up and operate power supplies for digital circuits and solve power distribution and noise problems.
17.04 Set up and operate pulsers for digital circuits.
17.05 Set up and operate oscilloscopes for digital circuits.
17.06 Set up and operate logic analyzers for digital circuits.
17.07 Set up and operate pulse generators for digital circuits.
17.08 Identify types of logic gates and their truth tables.
17.09 Verify combinational logic circuits made up of integrated circuits.
17.10 Troubleshoot logic circuits.
17.11 Analyze types of flip-flops and their truth tables.
17.12 Troubleshoot flip-flops.
17.13 Identify, define and measure characteristics of integrated circuit (IC) logic families.
17.14 Identify types of registers and counters.

CTE Standards and Benchmarks
17.15 Troubleshoot registers and counters.
17.16 Analyze clock and timing circuits.
17.17 Troubleshoot clock and timing circuits.
17.18 Identify types of arithmetic-logic circuits.
17.19 Troubleshoot arithmetic-logic circuits.
17.20 Identify types of encoding and decoding devices.
17.21 Troubleshoot encoders and decoders.
17.22 Identify types of multiplexer and de-multiplexer circuits.
17.23 Troubleshoot multiplexer and de-multiplexer circuits.
17.24 Identify types of memory circuits.
17.25 Relate the uses of digital-to-analog and analog-to-digital conversions.
17.26 Troubleshoot digital-to-analog and analog-to-digital circuits.
17.27 Identify types of digital displays.
17.28 Troubleshoot digital display circuits.
17.29 Demonstrate the operating characteristics of digital-type servo and stepper motors
18.0 Demonstrate proficiency in fundamental microprocessors. The student will be able to:
18.01 Identify central processing unit (CPU) building blocks and their uses (architecture).
18.02 Analyze bus concepts.
18.03 Analyze various memory schemes.
18.04 Verify memory device operation.
18.05 Set up and operate oscilloscopes for microprocessor systems.
18.06 Identify types of input and output devices and peripherals.

CTE Standards and Benchmarks	
	18.07 Interface input and output ports to peripherals.
	18.08 Analyze and troubleshoot input and output ports.
	18.09 Develop a simple microprocessor and/or microcontroller application program.
19.0	Demonstrate an understanding of workplace safety practices. The student will be able to:
	19.01 Use Safety Data Sheets (SDS) information to determine the use, safety precautions, and disposition of chemicals used in avionics applications.
	19.02 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.
	19.03 Describe flight line safety to include foreign object elimination, situational awareness, aircraft movement precautions, fire classifications, and fire extinguishing.
20.0	Demonstrate appropriate communication skills. The student will be able to:
	20.01 Make equipment failure reports.
	20.02 Specify and requisition simple electronic components.
	20.03 Compose technical letters and memoranda.
	20.04 Draft preventive maintenance procedures.
	20.05 Use an analysis of technical data to form conclusions and recommend changes.
21.0	Demonstrate knowledge of basic avionics systems. The student will be able to:
	21.01 Identify and describe aircraft communications systems.
	21.02 Identify and describe aircraft short-range navigation systems.
	21.03 Identify and describe aircraft long-range navigation systems
	21.04 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	
22.0	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:
22.01	Create and produce an original working drawing using avionics nomenclature.
22.02	Compose a well written design proposal and present to instructor for approval.
22.03	Incorporate principles and practices of Avionics Systems into the project.
23.0	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:
23.01	Create a Design Portfolio documenting project timeline, drawings, and specifications.
23.02	Create a Bill of Material (BOM) for your project.
23.03	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.

Florida Standards for English Language Development (ELD)

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

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

Special Notes

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.

Career and Technical Student Organization (CTSO)

SkillsUSA and Florida Technology Student Association (FL-TSA) are the co-curricular 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 course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **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
Program 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
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 four credits.

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:

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

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

National Standards

Programs identified as having Industry or National Standards to the corresponding standards and/or benchmarks for the Medium and Heavy Duty Bus and Truck program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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.

ASE = Required Supplemental Tasks

CTE Standards and Benchmarks		Priority Number
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
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

CTE Standards and Benchmarks		Priority Number
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
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.	

CTE Standards and Benchmarks		Priority Number
	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
	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

CTE Standards and Benchmarks	Priority Number
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:
BR – Brakes

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

CTE Standards and Benchmarks		Priority Number
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, unloader assembly valves, filters, lines, hoses, and fittings; replace as needed.	P-1

CTE Standards and Benchmarks		Priority Number
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; replace as needed.	P-1
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

CTE Standards and Benchmarks		Priority Number
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
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

CTE Standards and Benchmarks	Priority Number
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:
PM = Preventative Maintenance

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

CTE Standards and Benchmarks	Priority Number
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
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
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

CTE Standards and Benchmarks	Priority Number
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
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

CTE Standards and Benchmarks		Priority Number
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
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:
PM = Preventative Maintenance

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

CTE Standards and Benchmarks	Priority Number
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
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

CTE Standards and Benchmarks	Priority Number
24.12 Check brake chambers and air lines for secure mounting and damage.	P-1
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

CTE Standards and Benchmarks		Priority Number
	25.10 Check drum brakes for proper adjustment.	
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
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
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.

Florida Standards for English Language Development (ELD)

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

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

Career and Technical Student Organization (CTSO)

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

Florida Department of Education
Curriculum Framework

Program Title: **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
Program 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
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 six credits.

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

The following table illustrates the secondary program structure:

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

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

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.

CTE Standards and Benchmarks	
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.
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.

CTE Standards and Benchmarks
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.
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.

CTE Standards and Benchmarks	
	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:
	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.

CTE Standards and Benchmarks	
	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 because 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.
	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.

CTE Standards and Benchmarks	
	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.
	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.

CTE Standards and Benchmarks	
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.
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.

CTE Standards and Benchmarks
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:
14.01 Service and repair manual starting systems.
14.02 Service and repair electrical starting systems.
14.03 Test and service battery starting systems.

CTE Standards and Benchmarks
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.
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.

CTE Standards and Benchmarks
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.

CTE Standards and Benchmarks
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.
18.12 Hone cylinders.
18.13 Check the total bearing surface of connecting rod bearings.

CTE Standards and Benchmarks
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.
19.11 Remove and inspect camshafts and lifters.

CTE Standards and Benchmarks
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.

CTE Standards and Benchmarks	
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:
21.01	Diagnose and replace power transfer system components.
21.02	Diagnose and repair manual transmissions.
21.03	Diagnose and repair differentials.

CTE Standards and Benchmarks	
	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.
	24.02 Identify principles of stress management.
	24.03 Identify and define career opportunities in the industry.

CTE Standards and Benchmarks
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.

CTE Standards and Benchmarks	
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.

CTE Standards and Benchmarks	
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.

Florida Standards for English Language Development (ELD)

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

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

Career and Technical Student Organization (CTSO)

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

Florida Department of Education
Curriculum Framework

Program Title: **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
Program Length	4 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	FL-TSA, SkillsUSA
SOC Codes (all applicable)	17-3024 – Electro-Mechanical Technicians 49-3011 – Aircraft Mechanics and Service Technicians
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this program is to prepare students for employment 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 four credits.

The following table illustrates the Secondary program structure:

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

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

National Standards

Programs identified as having Industry or National Standards to the corresponding standards and/or benchmarks for the Unmanned Aircraft Systems (UAS) Operations program can be found using the following link: https://www.faa.gov/uas/

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.

CTE Standards and Benchmarks		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.	
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.	

CTE Standards and Benchmarks		FAA FAR Part 61
	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.	
	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.	

CTE Standards and Benchmarks		FAA FAR Part 61
	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.	
	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.	

CTE Standards and Benchmarks		FAA FAR Part 61
	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.	
	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:	

CTE Standards and Benchmarks	FAA FAR Part 61
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 approach lighting systems).	

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.

CTE Standards and Benchmarks		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.	
	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:	

CTE Standards and Benchmarks	FAA FAR Part 107
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:	
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.	

CTE Standards and Benchmarks	FAA FAR Part 107
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.

CTE Standards and Benchmarks	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.	
25.10 Develop flight planning dynamics using programmable software.	
25.11 Program and configure software flight plan.	

CTE Standards and Benchmarks	FAA FAR Part 107
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.	
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:	

CTE Standards and Benchmarks	FAA FAR Part 107
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.

CTE Standards and Benchmarks	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.	
36.03 Apply setup procedures to test, calibrate and optimize the UAS.	

CTE Standards and Benchmarks	FAA FAR Part 61
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.

Florida Standards for English Language Development (ELD)

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

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

Special Notes

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.

Career and Technical Student Organization (CTSO)

Florida Technology Student Association (FL-TSA) and SkillsUSA are the co-curricular career and technical student organization providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Accommodations

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

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

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

Florida Department of Education
Curriculum Framework

Program Title: **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
Program Length	6 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3021 -- Automotive Body and Related Repairers
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 six credits.

Benchmarks identified with a designation of HP-I and HP-G are Automotive Service Excellence Education Foundation (ASEEF) 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:

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

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

National Standards

Programs identified as having Industry or National Standards corresponding to the standards and/or benchmarks for the Automotive Collision Technology program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation.

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:
Automotive Service Excellence = ASE Supplemental Tasks

CTE Standards and Benchmarks		Priority Number
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-1910.6H).	
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
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

CTE Standards and Benchmarks		Priority Number
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.	
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.	

CTE Standards and Benchmarks	Priority Number
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 and 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:
PR = Painting and Refinishing

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

CTE Standards and Benchmarks		**Priority Number**
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
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	HP-I

CTE Standards and Benchmarks		Priority Number
	regulation.	
04.05	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		
04.06	Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment).	HP-I
04.07	Select spray gun setup (fluid needle, nozzle, and cap) for product being applied.	HP-I
04.08	Test and adjust spray gun using fluid, air and pattern control valves.	HP-I
04.09	Demonstrate an understanding of the operation of pressure spray equipment.	HP-G
Surface Preparation		
04.10	Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants.	HP-I
04.11	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
04.12	Remove paint finish as needed.	HP-I
04.13	Dry or wet sand areas to be refinished.	HP-I
04.14	Featheredge areas to be refinished.	HP-I
04.15	Apply suitable metal treatment or primer in accordance with total product systems.	HP-I
04.16	Identify, mask, and protect other areas that will not be refinished.	HP-I
04.17	Demonstrate different masking techniques (recess/back masking, foam door type, etc.).	HP-G
04.18	Mix primer, primer-surfacer, or primer-sealer.	HP-I
04.19	Identify a complimentary color or shade of undercoat to improve coverage.	HP-G
04.20	Apply primer onto surface of repaired area.	HP-I
04.21	Apply two-component finishing filler to minor surface imperfections.	HP-I
04.22	Block sand area to which primer-surfacer has been applied.	HP-I

CTE Standards and Benchmarks		Priority Number
04.23	Dry sand area to which finishing filler has been applied.	HP-I
04.24	Remove dust from area to be refinished, including cracks or moldings of adjacent areas.	HP-I
04.25	Clean area to be refinished using a final cleaning solution.	HP-I
04.26	Remove, with a tack rag, any dust or lint particles from the area to be refinished.	HP-I
04.27	Apply suitable primer sealer to the area being refinished.	HP-I
04.28	Scuff sand to remove nibs or imperfections from a sealer.	HP-I
04.29	Apply stone chip resistant coating.	HP-G
04.30	Restore caulking and seam sealers to repaired areas.	HP-G
04.31	Prepare panels for blending as needed.	HP-I
04.32	Identify the types of rigid, semi-rigid or flexible plastic parts to be refinished; determine the materials needed, preparation, and refinishing procedures.	HP-I
04.33	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:
PR = Painting and Refinishing

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

CTE Standards and Benchmarks		**Priority Number**
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
05.03	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
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
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

CTE Standards and Benchmarks	Priority Number
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
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, crow's-feet, or line-checking, micro-checking, etc.); correct the cause(s) and the condition.	HP-G

CTE Standards and Benchmarks		Priority Number
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:
PR = Painting and Refinishing

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

CTE Standards and Benchmarks		**Priority Number**
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
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 and preparation; outer body panel repairs, replacements, and adjustments; and metal finishing and body filling.

Abbreviations:
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
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
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

CTE Standards and Benchmarks		Priority Number
07.05	Identify vehicle system precautions and/or inspections to include but not limited to supplemental restraint system (SRS), advanced driver assistance systems (ADAS), hybrid/alternate fuel vehicles, locations, and recommended procedures before inspecting or replacing components.	HP-1
Preparation		
07.06	Review damage report and analyze damage to determine appropriate methods for overall repair; develop and document a repair plan.	HP-I
07.07	Inspect, remove, store, protect, and replace exterior trim and components necessary for proper surface preparation.	HP-I
07.08	Inspect, remove, label, store, and reinstall necessary trim and moldings.	HP-I
07.09	Inspect, remove, label, store, and reinstall body panels and components that may interfere with or be damaged during repair.	HP-I
07.10	Inspect, remove, protect label, store, and reinstall vehicle mechanical and electrical components that may interfere with or be damaged during repair.	HP-G
07.11	Protect panels, glass, interior parts, and other vehicles adjacent to the repair area.	HP-I
07.12	Soap and water wash entire vehicle; complete pre-repair inspection checklist.	HP-I
07.13	Prepare damaged area using water-based and solvent-based cleaners.	HP-I
07.14	Remove corrosion protection, undercoatings, sealers, and other protective coatings as necessary to perform repairs.	HP-I
07.15	Determine the presence of a Tire Pressure Monitoring System (TPMS).	
07.16	Determine the presence of wheel locks.	
07.17	Determine the presence of an air suspension system.	
07.18	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)	ASE
07.19	Identify procedures to reset maintenance indicators.	
07.20	Verify status of instrument panel warning lights and gauges.	
07.21	Test and replace fuses; confirm proper circuit operation.	
07.22	Inspect and replace exterior and courtesy lamps.	
07.23	Document damage, unusual conditions, and concerns.	

CTE Standards and Benchmarks	Priority Number
Outer Body Panel Repairs, Replacements, and Adjustments	
07.24 Inspect/locate direct, indirect, or hidden damage and direction of impact.	HP-I
07.25 Inspect, remove, and replace mechanically fastened welded steel panel or panel assemblies.	HP-G
07.26 Determine the extent of damage to aluminum body panels; repair or replace.	HP-G
07.27 Inspect, remove, replace, and align hood, hood hinges, and hood latch (when available).	HP-I
07.28 Inspect, remove, replace, and align deck lid, lid hinges, and lid latch.	HP-I
07.29 Inspect, remove, replace, and align doors, latches, hinges, and related hardware (when available).	HP-I
07.30 Inspect, remove, replace, and align tailgates, hatches, liftgates and sliding doors (when available).	HP-G
07.31 Inspect, remove, replace, and align bumper bars, covers, reinforcements, guards, impact absorbers, and mounting hardware.	HP-I
07.32 Inspect, remove, replace, and align fenders, and related panels.	HP-I
07.33 Restore corrosion protection during and after the repair.	HP-I
07.34 Identify procedures to replace door skins.	HP-G
07.35 Identify procedures to restore sound deadeners and foam materials.	HP-G
07.36 Identify procedures to perform panel bonding and weld bonding.	HP-G
07.37 Identify procedures to diagnose and repair water leaks, dust leaks, and wind noise.	HP-G
07.38 Identify one-time use fasteners.	HP-G
07.39 Identify procedures to weld damaged or torn steel body panels; repaired broken welds.	HP-G
Metal Finishing and Body Filling	
07.40 Prepare a panel for body filler by abrading or removing the coatings; featheredge and refine scratches before the application of body filler.	HP-I
07.41 Locate and repair surface irregularities on a damaged body panel using power tools, hand tools, and weld-on pulling attachments.	HP-I
07.42 Demonstrate hammer and dolly techniques.	HP-I

CTE Standards and Benchmarks		Priority Number
07.43	Identify procedures to Hot or cold shrink stretched panel areas to proper contour.	HP-I
07.44	Identify body filler defects; correct the cause and condition. (Pinholing, ghosting, staining, over catalyzing, etc.)	HP-I
07.45	Identify different types of body fillers.	HP-G
07.46	Shape body filler to contour; finish sand.	HP-I
07.47	Identify the processes to Perform proper metal finishing techniques for ferrous and non-ferrous metals.	HP-G
07.48	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:
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
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-1
08.03	Locate OEM procedures to identify material and composition of the vehicle being repaired (mild steel, high strength steel, ultra-high strength steel, and aluminum, etc.).	HP-I
08.04	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
08.05	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	HP-I

CTE Standards and Benchmarks		Priority Number
	regulation.	
08.06	Identify vehicle system precautions and/or inspections to include but not limited to supplemental restraint system (SRS), advanced driver assistance systems (ADAS), hybrid/alternate fuel vehicles, locations and recommended procedures before inspecting or replacing components.	HP-1
Moveable Glass and Hardware		
08.07	Inspect, adjust, repair, or replace window regulators, run channels, glass, power mechanisms, and related controls.	HP-I
08.08	Inspect, adjust, repair, remove, reinstall, or replace weather-stripping.	HP-G
08.09	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
08.10	Inspect, remove, reinstall, and align convertible top and related mechanisms.	HP-G
08.11	Identify procedures to initialize electrical components as needed.	HP-G
Plastics and Adhesives		
08.12	Identify the types of plastics; determine repairability.	HP-I
08.13	Clean and prepare the surface of plastic parts; identify the types of plastic repair procedures.	HP-I
08.14	Repair rigid, semi-rigid, or flexible plastic panels.	HP-I
08.15	Remove or repair damaged areas from rigid exterior composite panels.	HP-G
08.16	Replace bonded rigid exterior composite body panels; straighten or align panel supports.	HP-G
08.17	Inspect, remove, and reinstall repairable plastics and other components for off-vehicle repair.	HP-I
Electrical		
08.18	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
08.19	Identify processes and procedures to repair wiring and connectors.	HP-I
08.20	Identify processes and procedures to inspect, test, and replace fusible links, circuit breakers, and fuses.	HP-I
08.21	Identify processes and procedures to perform battery state-of-charge test and slow/fast battery charge.	HP-I
08.22	Identify processes and procedures to inspect, clean, repair or replace battery, battery cables, connectors and	HP-I

CTE Standards and Benchmarks		Priority Number
	clamps.	
08.23	Dispose of batteries and battery acid according to local, state, and federal requirements.	HP-G
08.24	Identify programmable electrical/electronic components and check for malfunction indicator lamp (MIL) and fault codes; record data for reprogramming before disconnecting battery.	HP-I
08.25	Identify processes and procedures to inspect alignment, adjust, remove, and replace alternator (generator), drive belts, pulleys, and fans.	HP-I
08.26	Check operation and aim headlamp assemblies and fog/driving lamps; determine needed repairs.	HP-I
08.27	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
08.28	Identify processes and procedures to remove and replace horn(s); check operation.	HP-I
08.29	Identify processes and procedures to check operation of wiper/washer systems; determine needed repairs.	HP-I
08.30	Identify processes and procedures to check operation of power side and tailgate window; determine needed repairs.	HP-I
08.31	Identify processes and procedures to inspect, remove and replace power seat, motors, linkages, cables, etc.	HP-G
08.32	Identify processes and procedures to inspect, remove and replace components of electric door and hatch/trunk lock.	HP-G
08.33	Identify processes and procedures to inspect, remove and replace components of keyless lock/unlock devices and alarm systems.	HP-G
08.34	Identify processes and procedures to inspect, remove and replace components of electrical sunroof and convertible/retractable hard top.	HP-G
08.35	Identify processes and procedures to check operation of electrically heated mirrors, windshields, back lights, panels, etc.; determine needed repairs.	HP-I
08.36	Identify processes and procedures to demonstrate the proper self-grounding procedures (anti-static) for handling electronic components.	HP-I
08.37	Identify processes and procedures to check for module communication errors using a scan tool.	HP-G
08.38	Identify processes and procedures to use wiring diagrams, component location, and diagnostic flow charts during diagnosis of electrical circuit problems.	HP-G
08.39	Identify processes and procedures to identify safe disabling techniques of high voltage systems on hybrid/electric vehicles.	HP-G
08.40	Identify processes and procedures to identify potential safety and material handling concerns associated with high voltage hybrid/electric vehicle battery systems.	HP-G
Brakes		

CTE Standards and Benchmarks		Priority Number
08.41	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
08.42	Identify processes and procedures to replace hoses, fittings, seals, and supports.	HP-I
08.43	Identify processes and procedures to identify, handle, store, and fill with appropriate brake fluids.	HP-G
08.44	Identify processes and procedures to bleed (manual, pressure, or vacuum) hydraulic brake system.	HP-I
08.45	Identify processes and procedures to pressure test brake hydraulic system; determine necessary action.	HP-G
08.46	Identify processes and procedures to adjust brake shoes or pads; remove and reinstall brake drums or drum/hub assemblies.	HP-I
08.47	Identify processes and procedures to remove, clean and inspect caliper and rotor assembly and mountings for wear and damage; reinstall.	HP-I
08.48	Identify processes and procedures to inspect parking brake system operation; repair or adjust as necessary; verify operation.	HP-I
08.49	Identify processes and procedures to identify the proper procedures for handling brake dust.	HP-G
08.50	Identify processes and procedures to check for bent or damaged brake system components.	HP-G
08.51	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.

Florida Standards for English Language Development (ELD)

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

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

Special Notes

Benchmarks identified with a designation of HP-I and HP-G are Automotive Service Excellence Education Foundation tasks.

Career and Technical Student Organization (CTSO)

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

Florida Department of Education
Curriculum Framework

Program Title: **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
Program Length	8 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3052 – Motorcycle Mechanics
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 eight credits.

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

The following table illustrates the secondary program structure:

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

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

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.

CTE Standards and Benchmarks	
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.
02.06	Use heating devices to perform service procedures.
03.0	Outline the appropriate set-up procedures. The student will be able to:

CTE Standards and Benchmarks	
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.

CTE Standards and Benchmarks	
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.

CTE Standards and Benchmarks	
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.
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.

CTE Standards and Benchmarks	
	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.

CTE Standards and Benchmarks
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.

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

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.

CTE Standards and Benchmarks
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.
14.02 Service and repair rear suspension.
14.03 Inspect, remove, and replace frames.

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.

CTE Standards and Benchmarks	
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.

CTE Standards and Benchmarks	
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.

Florida Standards for English Language Development (ELD)

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

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

Career and Technical Student Organization (CTSO)

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

Florida Department of Education
Curriculum Framework

Program Title: **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
Program Length	4 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3011 – Aircraft Mechanics and Service Technicians
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this program is to prepare students for employment or advanced training in 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 four credits.

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.

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
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	CT
8715110	Aviation Maintenance General 1	AIR MECH @7 7G	1 credit	49-3011	3	CT
8715120	Aviation Maintenance General 2		1 credit		3	CT
8715130	Aviation Maintenance General 3		1 credit		3	CT

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

National Standards

Programs identified as having Industry or National Standards to the corresponding standards and/or benchmarks for the Aviation Maintenance General program can be found using the following link:
http://www.gpo.gov/fdsys/pkg/CFR-2012-title14-vol3/pdf/CFR-2012-title14-vol3-part147-appC.pdf

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.

CTE Standards and Benchmarks		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.	
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.	

CTE Standards and Benchmarks		FAA
	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.	
	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.	

CTE Standards and Benchmarks		FAA
	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.	
	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.	

CTE Standards and Benchmarks		FAA
	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.	
	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:	

CTE Standards and Benchmarks	FAA
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 approach lighting systems).	

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.

CTE Standards and Benchmarks	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
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:	

CTE Standards and Benchmarks	FAA FAR Part 147
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.	
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.	

CTE Standards and Benchmarks	FAA FAR Part 147
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.

CTE Standards and Benchmarks	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.	
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:	

CTE Standards and Benchmarks		FAA FAR Part 147
	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
	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

CTE Standards and Benchmarks	FAA FAR Part 147
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.

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		FAA FAR Part 147
	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.	
	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.

Florida Standards for English Language Development (ELD)

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

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

Special Notes

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, torquing 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.

Career and Technical Student Organization (CTSO)

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

Florida Department of Education
Curriculum Framework

Program Title: **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
Program 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
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 four credits.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
9540610	Private Pilot Ground School	AIR MECH @7 7G AVIONICS @7 7G AEROSPACE 7G ENG TEC 7G TEC ED 1@2 ENG&TEC ED1@2	1 credit	49-3011	3	CT
9540710	Aviation Assembly Technician 1		1 credit	51-2011	3	CT
9540720	Aviation Assembly Technician 2		1 credit		3	CT
9540730	Aviation Assembly Technician 3		1 credit		3	CT

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

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.

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.

CTE Standards and Benchmarks	
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.
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.

CTE Standards and Benchmarks	
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.
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.

CTE Standards and Benchmarks	
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.
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.

CTE Standards and Benchmarks	
	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.
	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.

CTE Standards and Benchmarks
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 approach lighting systems).

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.

CTE Standards and Benchmarks	
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.
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:

CTE Standards and Benchmarks	
	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.
	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.

CTE Standards and Benchmarks	
	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
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 hypergolics (hydrazine family, 5606).

CTE Standards and Benchmarks	
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.
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.

CTE Standards and Benchmarks	
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.
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

CTE Standards and Benchmarks	
	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 delamination (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.
	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.

CTE Standards and Benchmarks	
	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 torquing 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 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:
	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.

CTE Standards and Benchmarks	
	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.

CTE Standards and Benchmarks	
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:
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 operational maintenance processes (inspections, system checks, oiling, lubrication).

CTE Standards and Benchmarks	
	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:
	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.

CTE Standards and Benchmarks	
	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 and 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.
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 and 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

CTE Standards and Benchmarks	
	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.

Florida Standards for English Language Development (ELD)

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

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

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.

Career and Technical Student Organization (CTSO)

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

Florida Department of Education
Curriculum Framework

Course Title: **Introduction to Transportation, Distribution and Logistics**
Course Type: **Orientation/Exploratory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Middle School	
Course Number	9590350
CIP Number	149590350M
Grade Level	6 – 8
Course Length	Semester
Teacher Certification	Refer to the **Course Structure** section.
CTSO	FL-TSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to assist students in making informed decisions regarding their future academic and occupational goals and to provide information regarding careers in the transportation, distribution and logistics career cluster. This includes but is not limited to coherent and rigorous content aligned with the 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; providing technical skill proficiency, and competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the transportation, distribution and logistics career cluster. Reinforcement of academic skills occurs through classroom instruction and applied laboratory procedures. Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

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

Course Structure

The length of this course is one semester. It may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

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

The following table illustrates the course structure:

Course Number	Course Title	Teacher Certification	Length
9590350	Introduction to Transportation, Distribution and Logistics	AEROSPACE 7G AIR MECH @7 7G AUTO MECH @7 7G DIESEL MECH @7 7G GASENG RPR @7 7G LOG TECH 7G TEC ED 1 @2 ENG&TEC ED1@2 TRANSPORT 7G	Semester

Standards

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

01.0 Demonstrate an understanding of the Transportation Operations career pathway.
02.0 Demonstrate an understanding of the Logistics Planning and Management Services career pathway.
03.0 Demonstrate an understanding of the Warehousing and Distribution Center Operations career pathway.
04.0 Demonstrate an understanding of the Facility and Mobile Equipment Maintenance career pathway.
05.0 Demonstrate an understanding of the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway.
06.0 Demonstrate an understanding of the Health, Safety and Environmental Management career pathway.
07.0 Demonstrate an understanding of the Sales and Service career pathway.
08.0 Apply leadership and communication skills.
09.0 Describe how information technology is used in the Transportation, Distribution and Logistics career cluster.
10.0 Use information technology tools.

Florida Department of Education
Student Performance Standards

Course Title: **Introduction to Transportation, Distribution and Logistics**
Course Number: **9590350**
Course Length: **Semester**

Course Description:

Beginning with a broad overview of the Transportation, Distribution and Logistics career cluster, students are introduced to the terminology, careers, history, required skills, and technologies associated with each pathway in the Transportation, Distribution and Logistics career cluster. Additionally, they will be provided with opportunities to acquire and demonstrate beginning leadership skills.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the Transportation Operations career pathway. The student will be able to:
01.01	Define and use proper terminology associated with the Transportation Operations career pathway.
01.02	Describe some of the careers available in the Transportation Operations career pathway.
01.03	Identify common characteristics of the careers in the Transportation Operations career pathway.
01.04	Research the history of the Transportation Operations career pathway and describe how the associated careers have evolved and impacted society.
01.05	Identify skills required to successfully enter any career in the Transportation Operations career pathway.
01.06	Describe technologies associated in careers within the Transportation Operations career pathway.
02.0	Demonstrate an understanding of the Logistics Planning and Management Services career pathway. The student will be able to:
02.01	Define and use proper terminology associated with the Logistics Planning and Management Services career pathway.
02.02	Describe some of the careers available in the Logistics Planning and Management Services career pathway.
02.03	Identify common characteristics of the careers in the Logistics Planning and Management Services career pathway.
02.04	Research the history of the Logistics Planning and Management Services career pathway and describe how the careers have evolved and impacted society.
02.05	Identify skills required to successfully enter any career in the Logistics Planning and Management Services career pathway.
02.06	Describe technologies associated in careers within the Logistics Planning and Management Services career pathway.
03.0	Demonstrate an understanding of the Warehousing and Distribution Center Operations career pathway. The student will be able to:
03.01	Define and use proper terminology associated with the Warehousing and Distribution Center Operations career pathway.

CTE Standards and Benchmarks	
	03.02 Describe some of the careers available in the Warehousing and Distribution Center Operations career pathway.
	03.03 Identify common characteristics of the careers in the Warehousing and Distribution Center Operations career pathway.
	03.04 Research the history of the Warehousing and Distribution Center Operations career pathway and describe how the careers have evolved and impacted society.
	03.05 Identify skills required to successfully enter any career in the Warehousing and Distribution Center Operations career pathway.
	03.06 Describe technologies associated in careers within the Warehousing and Distribution Center Operations career pathway.
04.0	Demonstrate an understanding of the Facility and Mobile Equipment Maintenance career pathway. The student will be able to:
	04.01 Define and use proper terminology associated with the Facility and Mobile Equipment Maintenance career pathway.
	04.02 Describe some of the careers available in the Facility and Mobile Equipment Maintenance career pathway.
	04.03 Identify common characteristics of the careers in the Facility and Mobile Equipment Maintenance career pathway.
	04.04 Research the history of the Facility and Mobile Equipment Maintenance career pathway and describe how the careers have evolved and impacted society.
	04.05 Identify skills required to successfully enter any career in the Facility and Mobile Equipment Maintenance career pathway.
	04.06 Describe technologies associated in careers within the Facility and Mobile Equipment Maintenance career pathway.
05.0	Demonstrate an understanding of the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway. The student will be able to:
	05.01 Define and use proper terminology associated with the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway.
	05.02 Describe some of the careers available in the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway.
	05.03 Identify common characteristics of the careers in the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway.
	05.04 Research the history of the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway and describe how the careers have evolved and impacted society.
	05.05 Identify skills required to successfully enter any career in the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway.
	05.06 Describe technologies associated in careers within the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway.
06.0	Demonstrate an understanding of the Health, Safety and Environmental Management career pathway. The student will be able to:
	06.01 Define and use proper terminology associated with the Health, Safety and Environmental Management career pathway.
	06.02 Describe some of the careers available in the Health, Safety and Environmental Management career pathway.
	06.03 Identify common characteristics of the careers in the Health, Safety and Environmental Management career pathway.

CTE Standards and Benchmarks	
06.04	Research the history of the Health, Safety and Environmental Management career pathway and describe how the careers have evolved and impacted society.
06.05	Identify skills required to successfully enter any career in the Health, Safety and Environmental Management career pathway.
06.06	Describe technologies associated in careers within the Health, Safety and Environmental Management career pathway.
07.0	Demonstrate an understanding of the Sales and Service career pathway. The student will be able to:
07.01	Define and use proper terminology associated with the Sales and Service career pathway.
07.02	Describe some of the careers available in the Sales and Service career pathway.
07.03	Identify common characteristics of the careers in the Sales and Service career pathway.
07.04	Research the history of the Sales and Service career pathway and describe how the careers have evolved and impacted society.
07.05	Identify skills required to successfully enter any career in the Sales and Service career pathway.
07.06	Describe technologies associated in careers within the Sales and Service career pathway.
08.0	Apply leadership and communication skills. The student will be able to:
08.01	Discuss the establishment and history of the FL-TSA organization.
08.02	Identify the characteristics and responsibilities of organizational leaders.
08.03	Demonstrate parliamentary procedure skills during a meeting.
08.04	Participate on a committee which has an assigned task and report to the class.
08.05	Demonstrate effective communication skills through delivery of a speech, a slide presentation, or conducting a demonstration.
08.06	Use a computer to assist in the completion of a project related to the Transportation, Distribution and Logistics career cluster.
09.0	Describe how information technology is used in the Transportation, Distribution and Logistics career cluster. The student will be able to:
09.01	Identify information technology (IT) careers in the Transportation, Distribution and Logistics career cluster, including the responsibilities, tasks and skills they require.
09.02	Relate information technology project management concepts and terms to careers in the Transportation, Distribution and Logistics career cluster.
09.03	Manage information technology components typically used in professions of the Transportation, Distribution and Logistics career cluster.
09.04	Identify security-related ethical and legal IT issues faced by professionals in the transportation, distribution and logistics career cluster.
10.0	Use information technology tools. The student will be able to:
10.01	Identify the functions of web browsers, and use them to access the World Wide Web and other computer resources typically used in the transportation, distribution and logistics career cluster.

CTE Standards and Benchmarks	
10.02	Use e-mail clients to send simple messages and files to other Internet users.
10.03	Demonstrate ways to communicate effectively using Internet technology.
10.04	Use different types of web search engines effectively to locate information relevant to the transportation, distribution and logistics career cluster.

Additional Information

Laboratory Activities

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

Florida Standards for English Language Development (ELD)

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

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

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the co-curricular 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. 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.

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

Florida Department of Education
Curriculum Framework

Course Title: **Introduction to Transportation, Distribution and Logistics and Career Planning**
Course Type: **Orientation/Exploratory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Middle School	
Course Number	9590360
CIP Number	149590360M
Grade Level	6 – 8
Course Length	Semester
Teacher Certification	Refer to the **Course Structure** section.
CTSO	FL-TSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to assist students in making informed decisions regarding their future academic and occupational goals and to provide information regarding careers in the transportation, distribution and logistics career cluster. This includes but is not limited to coherent and rigorous content aligned with the 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; providing technical skill proficiency, and competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the transportation, distribution and logistics career cluster. Reinforcement of academic skills occurs through classroom instruction and applied laboratory procedures. Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

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

Course Structure

The length of this course is one semester. It may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

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

The following table illustrates the course structure:

Course Number	Course Title	Teacher Certification	Length
9590360	Introduction to Transportation, Distribution and Logistics and Career Planning	AEROSPACE 7G AIR MECH @7 7G AUTO MECH @7 7G DIESEL MECH @7 7G GASENG RPR @7 7G LOG TECH 7G TEC ED 1 @2 ENG&TEC ED1@2 TRANSPORT 7G	Semester

Standards

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

01.0 Demonstrate an understanding of the Transportation Operations career pathway.
02.0 Demonstrate an understanding of the Logistics Planning and Management Services career pathway.
03.0 Demonstrate an understanding of the Warehousing and Distribution Center Operations career pathway.
04.0 Demonstrate an understanding of the Facility and Mobile Equipment Maintenance career pathway.
05.0 Demonstrate an understanding of the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway.
06.0 Demonstrate an understanding of the Health, Safety and Environmental Management career pathway.
07.0 Demonstrate an understanding of the Sales and Service career pathway.
08.0 Apply leadership and communication skills.
09.0 Describe how information technology is used in the Transportation, Distribution and Logistics career cluster.
10.0 Use information technology tools.

Listed below are the standards that must be met to satisfy the requirements of Section 1003.4156, Florida Statutes.

11.0 Describe the influences that societal, economic, and technological changes have on employment trends and future training.
12.0 Develop skills to locate, evaluate, and interpret career information.
13.0 Identify and demonstrate processes for making short- and long-term goals.
14.0 Demonstrate employability skills such as working in a group, problem-solving and organizational skills, and the importance of entrepreneurship.
15.0 Understand the relationship between educational achievement and career choices/postsecondary options.
16.0 Identify a career cluster and related pathways through an interest assessment that match career and education goals.
17.0 Develop a career and education plan that includes short and long-term goals, high school program of study, and postsecondary/career goals.
18.0 Demonstrate knowledge of technology and its application in career fields/clusters.

Florida Department of Education
Student Performance Standards

Course Title: **Introduction to Transportation, Distribution and Logistics and Career Planning**
Course Number: **9590360**
Course Length: **Semester**

Course Description:

Beginning with a broad overview of the transportation, distribution and logistics career cluster, students are introduced to the terminology, careers, history, required skills, and technologies associated with each pathway in the Transportation, Distribution and Logistics career cluster. Additionally, they will be provided with opportunities to acquire and demonstrate beginning leadership skills.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the Transportation Operations career pathway. The student will be able to:
01.01	Define and use proper terminology associated with the Transportation Operations career pathway.
01.02	Describe some of the careers available in the Transportation Operations career pathway.
01.03	Identify common characteristics of the careers in the Transportation Operations career pathway.
01.04	Research the history of the Transportation Operations career pathway and describe how the associated careers have evolved and impacted society.
01.05	Identify skills required to successfully enter any career in the Transportation Operations career pathway.
01.06	Describe technologies associated in careers within the Transportation Operations career pathway.
02.0	Demonstrate an understanding of the Logistics Planning and Management Services career pathway. The student will be able to:
02.01	Define and use proper terminology associated with the Logistics Planning and Management Services career pathway.
02.02	Describe some of the careers available in the Logistics Planning and Management Services career pathway.
02.03	Identify common characteristics of the careers in the Logistics Planning and Management Services career pathway.
02.04	Research the history of the Logistics Planning and Management Services career pathway and describe how the careers have evolved and impacted society.
02.05	Identify skills required to successfully enter any career in the Logistics Planning and Management Services career pathway.
02.06	Describe technologies associated in careers within the Logistics Planning and Management Services career pathway.
03.0	Demonstrate an understanding of the Warehousing and Distribution Center Operations career pathway. The student will be able to:
03.01	Define and use proper terminology associated with the Warehousing and Distribution Center Operations career pathway.

CTE Standards and Benchmarks	
	03.02 Describe some of the careers available in the Warehousing and Distribution Center Operations career pathway.
	03.03 Identify common characteristics of the careers in the Warehousing and Distribution Center Operations career pathway.
	03.04 Research the history of the Warehousing and Distribution Center Operations career pathway and describe how the careers have evolved and impacted society.
	03.05 Identify skills required to successfully enter any career in the Warehousing and Distribution Center Operations career pathway.
	03.06 Describe technologies associated in careers within the Warehousing and Distribution Center Operations career pathway.
04.0	Demonstrate an understanding of the Facility and Mobile Equipment Maintenance career pathway. The student will be able to:
	04.01 Define and use proper terminology associated with the Facility and Mobile Equipment Maintenance career pathway.
	04.02 Describe some of the careers available in the Facility and Mobile Equipment Maintenance career pathway.
	04.03 Identify common characteristics of the careers in the Facility and Mobile Equipment Maintenance career pathway.
	04.04 Research the history of the Facility and Mobile Equipment Maintenance career pathway and describe how the careers have evolved and impacted society.
	04.05 Identify skills required to successfully enter any career in the Facility and Mobile Equipment Maintenance career pathway.
	04.06 Describe technologies associated in careers within the Facility and Mobile Equipment Maintenance career pathway.
05.0	Demonstrate an understanding of the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway. The student will be able to:
	05.01 Define and use proper terminology associated with the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway.
	05.02 Describe some of the careers available in the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway.
	05.03 Identify common characteristics of the careers in the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway.
	05.04 Research the history of the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway and describe how the careers have evolved and impacted society.
	05.05 Identify skills required to successfully enter any career in the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway.
	05.06 Describe technologies associated in careers within the Transportation Systems/Infrastructure Planning, Management and Regulation career pathway.
06.0	Demonstrate an understanding of the Health, Safety and Environmental Management career pathway. The student will be able to:
	06.01 Define and use proper terminology associated with the Health, Safety and Environmental Management career pathway.
	06.02 Describe some of the careers available in the Health, Safety and Environmental Management career pathway.
	06.03 Identify common characteristics of the careers in the Health, Safety and Environmental Management career pathway.

CTE Standards and Benchmarks	
06.04	Research the history of the Health, Safety and Environmental Management career pathway and describe how the careers have evolved and impacted society.
06.05	Identify skills required to successfully enter any career in the Health, Safety and Environmental Management career pathway.
06.06	Describe technologies associated in careers within the Health, Safety and Environmental Management career pathway.
07.0	Demonstrate an understanding of the Sales and Service career pathway. The student will be able to:
07.01	Define and use proper terminology associated with the Sales and Service career pathway.
07.02	Describe some of the careers available in the Sales and Service career pathway.
07.03	Identify common characteristics of the careers in the Sales and Service career pathway.
07.04	Research the history of the Sales and Service career pathway and describe how the careers have evolved and impacted society.
07.05	Identify skills required to successfully enter any career in the Sales and Service career pathway.
07.06	Describe technologies associated in careers within the Sales and Service career pathway.
08.0	Apply leadership and communication skills. The student will be able to:
08.01	Discuss the establishment and history of the FL-TSA organization.
08.02	Identify the characteristics and responsibilities of organizational leaders.
08.03	Demonstrate parliamentary procedure skills during a meeting.
08.04	Participate on a committee which has an assigned task and report to the class.
08.05	Demonstrate effective communication skills through delivery of a speech, a slide presentation, or conducting a demonstration.
08.06	Use a computer to assist in the completion of a project related to the Transportation, Distribution and Logistics career cluster.
09.0	Describe how information technology is used in the Transportation, Distribution, and Logistics career cluster. The student will be able to:
09.01	Identify information technology (IT) careers in the Transportation, Distribution and Logistics career cluster, including the responsibilities, tasks and skills they require.
09.02	Relate information technology project management concepts and terms to careers in the Transportation, Distribution and Logistics career cluster.
09.03	Manage information technology components typically used in professions of the Transportation, Distribution and Logistics career cluster.
09.04	Identify security-related ethical and legal IT issues faced by professionals in the Transportation, Distribution and Logistics career cluster.
10.0	Use information technology tools. The student will be able to:
10.01	Identify the functions of web browsers, and use them to access the World Wide Web and other computer resources typically used in the Transportation, Distribution and Logistics career cluster.

CTE Standards and Benchmarks	
10.02	Use e-mail clients to send simple messages and files to other Internet users.
10.03	Demonstrate ways to communicate effectively using Internet technology.
10.04	Use different types of web search engines effectively to locate information relevant to the Transportation, Distribution and Logistics career cluster.
Listed below are the standards that must be met to satisfy the requirements of Section 1003.4156, Florida Statutes. The student will be able to**:**	
11.0	Describe the influences that societal, economic, and technological changes have on employment trends and future training.
12.0	Develop skills to locate, evaluate, and interpret career information.
13.0	Identify and demonstrate processes for making short- and long-term goals.
14.0	Demonstrate employability skills such as working in a group, problem-solving and organizational skills, and the importance of entrepreneurship.
15.0	Understand the relationship between educational achievement and career choices/postsecondary options.
16.0	Identify a career cluster and related pathways through an interest assessment that match career and education goals.
17.0	Develop a career and education plan that includes short and long-term goals, high school program of study, and postsecondary/career goals.
18.0	Demonstrate knowledge of technology and its application in career fields/clusters.

Additional Information

Laboratory Activities

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

Florida Standards for English Language Development (ELD)

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

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

Career Planning

Effective July 1, 2019, per Section 1003.4156, Florida Statutes (F.S.), for students to meet middle grades promotion requirements, a Career and Education Planning course must be completed in either sixth, seventh, or eighth grade. These courses should be taught integrating the eight career and education planning course standards.

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the co-curricular 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.

Florida Department of Education
Curriculum Framework

Course Title: **Fundamentals of Transportation**
Course Type: **Orientation/Exploratory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Middle School	
Course Number	9590400
CIP Number	149590400M
Grade Level	6 – 8
Course Length	Semester
Teacher Certification	Refer to the **Course Structure** section.
CTSO	FL-TSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to assist students in making informed decisions regarding their future academic and occupational goals and to provide information regarding careers in the transportation, distribution, and logistics career cluster. This course provides students with opportunities to become familiar with related careers and develop fundamental technological literacy as they learn about the history, systems, and processes of transportation. In addition, the course will provide an overview of the safe use of tools and equipment used in industry. Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials, and technology appropriate to the course content and in accordance with current practices.

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

Course Structure

The length of this course is one semester. It may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

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

The following table illustrates the course structure:

Course Number	Course Title	Teacher Certification	Length
9590400	Fundamentals of Transportation	AEROSPACE 7G AIR MECH @7 7G AUTO MECH @7 7G DIESEL MECH @7 7G GASENG RPR @7 7G LOG TECH 7G TEC ED 1 @2 ENG&TEC ED1@2 TRANSPORT 7G	Semester

Standards

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

01.0 Demonstrate an understanding of the societal impact of transportation.
02.0 Research the history of the transportation industry**.**
03.0 Demonstrate knowledge of service publications by selecting the correct source and locating information found in each.
04.0 Demonstrate an understanding of the major components of ground, air, and maritime transportation vehicles.
05.0 Demonstrate knowledge of safety, OSHA, EPA issues and procedures.
06.0 Identify and measure fasteners used in the aerospace, ground, and maritime transportation industry.
07.0 Identify, select, and use the proper tool for a given fastener or job.
08.0 Identify and measure components of an engine used in the aerospace, ground, and maritime transportation industry.
09.0 Inspect an aerospace, ground and maritime transportation vehicle for maintenance needed for safe operation.
10.0 Demonstrate an understanding of basic electricity and electronics.
11.0 Demonstrate knowledge of current and alternative fuel sources.
12.0 Use visual and verbal communication to present employment and career opportunities in transportation.
13.0 Students will develop leadership and interpersonal problem-solving skills through participation in co-curricular activities.
14.0 Identify components of network systems.
15.0 Describe and use communication features of information technology.

Florida Department of Education
Student Performance Standards

Course Title: **Fundamentals of Transportation**
Course Number: **9590400**
Course Length: **Semester**

Course Description:

This course provides students with opportunities to become familiar with related careers and develop fundamental technological literacy as they learn about the history, systems, and processes of transportation. In addition, the course will provide an overview of the safe use of tools and equipment used in the industry.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the societal impact of transportation. The student will be able to:
01.01	Track the evolution of transportation and its impact on society.
01.02	Explain the educational requirements and professional expectations associated with a career in transportation.
01.03	Describe the impact of governmental and political systems on transportation.
01.04	Explain the interaction between transportation industries and social change.
01.05	Explain how transportation made the United States a world leader.
01.06	Describe the relationship between transportation and the environment.
01.07	Explain the importance of a technologically literate workforce to the transportation industry.
02.0	Research the history of the transportation industry. The student will be able to:
02.01	Trace the development of transportation in the United States from a historical perspective.
02.02	Explain the economic impact of the transportation industry at the local and national levels.
02.03	Describe the impact of transportation on a global scale.
02.04	Describe the differences and similarities between ground, air, and maritime travel.
03.0	Demonstrate knowledge of service publications by selecting the correct source and locating information found in each. The student will be able to:
03.01	Identify aerospace, ground and maritime service publications such as owner's manuals, manufacturer's manuals and electronic service publications and Federal Aviation Regulations.
03.02	Read service publications to retrieve desired information.

CTE Standards and Benchmarks	
	03.03 Describe the basic types of troubleshooting charts found in service publications.
04.0	Demonstrate an understanding of the major components of ground, air and maritime transportation vehicles. The student will be able to:
	04.01 Identify and locate important parts of ground, air, and maritime transportation vehicles.
	04.02 Describe the purpose of the fundamental transportation systems.
	04.03 Explain how each transportation system works dependent and independently of each other.
	04.04 Describe the Merchant Marine and Marine Transportation System.
05.0	Demonstrate knowledge of safety, OSHA, EPA issues and procedures. The student will be able to:
	05.01 Define OSHA and how it oversees and provides safety guidelines to the transportation industry.
	05.02 Describe the typical layout and sections of a ground, air, and maritime transportation lab.
	05.03 List the types of accidents that can occur in a ground, air and maritime transportation lab.
	05.04 Explain how to prevent ground, air, and maritime transportation lab accidents.
	05.05 Describe the general rules for the ground, air and maritime transportation lab.
	05.06 Explain federal, state, and local rules and regulations regarding environmental issues related to the work of the ground, air and maritime transportation industry.
06.0	Identify and measure fasteners used in the aerospace, ground and maritime transportation industry. The student will be able to:
	06.01 Identify the different fasteners such as screws, bolts, washers, nuts, rivets, etc. that are used in the aerospace, ground and maritime transportation industry.
	06.02 Explain the functions and applications of various fasteners.
	06.03 Demonstrate how to measure fasteners.
	06.04 Identify the proper hand tools and safe uses when working with fasteners used in the aerospace, ground, and maritime transportation industry.
07.0	Identify, select and use the proper tool for a given fastener or job. The student will be able to:
	07.01 Identify common ground, air and maritime transportation hand and power tools and proper uses.
	07.02 List safety rules for common ground, air and maritime transportation hand and power tools.
	07.03 Explain how to maintain and store tools properly.
08.0	Identify and measure components of an engine used in the aerospace, ground and maritime transportation industry. The student will be able to:
	08.01 Introduce and explain the major components of an aerospace/transportation engine.
	08.02 Demonstrate how to properly measure each component.

CTE Standards and Benchmarks	
	08.03 Explain the different instruments used for engine measurements.
	08.04 Discuss various propulsion systems for maritime vessels.
09.0	Inspect an aerospace, ground and maritime transportation vehicle for maintenance needed for safe operation. The student will be able to:
	09.01 Explain the importance of vehicle maintenance.
	09.02 Demonstrate how to check fluid levels, belts, hoses, tires, etc.
	09.03 Demonstrate safe practices while working with fluids.
10.0	Demonstrate an understanding of basic electricity and electronics. The student will be able to:
	10.01 Explain the principles of electricity.
	10.02 Describe the basic electrical circuits.
	10.03 Identify basic electrical and electronic terms and components.
	10.04 Calculate and measure voltage, resistance, and amperage.
	10.05 Explain different kinds of aerospace/transportation vehicle wiring.
	10.06 Repair and build electrical circuits.
	10.07 Demonstrate fundamental electrical testing.
11.0	Demonstrate knowledge of current and alternative fuel sources. The student will be able to:
	11.01 Summarize how crude oil is converted to gasoline and diesel fuels.
	11.02 Describe properties of gasoline and diesel fuels.
	11.03 Summarize properties of alternative fuels.
	11.04 Compare and contrast benefits of green fuels and energy production.
12.0	Use visual and verbal communication to present employment and career opportunities in transportation. The student will be able to:
	12.01 Present a technical report to an audience regarding a researched transportation related career using multimedia.
	12.02 Prepare and produce a portfolio representing experiences throughout the course of study.
13.0	Students will develop leadership and interpersonal problem-solving skills through participation in co-curricular activities. The student will be able to:
	13.01 Demonstrate effective communication skills.
	13.02 Participate in teamwork to accomplish specified organizational goals.
	13.03 Demonstrate cooperation and understanding with people who are ethnically and culturally diverse.

CTE Standards and Benchmarks	
14.0	Identify components of network systems. The student will be able to:
14.01	Identify structure to access internet, including hardware and software components.
14.02	Identify and configure user customization features in web browsers, including preferences, caching, and cookies.
14.03	Recognize essential database concepts.
14.04	Define and use additional networking and internet services.
15.0	Describe and use communication features of information technology. The student will be able to:
15.01	Define important internet communications protocols and their roles in delivering basic Internet services.
15.02	Identify basic principles of the Domain Name System (DNS).
15.03	Identify security issues related to Internet clients.
15.04	Identify and use principles of personal information management (PIM), including common applications.
15.05	Efficiently transmit text and binary files using popular Internet services.
15.06	Conduct a webcast and related services.
15.07	Represent technical issues to a non-technical audience.

Additional Information

Laboratory Activities

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

Florida Standards for English Language Development (ELD)

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

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

Career Planning

Effective July 1, 2019, per Section 1003.4156, Florida Statutes (F.S.), for students to meet middle grades promotion requirements, a Career and Education Planning course must be completed in either sixth, seventh, or eighth grade. These courses should be taught integrating the eight career and education planning course standards.

Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) is the co-curricular 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. 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.

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

Florida Department of Education
Curriculum Framework

Program Title: **Small Unmanned Aircraft Systems and Applications**
Career Cluster: **Transportation, Distribution & Logistics**

CCC	
CIP Number	0615040700
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	SkillsUSA
SOC Code(s) (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Unmanned Vehicle Systems Operations AS degree program (1615080102).

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 certificate program provides both theoretical knowledge as well as practical hands-on skills in operation of small unmanned aircraft systems (SUAS) and their applications. Through a sequence of courses, students will be prepared to take FAA107 Commercial Remote Pilot Exam. Practical training consists of comprehensive flight training on a flight simulator, followed by indoor obstacle flight labs and finally, outdoor flight missions on the most popular drone vehicles. Students will also be introduced to the concepts, techniques, and software tools used for aerial photo and video collection and production, autonomous flight modes and operations, photogrammetry in surveying, real estate, public safety, mining, agriculture, and other popular applications of small unmanned aircraft systems. The content includes but is not limited to communications, ethics, mathematics, science, management, psychology, unmanned systems, private pilot ground school, electronics data acquisition and control, robotics, underwater and surface unmanned systems, geographical mapping, data collection for 3D photogrammetry, remote sensing using LiDAR, construction project tracking, surveying, and public safety monitoring operation.

This program consists of a sequence of courses that provides coherent educational content relevant to the technical knowledge and skills needed to prepare for further education and careers in the Transportation, Distribution & Logistics career cluster. The program 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 some aspects of the Transportation, Distribution & 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 24 credit hours.

Standards

After successfully completing this program, the student will have demonstrated mastery the following student learning outcomes:

01.0 Demonstrate an understanding of weather variables, atmospheric motion participation and topics in modern weather science.
02.0 Demonstrate understanding of unmanned vehicle systems emphasizing the military and commercial history growth and application of UVS's.
03.0 Demonstrate ability to operate a UVS in normal and abnormal conditions.
04.0 Demonstrate competency in measurement of resistance, current and voltage in any electrical circuit.
05.0 Analyze and report sensor information pertinent to safety of flight and mission accomplishment.
06.0 Demonstrate a practical understanding of remote sensing systems, their respective capabilities and their relationship to unmanned vehicle systems (UVS).
07.0 Demonstrate the ability to operate an unmanned vehicle through either direct visual observation or the remote use of sensors.
08.0 Demonstrate ability to apply knowledge of rules and regulations governing the legal, safe and ethical use of unmanned vehicle systems.
09.0 Demonstrate understanding of how to defeat an unmanned vehicle.

Florida Department of Education
Student Performance Standards

Program Title: **Small Unmanned Aircraft Systems and Applications**
CIP Number: **0615040700**
Program Length: **24 credit hours**

This certificate program is part of the Unmanned Vehicle Systems Operations AS degree program (1615080102). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of weather variables, atmospheric motion participation and topics in modern weather science. The student will be able to:
	01.01 Describe the compositions, circulation and stability of the atmosphere.
	01.02 Demonstrate an understanding of air mass development, the movement of fronts and their effect on aviation.
	01.03 Demonstrate an awareness of weather hazards to aviation and an understanding of how to avoid them.
	01.04 Demonstrate the ability to access weather information prior to and during flights through a variety of media.
	01.05 Interpret printed reports, forecasts and graphic weather products.
02.0	Demonstrate understanding of unmanned vehicle systems emphasizing the military and commercial history growth and application of UVS. The student will be able to:
	02.01 Understand the history of UVS in the military.
	02.02 Understand the history of unmanned vehicle systems in the commercial sector.
	02.03 Describe the pros and cons of UVS in each sector.
	02.04 Explain the concerns and challenges associated with the use of UVS in both sectors.
03.0	Demonstrate ability to operate a UVS in normal and abnormal conditions. The student will be able to:
	03.01 Operate a UVS in normal conditions.
	03.02 Operate a UVS in abnormal conditions.
04.0	Demonstrate competency in measurement of resistance, current and voltage in any electrical circuit. The student will be able to:
	04.01 Perform measurements and work with electricity in a safe manner.
	04.02 Understand basic concepts.
	04.03 Understand electrical quantities and units.
	04.04 Understand basic circuits, laws and measurements.
05.0	Analyze and report sensor information pertinent to safety of flight and mission accomplishment. The student will be able to:

	05.01 Understand and be able to process and analyze remote sensory data.
06.0	Demonstrate a practical understanding of remote sensing systems, their respective capabilities and their relationship to unmanned vehicle systems (UVS). The student will be able to:
	06.01 Understand the overall concepts of sensors and uses.
	06.02 Understand the applications of remote sensory data.
07.0	Demonstrate the ability to operate an unmanned vehicle through either direct visual observation or the remote use of sensors. The student will be able to:
	07.01 Examine control and system programming in the context of specific missions.
	07.02 Operate unmanned vehicle systems.
08.0	Demonstrate ability to apply knowledge of rules and regulations governing the legal, safe and ethical use of unmanned vehicle systems. The student will be able to:
	08.01 Understand and be able to apply local, state and federal regulations regarding the operation of UVS.
	08.02 Adhere to the highest ethical standards in the operation of UVS.
09.0	Demonstrate understanding of how to defeat an unmanned vehicle system. The student will be able to:
	09.01 Understand the components of UVS systems that are vulnerable to hacking.
	09.02 Understand the concepts of GPS spoofing.
	09.03 Understand spoofing attacks countermeasures.
	09.04 Understand GPS signal jamming.
	09.05 Understand the use of cyber-attacks malware against UVS.

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

In order for this certificate to be offered by a Florida college the facility and devices must undergo a safety inspection according to the guidelines of a recognized and/or accredited organization with expertise in the safe operation of unmanned vehicles. All faculty/instructors must also successfully complete safety training by a recognized organization with expertise in the safe operation of unmanned vehicles.

Schools offering this certificate program must ensure full compliance with Federal Aviation Administration (FAA) Federal Aviation Regulations (FAR) Part 107 in order to operate unmanned aerial systems.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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: **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)	Please see the CIP to SOC crosswalk located below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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.

(Optional) Standards 17-21 are for the Electric/Hybrid Vehicle Specialization

17.0 Demonstrate proficiency in knowledge, equipment, and safety regulations relating to the automotive hybrid electric and electric vehicle industries.
18.0 Demonstrate understanding of hybrid battery and hybrid drive systems.
19.0 Demonstrate proficiency in diagnosing and servicing electric vehicle battery systems.
20.0 Demonstrate proficiency in diagnosing and servicing electric vehicle drive systems.
21.0 Demonstrate proficiency in diagnosing and servicing electric vehicle power inverter systems and controls.

Florida Department of Education
Student Performance Standards

Program Title: **Automotive Service Management Technology**
CIP Number: **0615080300**
Program Length: **68 credit hours**

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 engine 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 block, oil passages and pistons.
	09.17 Inspect block for warpage.
	09.18 Measure and inspect engine components for proper tolerances.
	09.19 Remove and replace crankshafts, main and rod bearings.
	09.20 Remove and replace the 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.
(Optional) Standards 17-21 are for the Electric/Hybrid Vehicle Specialization	
17.0	Demonstrate proficiency in knowledge, equipment, and safety regulations relating to the hybrid electric and electric vehicle industries. The student will be able to:
	17.01 Identify the type of high voltage system (hybrid, plug-in hybrid, or electric vehicle) from the standardized symbol.
	17.02 Perform electrical measurements using equipment that meets the CAT III industry safety requirements.

17.03	Identify the categories of vehicles using high-voltage electricity.
17.04	Categorize high voltage electricity by IEC CAT number.
17.05	Outline how electric energy can cause injuries and fatalities.
17.06	Define ventricular fibrillation.
17.07	Explain the difference between arc flash and arc blast.
17.08	Explain the term distributed capacitance.
17.09	Identify the specialty safety equipment that must be worn when working on high voltage equipment.
17.10	Identify the appropriate lockout, tag-out precautions for working in a high voltage work area.
17.11	Prepare a safe high voltage working environment.
17.12	List CAT III tools required for working in a high voltage environment.
17.13	Outline the cleaning precautions required for high voltage chassis.
17.14	Outline precautions for welding on a high voltage chassis.
17.15	Describe EES architecture and explain how cells, strings, packs, and banks are arranged to supply high voltage circuits.
17.16	Identify the causes of lithium-ion cell thermal runaway.
17.17	Identify methods used to safely change high-voltage electric vehicles.
18.0	Demonstrate proficiency in servicing hybrid battery and hybrid drive systems. The student will be able to:
18.01	Identify common types of hybrid electric vehicles and plug-in hybrid electric vehicles.
18.02	Perform high voltage disconnect procedure; reconnect/enable high voltage system.
18.03	Retrieve and diagnose DTCs; determine needed repairs.
18.04	Diagnose problems caused by damaged or failed harnesses, connectors, terminals and fuses.
18.05	Diagnose high voltage (HV) battery pack malfunctions.
18.06	Remove and install high voltage battery pack.
18.07	Test, diagnose and repair high voltage leaks/loss of isolation.
18.08	Test, diagnose and repair high voltage battery pack heating and cooling systems.
18.09	Test, diagnose, repair or replace high voltage battery pack internal components.
18.10	Outline the torque and power characteristics of internal combustion engines and electric motors and explain how their power bands can be complementary in an electric drive train.
18.11	Describe how the internal combustion engine has been adapted for integration into a hybrid electric vehicle drive train.

	18.12 Define the term Atkinson cycle and explain how some original equipment manufacturers use it in hybrid electric vehicles.
	18.13 Identify the main categories of blended torque drive trains used in hybrid electric vehicles.
	18.14 Explain how planetary gearing may be used to produce continuously variable ratios.
	18.15 Describe the operating principles of a power-split hybrid synergy drive train.
	18.16 Describe the operating principles of a blended torque transmission drive train.
	18.17 Outline the differences between hybrid synergy drive and blended torque transmission in hybrid electric vehicle drive trains.
19.0	Demonstrate proficiency in diagnosis and servicing electric vehicle battery systems. The student will be able to:
	19.01 Use industry terminology to document components of high voltage systems.
	19.02 Distinguish between battery pack type, location, and kW/hr rating.
	19.03 Identify and describe the function of components in a High Voltage battery pack.
	19.04 Use industry terminology when describing Lithium-Ion battery cells.
	19.05 Describe the structures of different formats of a lithium-ion battery cell.
	19.06 Describe the operation of a Lithium-Ion battery cell.
	19.07 Describe the function and operation of the Lithium-Ion battery safety sensing systems.
	19.08 Describe the function and operation of the Lithium-Ion battery cell balancing systems.
	19.09 Diagnose Lithium cylindrical pouch cell failure modes, aging, and capacity loss.
	19.10 Contrast the structure and operation of a Lithium-Ion battery and a Nickle Metal Hydride (NiMH) battery.
	19.11 Diagnose the NiMH cell failure modes.
	19.12 Determine the High Voltage Battery pack state of health using electronic diagnostic tools.
	19.13 Test the power, capacity, and thermal metrics of a battery pack using cell testing equipment.
	19.14 Interpret the results of a high voltage battery pack state of health test in regard to whether the battery can be balanced, reused, or recycled to rebuild a high voltage battery pack.
	19.15 Remove and replace a high voltage battery pack using original equipment manufacturer service information.
20.0	Demonstrate proficiency in diagnosis and servicing electric vehicle drive systems. The student will be able to:
	20.01 Define terms that describe the structure and function of electric vehicle drive systems.
	20.02 Describe electric machine propulsion, regenerative braking, and coasting modes.
	20.03 Illustrate how Induction Machines (IM) operate.
	20.04 Describe how IM electric machines are constructed.

20.05	Analyze the condition of IM electric machines using diagnostic techniques and tools.
20.06	Explain how IM positive, negative, and zero slip % is produced.
20.07	Compare and contrast constant torque and constant power.
20.08	Analyze the condition of IM using a scan tool, oscilloscope, milli-ohmmeter, and insulation tester.
20.09	Describe how permanent magnet electric machines operate.
20.10	Describe how permanent magnet electric machines are constructed.
20.11	Analyze the condition of permanent magnet electric machines using a scan tool, oscilloscope, milli-ohmmeter, and insulation tester.
20.12	Illustrate how encoder and resolver sensor systems operate within electric vehicles.
20.13	Describe how encoders and resolvers are constructed.
20.14	Analyze the condition of encoders and resolvers using diagnostic techniques and tools.
20.15	Diagnose 3-phase HEV, PHEV, BEV, or FCEV electric powertrain systems.
20.16	Identify and explain the function of the compound planetary gearset, differential, drive unit, hydraulic clutch, transmission and transaxle in an electric transmission and drive unit.
20.17	Identify the configurations of the electric transmission, transaxle, drive unit, and e-axle.
20.18	Utilize proper terminology and acronyms when documenting information on Regenerative (Regen) Braking Systems.
20.19	Articulate how the mechanical, hydraulic, electrical, and electronic systems operate to permit and control the Regen Braking System, and how to test, analyze, and service the Regen Braking System.
21.0	Demonstrate proficiency in diagnosing and servicing electric vehicle power inverter systems and controls. The student will be able to:
21.01	Define the following: Three Phase, 6-Pack Motor, 6-step, Alternating Current, Amplitude, Asymmetrical Waveform, Bipolar Transistor, Buck/Boost Converter, Bus Bar, Bus Capacitor, Bus Discharge Circuit, Current Regulation, Current Regulation, Power Inverter Current Sensor, Direct Current, Electrical Degrees, Electromagnetic Interference, Electromagnetic Pole, Enclosure, Field Effect Transistor, Frequency, Gate Driver, Insulation Gate Bipolar Transistor, Invert, Magnet Pole, Microcontroller, Motor Controller, Neutral, North Pole, Peak, Peak-to-Peak, Phase Angle, Power Factor Correction, Power Inverter and Module, Pulse Width Modulation, Regenerative Braking, Rectifier Diode, Root-Mean-Square, Self-Induction, Sine Wave, South Pole, Symmetrical, Thermal Grease.
21.02	Describe how vehicle power inverter module is used in propulsion, regenerative braking, and coasting modes.
21.03	Utilize the correct acronyms and definitions when describing power inverter module operation.
21.04	Identify components within the power inverter module.
21.05	Disassemble and reassemble a power inverter module.
21.06	Test specified power electronics and electrical components within the power inverter module.

21.07	Describe how the power inverter module controls electric machine torque and speed by focusing on how 3-Phase waveforms are created with power electronic devices and controlled with software.
21.08	Describe the function of the power inverter module bus capacitors and power factor correction.
21.09	Select, configure, and connect testing tools/equipment to analyze 3-Phase Power Inverter Module waveforms.
21.10	Define the following: Alternating Current, Amp Clamp, Automotive BEV/FCEV/HEV/PHEV,DC-DC Converter, Boost Converter, Buck Converter, Buck-Boost Converter, Bus Bar, Controller Area Network, Center-Tapped Transformer, Choke, Controller (DC-DC Converter), Current Regulation, Direct Current, Full Wave Rectifier, Input Filter, Insulation Gate Bipolar Transistor, Load Tester, Oscilloscope, Output Inductor Capacitor Filter, Phase Angle, Parameter Identification, Primary Transformer Winding, Pulse Width Modulation, Rectifier Diode, Ripple Current, Secondary Transformer Winding, Serial Data Tool, Step-down Transformer, Step-up Transformer, Switching Frequency, Totem Pole Driver, Voltage Regulation.
21.11	Describe how DC-DC Converter and its circuits converts a high voltage (i.e., 60V - 800Vdc) input to a low voltage dc (i.e., 14.0V) output.
21.12	Visually identify components within the DC-DC Converter.
21.13	Disassemble and reassemble the DC-DC Converter.
21.14	Describe how each stage of the DC-DC Converter operates.
21.15	Test the DC-DC Converter system using specified processes and equipment to confirm its output current and voltage regulation performance throughout its entire output range.
21.16	Locate the OBC module.
21.17	Convert kW-h to A-h units.
21.18	Determine the approximate charging time of a battery pack.
21.19	Analyze the performance of the OBC system using off-board analysis tools.
21.20	Identify what Levels of charging are utilized on any given vehicle type and model.
21.21	Identify all components that comprise the OBCM system, including all supporting systems.
21.22	Trace the routing of all electrical wire/cable, communications harness, and cooling system to determine all components that comprise the OBCM system.
21.23	Use a circuit diagram to illustrate the OBC input power filtering system operation.
21.24	Use a circuit diagram to illustrate the OBC Power Factor Correction stage and the Totem-Pole Transistor switching system.
21.25	Use a circuit diagram to illustrate the OBC Center Tapped Transformer operation.
21.26	Use a circuit diagram to illustrate the OBC output filter operation.
21.27	Test On-Board Charger Current Output and Ripple using a Current Clamp, and Oscilloscope (or Voltmeter with Snap-Shot feature).
21.28	Test On-Board Charger Voltage Regulation and Ripple using an Oscilloscope.

21.29	Monitor On-Board Charger PIDs with a Scan Tool during High Voltage Battery Charging to compare commanded vs. actual output performance.
21.30	Utilize Scan Tool Output Control functions to test CAN communications that control the On-Board Charger output.
21.31	Use a Charge Connector diagnostic tool to test the operation of a live high voltage charger connector (instructor installs a failure).
21.32	Use Scan Tool Output Control functions to test the operation of OBC cooling pumps and valves.

Additional Information

Laboratory Activities

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

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4 F.A.C identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S. and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

Florida SkillsUSA is the co-curricular 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
Hybrid and Electric Vehicle Maintenance (pending) – 24 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)
Program Length	24 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the 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 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.

Florida Department of Education
Student Performance Standards

Program Title: **Automotive Service Technician**
CIP Number: **0615080301**
Program Length: **24 credit hours**

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 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 co-curricular 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)
Program Length	44 Credits
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the 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 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

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 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 engine 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 block, oil passages and pistons.
	09.17 Inspect block for warpage.
	09.18 Measure and inspect engine components for proper tolerances.
	09.19 Remove and replace crankshaft, main and rod bearings.
	09.20 Remove and replace the 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 co-curricular 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: **Hybrid and Electric Vehicle Maintenance**
Career Cluster: **Transportation, Distribution & Logistics**

CCC	
CIP Number	0615080303
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Automotive 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, & 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 & Logistics career cluster.

The content includes but is not limited to basic theory and diagnostic principles for automotive hybrid and electric vehicle battery management, servicing drive systems for hybrid and electric vehicles, and servicing power control systems for electric vehicles.

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

Program Structure

This program is a planned sequence of instruction consisting of 24 credit hours

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 knowledge, equipment, and safety regulations relating to the automotive hybrid electric and electric vehicle industries.
04.0 Demonstrate understanding of hybrid battery and hybrid drive systems.
05.0 Demonstrate proficiency in diagnosing and servicing electric vehicle battery systems.
06.0 Demonstrate proficiency in diagnosing and servicing electric vehicle drive systems.
07.0 Demonstrate proficiency in diagnosing and servicing electric vehicle power inverter systems and controls.

Florida Department of Education
Student Performance Standards

Program Title: **Hybrid and Electric Vehicle Maintenance**
CIP Number: **0615080303**
Program Length: **24 credit hours**

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 knowledge, equipment, and safety regulations relating to the hybrid electric and electric vehicle industries. The student will be able to:
	03.01 Identify the type of high voltage system (hybrid, plug-in hybrid, or electric vehicle) from the standardized symbol.
	03.02 Perform electrical measurements using equipment that meets the CAT III industry safety requirements.
	03.03 Identify the categories of vehicles using high-voltage electricity.
	03.04 Categorize high voltage electricity by IEC CAT number.
	03.05 Outline how electric energy can cause injuries and fatalities.
	03.06 Define ventricular fibrillation.
	03.07 Explain the difference between arc flash and arc blast.
	03.08 Explain the term distributed capacitance.
	03.09 Identify the specialty safety equipment that must be worn when working on high voltage equipment.
	03.10 Identify the appropriate lockout, tag-out precautions for working in a high voltage work area.
	03.11 Prepare a safe high voltage working environment.
	03.12 List CAT III tools required for working in a high voltage environment.
	03.13 Outline the cleaning precautions required for high voltage chassis.
	03.14 Outline precautions for welding on a high voltage chassis.
	03.15 Describe EES architecture and explain how cells, strings, packs, and banks are arranged to supply high voltage circuits.
	03.16 Identify the causes of lithium-ion cell thermal runaway.
	03.17 Identify methods used to safely change high-voltage electric vehicles.
04.0	Demonstrate proficiency in servicing hybrid battery and hybrid drive systems. The student will be able to:
	04.01 Identify common types of hybrid electric vehicles and plug-in hybrid electric vehicles.

	04.02	Perform high voltage disconnect procedure; reconnect/enable high voltage system.
	04.03	Retrieve and diagnose DTCs; determine needed repairs.
	04.04	Diagnose problems caused by damaged or failed harnesses, connectors, terminals and fuses.
	04.05	Diagnose high voltage (HV) battery pack malfunctions.
	04.06	Remove and install high voltage battery pack.
	04.07	Test, diagnose and repair high voltage leaks/loss of isolation.
	04.08	Test, diagnose and repair high voltage battery pack heating and cooling systems.
	04.09	Test, diagnose, repair or replace high voltage battery pack internal components.
	04.10	Outline the torque and power characteristics of internal combustion engines and electric motors, and explain how their power bands can be complementary in an electric drive train.
	04.11	Describe how the internal combustion engine has been adapted for integration into a hybrid electric vehicle drive train.
	04.12	Define the term Atkinson cycle and explain how some original equipment manufacturers use it in hybrid electric vehicles.
	04.13	Identify the main categories of blended torque drive trains used in hybrid electric vehicles.
	04.14	Explain how planetary gearing may be used to produce continuously variable ratios.
	04.15	Describe the operating principles of a power-split hybrid synergy drive train.
	04.16	Describe the operating principles of a blended torque transmission drive train.
	04.17	Outline the differences between hybrid synergy drive and blended torque transmission in hybrid electric vehicle drive trains.
05.0	Demonstrate proficiency in diagnosis and servicing electric vehicle battery systems. The student will be able to:	
	05.01	Use industry terminology to document components of high voltage systems.
	05.02	Distinguish between battery pack type, location, and kW/hr rating.
	05.03	Identify and describe the function of components in a High Voltage battery pack.
	05.04	Use industry terminology when describing Lithium-Ion battery cells.
	05.05	Describe the structures of different formats of a lithium-ion battery cell.
	05.06	Describe the operation of a Lithium-Ion battery cell.
	05.07	Describe the function and operation of the Lithium-Ion battery safety sensing systems.
	05.08	Describe the function and operation of the Lithium-Ion battery cell balancing systems.
	05.09	Diagnose Lithium cylindrical pouch cell failure modes, aging, and capacity loss.
	05.10	Contrast the structure and operation of a Lithium-Ion battery and a Nickle Metal Hydride (NiMH) battery.

	05.11	Diagnose the NiMH cell failure modes.
	05.12	Determine the High Voltage Battery pack state of health using electronic diagnostic tools.
	05.13	Test the power, capacity, and thermal metrics of a battery pack using cell testing equipment.
	05.14	Interpret the results of a high voltage battery pack state of health test in regard to whether the battery can be balanced, reused, or recycled to rebuild a high voltage battery pack.
	05.15	Remove and replace a high voltage battery pack using original equipment manufacturer service information.
06.0	Demonstrate proficiency in diagnosis and servicing electric vehicle drive systems. The student will be able to:	
	06.01	Define terms that describe the structure and function of electric vehicle drive systems.
	06.02	Describe electric machine propulsion, regenerative braking, and coasting modes.
	06.03	Illustrate how Induction Machines (IM) operate.
	06.04	Describe how IM electric machines are constructed.
	06.05	Analyze the condition of IM electric machines using diagnostic techniques and tools.
	06.06	Explain how IM positive, negative, and zero slip % is produced.
	06.07	Compare and contrast constant torque and constant power.
	06.08	Analyze the condition of IM using a scan tool, oscilloscope, milli-ohmmeter, and insulation tester.
	06.09	Describe how permanent magnet electric machines operate.
	06.10	Describe how permanent magnet electric machines are constructed.
	06.11	Analyze the condition of permanent magnet electric machines using a scan tool, oscilloscope, milli-ohmmeter, and insulation tester.
	06.12	Illustrate how encoder and resolver sensor systems operate within electric vehicles.
	06.13	Describe how encoders and resolvers are constructed.
	06.14	Analyze the condition of encoders and resolvers using diagnostic techniques and tools.
	06.15	Diagnose 3-phase HEV, PHEV, BEV, or FCEV electric powertrain systems.
	06.16	Identify and explain the function of the compound planetary gearset, differential, drive unit, hydraulic clutch, transmission and transaxle in an electric transmission and drive unit.
	06.17	Identify the configurations of the electric transmission, transaxle, drive unit, and e-axle.
	06.18	Utilize proper terminology and acronyms when documenting information on Regenerative (Regen) Braking Systems.
	06.19	Articulate how the mechanical, hydraulic, electrical, and electronic systems operate to permit and control the Regen Braking System, and how to test, analyze, and service the Regen Braking System.
07.0	Demonstrate proficiency in diagnosing and servicing electric vehicle power inverter systems and controls. The student will be able to:	

07.01	Define the following: Three Phase, 6-Pack Motor, 6-step, Alternating Current, Amplitude, Asymmetrical Waveform, Bipolar Transistor, Buck/Boost Converter, Bus Bar, Bus Capacitor, Bus Discharge Circuit, Current Regulation, Current Regulation, Power Inverter Current Sensor, Direct Current, Electrical Degrees, Electromagnetic Interference, Electromagnetic Pole, Enclosure, Field Effect Transistor, Frequency, Gate Driver, Insulation Gate Bipolar Transistor, Invert, Magnet Pole, Microcontroller, Motor Controller, Neutral, North Pole, Peak, Peak-to-Peak, Phase Angle, Power Factor Correction, Power Inverter and Module, Pulse Width Modulation, Regenerative Braking, Rectifier Diode, Root-Mean-Square, Self-Induction, Sine Wave, South Pole, Symmetrical, and Thermal Grease.
07.02	Describe how vehicle power inverter module is used in propulsion, regenerative braking, and coasting modes.
07.03	Utilize the correct acronyms and definitions when describing power inverter module operation.
07.04	Identify components within the power inverter module.
07.05	Disassemble and reassemble a power inverter module.
07.06	Test specified power electronics and electrical components within the power inverter module.
07.07	Describe how the power inverter module controls electric machine torque and speed by focusing on how 3-Phase waveforms are created with power electronic devices and controlled with software.
07.08	Describe the function of the power inverter module bus capacitors and power factor correction.
07.09	Select, configure, and connect testing tools/equipment to analyze 3-Phase Power Inverter Module waveforms.
07.10	Define the following: Alternating Current, Amp Clamp, Automotive BEV/FCEV/HEV/PHEV,DC-DC Converter, Boost Converter, Buck Converter, Buck-Boost Converter, Bus Bar, Controller Area Network, Center-Tapped Transformer, Choke, Controller (DC-DC Converter), Current Regulation, Direct Current, Full Wave Rectifier, Input Filter, Insulation Gate Bipolar Transistor, Load Tester, Oscilloscope, Output Inductor Capacitor Filter, Phase Angle, Parameter Identification, Primary Transformer Winding, Pulse Width Modulation, Rectifier Diode, Ripple Current, Secondary Transformer Winding, Serial Data Tool, Step-down Transformer, Step-up Transformer, Switching Frequency, Totem Pole Driver, and Voltage Regulation.
07.11	Describe how DC-DC Converter and its circuits converts a high voltage (i.e., 60V - 800Vdc) input to a low voltage dc (i.e., 14.0V) output.
07.12	Visually identify components within the DC-DC Converter.
07.13	Disassemble and reassemble the DC-DC Converter.
07.14	Describe how each stage of the DC-DC Converter operates.
07.15	Test the DC-DC Converter system using specified processes and equipment to confirm its output current and voltage regulation performance throughout its entire output range.
07.16	Locate the OBC module.
07.17	Convert kW-h to A-h units.
07.18	Determine the approximate charging time of a battery pack.
07.19	Analyze the performance of the OBC system using off-board analysis tools.

07.20	Identify what Levels of charging are utilized on any given vehicle type and model.
07.21	Identify all components that comprise the OBCM system, including all supporting systems.
07.22	Trace the routing of all electrical wire/cable, communications harness, and cooling system to determine all components that comprise the OBCM system.
07.23	Use a circuit diagram to illustrate the OBC input power filtering system operation.
07.24	Use a circuit diagram to illustrate the OBC Power Factor Correction stage and the Totem-Pole Transistor switching system.
07.25	Use a circuit diagram to illustrate the OBC Center Tapped Transformer operation.
07.26	Use a circuit diagram to illustrate the OBC output filter operation.
07.27	Test On-Board Charger Current Output and Ripple using a Current Clamp, and Oscilloscope (or Voltmeter with Snap-Shot feature).
07.28	Test On-Board Charger Voltage Regulation and Ripple using an Oscilloscope.
07.29	Monitor On-Board Charger PIDs with a Scan Tool during High Voltage Battery Charging to compare commanded vs. actual output performance.
07.30	Utilize Scan Tool Output Control functions to test CAN communications that control the On-Board Charger output.
07.31	Use a Charge Connector diagnostic tool to test the operation of a live high voltage charger connector (instructor installs a failure).
07.32	Use Scan Tool Output Control functions to test the operation of OBC cooling pumps and valves.

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)

Florida SkillsUSA is the co-curricular career and technical student organization providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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
Program Length	66 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 Rig boats.
14.0 Repair lower units.
15.0 Perform corrosion experiments and understand corrosion control.
16.0 Apply fiberglass construction and maintenance procedures.
17.0 Demonstrate appropriate communication skills.
18.0 Demonstrate appropriate math skills.
19.0 Demonstrate appropriate understanding of basic science.
20.0 Demonstrate and practice employability skills.
21.0 Auxiliary systems.

Florida Department of Education
Student Performance Standards

Program Title: **Marine Engineering, Management & Seamanship**
CIP Numbers: **0647060500**
Program Length: **66 credit hours**

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	Calculate the basic concepts of force, work, power, and motion.
01.02	Determine metric system measurements.
01.03	Comply with safety rules and regulations.
01.04	Understand the basic concepts of technical drawing including orthographic projections, isometric, schematics, and measurements.
01.05	Understand the concept of friction and the different types of mechanical friction.
01.06	Operate power and hand 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	Identify engine specifications and recommended propeller selection based on manufacture’s engine data.
01.12	Demonstrate the ability to analyze and solve mechanical problems.
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 and principles of two- and four-cycle engines including diesel.
02.02	Identify the principal engine systems such as: Fuel, Cooling, Lubrication, Air Intake, and Electrical.
02.03	Identify basic engine parts and their functions.
02.04	List the information which may be found on the engine nameplate.
02.05	Describe types of motion and simple machines and characteristics of energy.
02.06	Describe the main theoretical concept of heat engines.
02.07	Describe the process by which an internal combustion engine converts chemical energy into rotary motion.

	02.08 Calculate problems using the formulas for engine cubic displacement and compression ratio.
	02.09 Identify the parts of a camshaft lobe-crankshaft lobe.
	02.10 Describe valve timing and overlap procedures.
	02.11 Identify types of valve arrangements.
	02.12 Identify types of engine construction.
	02.13 Describe piston engine operation and design.
	02.14 Describe the operation of two and four stroke engines including diesel engines.
	02.15 Identify major engine manufacturers in today's market.
	02.16 Describe the procedure to convert a boat with gasoline engines into a boat with diesel engines.
	02.17 Use service manuals and parts references.
03.0	Use service manuals and parts references. The student will be able to:
	03.01 Demonstrate use of manufacturer service and parts catalogs.
	03.02 Demonstrate use of specification handbooks and maintenance charts.
	03.03 Demonstrate use of marine engine installation manuals.
	03.04 Demonstrate use of manufacture's service bulletins.
	03.05 Describe 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 various advanced welding techniques.
	04.08 Describe techniques used to gas weld ferrous metals with or without filler rod.
	04.09 Perform Gas tungsten arc welding (GTAW) on ferrous and non-ferrous metals.
	04.10 Maintain a variety of welding equipment.

	04.11 Use welding principles to heat and remove broken screws and bolts.
	04.12 Identify five basic welding joints.
	04.13 Perform shielded metal arc welding (SMAW) on ferrous metals.
	04.14 Perform gas metal arc welding (GMAW) or flux-core arc welding (FCAW) on ferrous and non-ferrous metals.
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 Install and rig engines according to manufacturer's specifications.
	05.04 Cut openings for different engine installations.
	05.05 Describe the operation and mounting procedures of a propulsion unit.
	05.06 Align 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 install oil pump.
	06.06 Remove and install fuel pump.
	06.07 Remove and install connecting rods and bearings.
	06.08 Remove and install flywheel.
	06.09 Remove and install exhaust and intake manifolds.
	06.10 Perform cylinder compression test.
	06.11 Perform engine maintenance according to manufactures specifications.
	06.12 Remove and service piston ring and pistons.
	06.13 Fit piston pins.
	06.14 Inspect crankshaft, camshaft, connecting rods and piston assembly.
	06.15 Complete inspection of the head with different methods, replace valve springs and seals, and grinding of cylinder head seats and valves.

	06.16 Torque power head and lower unit to specifications.
	06.17 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 Inspect secondary circuit components.
	07.03 Analyze or adjust engine performance using engine computer diagnostic software.
	07.04 Remove and replace spark plugs.
	07.05 Use specialized test equipment.
	07.06 Test CD type ignition systems.
	07.07 Describe differences between marine and automotive type ignition components.
	07.08 Read and interpret manufacturers wire diagrams.
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, parallel, and series-parallel circuits.
	08.02 Perform continuity test.
	08.03 Locate and match electrical units by their symbols on a wiring diagram.
	08.04 Describe the theory and operation of alternators.
	08.05 Diagnose and repair or replace charging system regulator.
	08.06 Service or replace battery cables and battery box.
	08.07 Diagnose and repair the engine start circuit.
	08.08 Perform operational inspection of lighting system.
	08.09 Measure voltage drops, current flow, resistance in a circuit or component with a multi-meter.
	08.10 Repair or replace switches to include ignition switches.
	08.11 Repair or replace fuse block assembly.
	08.12 Locate and repair shorts and open circuits in wiring.
	08.13 Inspect or replace rectifier.
	08.14 Replace diode assembly.
	08.15 Remove, replace, and repair digital electronic control assembly.

	08.16 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 Describe carburation theory and operation.
	09.04 Repair gasoline injection systems.
	09.05 Replace fuel system components.
	09.06 Identify fuel systems malfunction.
	09.07 Service automatic or manual choke.
	09.08 Service fuel pump.
	09.09 Analyze fuel systems for foreign particles.
	09.10 Correct fuel tank installation.
	09.11 Test engines fuel flow using manufacturers' procedures and test equipment.
	09.12 Identify fuel specification for outboard motors, four-cycle engines, and diesel applications.
	09.13 Understand the operation of diesel fuel injector nozzles.
	09.14 Understand the operation of diesel fuel pumps.
	09.15 Introduce operation and adjustment procedures of unit injectors.
	09.16 Introduce the correct procedure and timing of fuel injector pumps.
	09.17 Understand how to conduct diesel fuel pressure test.
	09.18 Introduce 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 cooling system 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 service exhaust system components.
	11.02 Inspect service turbo charger.
	11.03 Recommend correct exhaust tubing for different marine applications.
	11.04 Service marine water-cooled exhaust systems.
	11.05 Determine back pressure and 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 engine testing with a marine dynamometer.
	12.08 Identify transom heights and explain the effects on engine performance/speed/horsepower.
	12.09 Operate engine dynamometer.
	12.10 Define heave, pitch, yaw, sway, and roll.
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.
	13.04 List methods of outboard motor transom bracket installation.
	13.05 Describe and illustrate correct lighting/wiring procedures.

	13.06 Install engine remote control to manufacturers' specifications.
14.0	Repair lower units. The student will be able to:
	14.01 Replace lower unit gear lube.
	14.02 Pressure and vacuum test lower unit.
	14.03 Inspect, clean, and lubricate propeller shaft.
	14.04 Inspect and install propeller.
	14.05 Remove, inspect, and replace lower unit seals.
	14.06 Calculate torque and gear ratio.
	14.07 Understand by examination the principles of marine propulsion propeller theory.
	14.08 Demonstrate an understanding of lower unit operations and installation.
15.0	Perform corrosion experiments and understand corrosion control. The student will be able to:
	15.01 Explain the use and function of the galvanic series.
	15.02 Understand corrosion and its prevention.
	15.03 Demonstrate a basic knowledge of electricity.
	15.04 Identify difference in corrosion and cavitation.
	15.05 Understand the causes of corrosion.
	15.06 Identify and prepare metals for protective coatings.
	15.07 Demonstrate theory of operation of impress currents.
	15.08 Identify proper installation and troubleshooting of impress current unit onboard ship.
	15.09 Identify non-metallic corrosion.
	15.10 Define special tools used in the maintenance and testing of sacrificial anodes.
	15.11 Understand different types of coatings.
	15.12 List causes of stray current corrosion.
16.0	Apply fiberglass construction and maintenance procedures. The student will be able to:
	16.01 Describe safe handling procedures and care of fiberglass resins and materials.
	16.02 Apply mixture methods of resins, gel coat and paints.
	16.03 Describe fiberglass boat manufacturing concepts.

	16.04 Prepare a mold for casting a fiberglass hull.
	16.05 Describe installation procedures of decks, transoms, and fuel tanks.
	16.06 Repair damaged fiberglass hulls.
	16.07 Apply modern methods of maintaining new and old fiberglass hulls.
	16.08 Demonstrate advance methods of boat building and the manufacturing of fiberglass accessories.
17.0	Demonstrate appropriate communication skills. The student will be able to:
	17.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
	17.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
	17.03 Read and follow written and oral instructions.
	17.04 Answer and ask questions coherently and concisely.
	17.05 Use effective vocabulary, conventional sentence structure, and standard American English grammar and usage.
	17.06 Demonstrate appropriate telephone/communication skills.
18.0	Demonstrate appropriate math skills. The student will be able to:
	18.01 Perform calculations with square roots and percentage.
	18.02 Change fractions to decimals and decimals to fractions.
	18.03 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
	18.04 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet, and inches.
	18.05 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	18.06 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
	18.07 Demonstrate an understanding of federal, state, and local taxes and their computation.
19.0	Demonstrate appropriate understanding of basic science. The student will be able to:
	19.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	19.02 Draw conclusions or make inferences from data.
	19.03 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.
	19.04 Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
20.0	Demonstrate employability skills. The student will be able to:
	20.01 Conduct a job search.

20.02	Secure information about a job.
20.03	Identify documents which may be required when applying for a job interview.
20.04	Complete a job application form correctly.
20.05	Demonstrate competence in job interview techniques.
20.06	Identify and adopt acceptable work habits.
20.07	Demonstrate knowledge of how to make appropriate job changes.
20.08	Demonstrate acceptable employee health habits.
21.0	Auxiliary systems. The student will be able to:
21.01	Familiarize with fire protection systems and extinguishing agent characteristics.
21.02	Compare the Code of Federal Regulations (CFR) to ABYC A-4 as it applies to recreational craft and firefighting equipment.
21.03	Understand on-board liquefied petroleum gas and compressed natural gas systems.
21.04	Identify the differences between LPG and CNG gasses.
21.05	Inspect CO detectors and review standard installation procedures.
21.06	Inspect approved appliances and identify the features that make them compliant with ABYC standards.
21.07	Install and Repair Piping and Plumbing/Potable Water Systems.
21.08	Drill and prepare cored composite hull for installation of a seacock.
21.09	Inspect bilge pump and scupper installations on a variety of boats to determine compliance with the two ABYC standards.
21.10	Design and build a potable hot and cold-water system mockup to include a pressurized system.
21.11	Understand gray water systems and instillation requirements on boats.
21.12	Familiarized with specific information regarding onboard tankage for fuel, water and waste.
21.13	Review ABYC Standards and USCG Federal Regulations as they apply to Gasoline and Diesel Fuel tank design and installations.
21.14	Recognize potable water storage tank requirements and ABYC Standard H-23, Potable Water Systems.
21.15	Identify issues related to waste holding tanks and cover best industry practices for their design and installation.
21.16	Learn to troubleshoot and repair tank level gauge problems.
21.17	Familiarize the student with a variety of steering system types available for power and sailing craft.
21.18	Review basic hydraulic principles as applied to steering systems, component placement and bleeding procedures as specified by the various vendors.
21.19	Review ABYC Standard P-21, Manual Hydraulic Steering Systems.

21.20	Practice steering system maintenance and adjustment procedures on steering system.
21.21	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.
21.22	Demonstrate knowledge of Federal and local regulations related to wastewater systems.
21.23	Identify Federal Laws as they apply to marine sanitation systems as installed on boats.
21.24	Explain different types of Marine Sanitation Devices (MSD) and their specialized installation, design, and service requirements.
21.25	Use of auxiliary power systems and gensets.
21.26	Installation, maintenance and repair of direct current generators.
21.27	Installation, maintenance and repair of alternate current generators.
21.28	Bow Thrusters, stabilizers, and stabilizing systems.
21.29	Maintenance and repair of stabilizers and stabilizing systems.
21.30	Understand principles of air conditioning and refrigeration systems on marine vessels.
21.31	Understand the refrigeration cycle.
21.32	Understand regulations for refrigeration.
21.33	Troubleshooting refrigeration and A/C equipment.
21.34	Demonstrate single and double flaring of copper piping.
21.35	Understand and trouble shoot hydraulic systems.
21.36	Understand and troubleshoot types of windlass systems.
21.37	Understand and troubleshoot 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.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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 (CCC):

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)
Program Length	24 Credits
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the 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 lower units.
13.0 Demonstrate appropriate communication skills.
14.0 Demonstrate appropriate math skills.
15.0 Demonstrate appropriate understanding of basic science.
16.0 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**

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	Calculate the basic concepts of force, work, power, and motion.
01.02	Determine metric system measurements.
01.03	Comply with safety rules and regulations.
01.04	Understand the basic concepts of technical drawing including orthographic projections, isometric, schematics, and measurements.
01.05	Understand the concept of friction and the different types of mechanical friction.
01.06	Operate power and hand 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	Identify engine specifications and recommended propeller selection based on manufacture’s engine data.
01.12	Demonstrate the ability to analyze and solve mechanical problems.
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 and principles of two- and four-cycle engines including diesel.
02.02	Identify the principal engine systems such as: Fuel, Cooling, Lubrication, Air Intake, and Electrical.
02.03	Identify basic engine parts and their functions.
02.04	List the information which may be found on the engine nameplate.
02.05	Describe types of motion and simple machines and characteristics of energy.
02.06	Describe the main theoretical concept of heat engines.

	02.07 Describe the process by which an internal combustion engine converts chemical energy into rotary motion.
	02.08 Calculate problems using the formulas for engine cubic displacement and compression ratio.
	02.09 Identify the parts of a camshaft lobe-crankshaft lobe.
	02.10 Describe valve timing and overlap procedures.
	02.11 Identify types of valve arrangements.
	02.12 Identify types of engine construction.
	02.13 Describe piston engine operation and design.
	02.14 Describe the operation of two and four stroke engines including diesel engines.
	02.15 Identify major engine manufacturers in today's market.
	02.16 Describe the procedure to convert a boat with gasoline engines into a boat with diesel engines.
	02.17 Use service manuals and parts references.
03.0	Use service manuals and parts references. The student will be able to:
	03.01 Demonstrate use of manufacturer service and parts catalogs.
	03.02 Demonstrate use of specification handbooks and maintenance charts.
	03.03 Demonstrate use of marine engine installation manuals.
	03.04 Demonstrate use of manufacture's service bulletins.
	03.05 Describe 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 Install and rig engines according to manufacturer's specifications.
	04.04 Cut openings for different engine installations.
	04.05 Describe the operation and mounting procedures of a propulsion unit.
	04.06 Align 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 install oil pump.
05.06	Remove and install fuel pump.
05.07	Remove and install connecting rods and bearings.
05.08	Remove and install flywheel.
05.09	Remove and install exhaust and intake manifolds.
05.10	Perform cylinder compression test.
05.11	Perform engine maintenance according to manufactures specifications.
05.12	Remove and service piston ring and pistons.
05.13	Fit piston pins.
05.14	Inspect crankshaft, camshaft, connecting rods and piston assembly.
05.15	Complete inspection of the head with different methods, replace valve springs and seals, and grinding of cylinder head seats and valves.
05.16	Torque power head and lower unit to specifications.
05.17	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	Inspect secondary circuit components.
06.03	Analyze or adjust engine performance using engine computer diagnostic software.
06.04	Remove and replace spark plugs.
06.05	Use specialized test equipment.
06.06	Test CD type ignition systems.
06.07	Describe differences between marine and automotive type ignition components.
06.08	Read and interpret manufacturers wire diagrams.
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, parallel, and series-parallel circuits.
07.02	Perform continuity test.

07.03	Locate and match electrical units by their symbols on a wiring diagram.
07.04	Describe the theory and operation of alternators.
07.05	Diagnose and repair or replace charging system regulator.
07.06	Service or replace battery cables and battery box.
07.07	Diagnose and repair the engine start circuit.
07.08	Perform operational inspection of lighting system.
07.09	Measure voltage drops, current flow, resistance in a circuit or component with a multi-meter.
07.10	Repair or replace switches to include ignition switches.
07.11	Repair or replace fuse block assembly.
07.12	Locate and repair shorts and open circuits in wiring.
07.13	Inspect or replace rectifier.
07.14	Replace diode assembly.
07.15	Remove, replace, and repair digital electronic control assembly.
07.16	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	Describe carburation theory and operation.
08.04	Repair gasoline injection systems.
08.05	Replace fuel system components.
08.06	Identify fuel systems malfunction.
08.07	Service automatic or manual choke.
08.08	Service fuel pump.
08.09	Analyze fuel systems for foreign particles.
08.10	Correct fuel tank installation.
08.11	Test engines fuel flow using manufacturers' procedures and test equipment.
08.12	Identify fuel specification for outboard motors, four-cycle engines, and diesel applications.

	08.13 Understand the operation of diesel fuel injector nozzles.
	08.14 Understand the operation of diesel fuel pumps.
	08.15 Introduce operation and adjustment procedures of unit injectors.
	08.16 Introduce the correct procedure and timing of fuel injector pumps.
	08.17 Understand how to conduct diesel fuel pressure test.
	08.18 Introduce 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 cooling system 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 service exhaust system components.
	10.02 Inspect service turbo charger.
	10.03 Recommend correct exhaust tubing for different marine applications.
	10.04 Service marine water-cooled exhaust systems.
	10.05 Determine back pressure and 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 engine testing with a marine dynamometer.
11.08	Identify transom heights and explain the effects on engine performance/speed/horsepower.
11.09	Operate engine dynamometer.
11.10	Define heave, pitch, yaw, sway, and roll.
12.0	Repair lower units. The student will be able to:
12.01	Replace lower unit gear lube.
12.02	Pressure and vacuum test lower unit.
12.03	Inspect, clean, and lubricate propeller shaft.
12.04	Inspect and install propeller.
12.05	Remove, inspect, and replace lower unit seals.
12.06	Calculate torque and gear ratio.
12.07	Understand by examination the principles of marine propulsion propeller theory.
12.08	Demonstrate an understanding of lower unit operations and installation.
13.0	Demonstrate appropriate communication skills. The student will be able to:
13.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
13.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
13.03	Read and follow written and oral instructions.
13.04	Answer and ask questions coherently and concisely.
13.05	Use effective vocabulary, conventional sentence structure, and standard American English grammar and usage.
13.06	Demonstrate appropriate telephone/communication skills.
14.0	Demonstrate appropriate math skills. The student will be able to:
14.01	Perform calculations with square roots and percentage.
14.02	Change fractions to decimals and decimals to fractions.
14.03	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.

	14.04 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
	14.05 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	14.06 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
	14.07 Demonstrate an understanding of federal, state, and local taxes and their computation.
15.0	Demonstrate appropriate understanding of basic science. The student will be able to:
	15.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	15.02 Draw conclusions or make inferences from data.
	15.03 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.
	15.04 Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
16.0	Demonstrate employability skills. The student will be able to:
	16.01 Conduct a job search.
	16.02 Secure information about a job.
	16.03 Identify documents which may be required when applying for a job interview.
	16.04 Complete a job application form correctly.
	16.05 Demonstrate competence in job interview techniques.
	16.06 Identify and adopt acceptable work habits.
	16.07 Demonstrate knowledge of how to make appropriate job changes.
	16.08 Demonstrate acceptable employee health habits.

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 co-curricular 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)
Program Length	12 Credits
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the 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**

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	Calculate the basic concepts of force, work, power, and motion.
01.02	Determine metric system measurements.
01.03	Comply with safety rules and regulations.
01.04	Understand the basic concepts of technical drawing including orthographic projections, isometric, schematics, and measurements.
01.05	Understand the concept of friction and the different types of mechanical friction.
01.06	Operate power and hand 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	Identify engine specifications and recommended propeller selection based on manufacture’s engine data.
01.12	Demonstrate the ability to analyze and solve mechanical problems.
02.0	Use service manuals and parts references. The student will be able to:
02.01	Demonstrate use of manufacturer service and parts catalogs.
02.02	Demonstrate use of specification handbooks and maintenance charts.
02.03	Demonstrate use of marine engine installation manuals.
02.04	Demonstrate use of manufacture’s service bulletins.
02.05	Describe 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, parallel, and series-parallel circuits.
03.02	Perform continuity test.
03.03	Locate and match electrical units by their symbols on a wiring diagram.
03.04	Describe the theory and operation of alternators.
03.05	Diagnose and repair or replace charging system regulator.
03.06	Service or replace battery cables and battery box.
03.07	Diagnose and repair the engine start circuit.
03.08	Perform operational inspection of lighting system.
03.09	Measure voltage drops, current flow, resistance in a circuit or component with a multi-meter.
03.10	Repair or replace switches to include ignition switches.
03.11	Repair or replace fuse block assembly.
03.12	Locate and repair shorts and open circuits in wiring.
03.13	Inspect or replace rectifier.
03.14	Replace diode assembly.
03.15	Remove, replace, and repair digital electronic control assembly.
03.16	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	Use effective vocabulary, conventional sentence structure, and standard American English grammar and usage.
04.06	Demonstrate appropriate telephone/communication skills.
05.0	Demonstrate appropriate math skills. The student will be able to:
05.01	Perform calculations with square roots and percentage.
05.02	Change fractions to decimals and decimals to fractions.
05.03	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.

	05.04 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
	05.05 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	05.06 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
	05.07 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.

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 co-curricular 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)
Program Length	34 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Marine Engineering, Management and 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 Rig boats.
13.0 Repair lower units.
14.0 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**

This certificate program is part of the Marine Engineering, Management and 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	Calculate the basic concepts of force, work, power, and motion.
01.02	Determine metric system measurements.
01.03	Comply with safety rules and regulations.
01.04	Understand the basic concepts of technical drawing including orthographic projections, isometric, schematics, and measurements.
01.05	Understand the concept of friction and the different types of mechanical friction.
01.06	Operate power and hand 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	Identify engine specifications and recommended propeller selection based on manufacture’s engine data.
01.12	Demonstrate the ability to analyze and solve mechanical problems.
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 and principles of two- and four-cycle engines including diesel.
02.02	Identify the principal engine systems such as: Fuel, Cooling, Lubrication, Air Intake, and Electrical.
02.03	Identify basic engine parts and their functions.
02.04	List the information which may be found on the engine nameplate.
02.05	Describe types of motion and simple machines and characteristics of energy.
02.06	Describe the main theoretical concept of heat engines.

	02.07 Describe the process by which an internal combustion engine converts chemical energy into rotary motion.
	02.08 Calculate problems using the formulas for engine cubic displacement and compression ratio.
	02.09 Identify the parts of a camshaft lobe-crankshaft lobe.
	02.10 Describe valve timing and overlap procedures.
	02.11 Identify types of valve arrangements.
	02.12 Identify types of engine construction.
	02.13 Describe piston engine operation and design.
	02.14 Describe the operation of two and four stroke engines including diesel engines.
	02.15 Identify major engine manufacturers in today's market.
	02.16 Describe the procedure to convert a boat with gasoline engines into a boat with diesel engines.
	02.17 Use service manuals and parts references.
03.0	Use service manuals and parts references. The student will be able to:
	03.01 Demonstrate use of manufacturer service and parts catalogs.
	03.02 Demonstrate use of specification handbooks and maintenance charts.
	03.03 Demonstrate use of marine engine installation manuals.
	03.04 Demonstrate use of manufacture's service bulletins.
	03.05 Describe 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 various advanced welding techniques.
	04.08 Describe techniques used to gas weld ferrous metals with or without filler rod.
	04.09 Perform Gas tungsten arc welding (GTAW) on ferrous and non-ferrous metals.

	04.10 Maintain a variety of welding equipment.
	04.11 Use welding principles to heat and remove broken screws and bolts.
	04.12 Identify five basic welding joints.
	04.13 Perform shielded metal arc welding (SMAW) on ferrous metals.
	04.14 Perform gas metal arc welding (GMAW) or flux-core arc welding (FCAW) on ferrous and non-ferrous metals.
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 Install and rig engines according to manufacturer’s specifications.
	05.04 Cut openings for different engine installations.
	05.05 Describe the operation and mounting procedures of a propulsion unit.
	05.06 Align 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 install oil pump.
	06.06 Remove and install fuel pump.
	06.07 Remove and install connecting rods and bearings.
	06.08 Remove and install flywheel.
	06.09 Remove and install exhaust and intake manifolds.
	06.10 Perform cylinder compression test.
	06.11 Perform engine maintenance according to manufactures specifications.
	06.12 Remove and service piston ring and pistons.
	06.13 Fit piston pins.
	06.14 Inspect crankshaft, camshaft, connecting rods and piston assembly.

06.15	Complete inspection of the head with different methods, replace valve springs and seals, and grinding of cylinder head seats and valves.
06.16	Torque power head and lower unit to specifications.
06.17	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	Inspect secondary circuit components.
07.03	Analyze or adjust engine performance using engine computer diagnostic software.
07.04	Remove and replace spark plugs.
07.05	Use specialized test equipment.
07.06	Test CD type ignition systems.
07.07	Describe differences between marine and automotive type ignition components.
07.08	Read and interpret manufacturers wire diagrams.
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, parallel, and series-parallel circuits.
08.02	Perform continuity test.
08.03	Locate and match electrical units by their symbols on a wiring diagram.
08.04	Describe the theory and operation of alternators.
08.05	Diagnose and repair or replace charging system regulator.
08.06	Service or replace battery cables and battery box.
08.07	Diagnose and repair the engine start circuit.
08.08	Perform operational inspection of lighting system.
08.09	Measure voltage drops, current flow, resistance in a circuit or component with a multi-meter.
08.10	Repair or replace switches to include ignition switches.
08.11	Repair or replace fuse block assembly.
08.12	Locate and repair shorts and open circuits in wiring.
08.13	Inspect or replace rectifier.
08.14	Replace diode assembly.

	08.15 Remove, replace, and repair digital electronic control assembly.
	08.16 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 Describe carburation theory and operation.
	09.04 Repair gasoline injection systems.
	09.05 Replace fuel system components.
	09.06 Identify fuel systems malfunction.
	09.07 Service automatic or manual choke.
	09.08 Service fuel pump.
	09.09 Analyze fuel systems for foreign particles.
	09.10 Correct fuel tank installation.
	09.11 Test engines fuel flow using manufacturers' procedures and test equipment.
	09.12 Identify fuel specification for outboard motors, four-cycle engines, and diesel applications.
	09.13 Understand the operation of diesel fuel injector nozzles.
	09.14 Understand the operation of diesel fuel pumps.
	09.15 Introduce operation and adjustment procedures of unit injectors.
	09.16 Introduce the correct procedure and timing of fuel injector pumps.
	09.17 Understand how to conduct diesel fuel pressure test.
	09.18 Introduce 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 cooling system 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 service exhaust system components.
	11.02 Inspect service turbo charger.
	11.03 Recommend correct exhaust tubing for different marine applications.
	11.04 Service marine water-cooled exhaust systems.
	11.05 Determine back pressure and exhaust applications.
12.0	Rig boats. The student will be able to:
	12.01 Install engine steering components.
	12.02 Install and service electrical wiring harness.
	12.03 Install trim tabs.
	12.04 List methods of outboard motor transom bracket installation.
	12.05 Describe and illustrate correct lighting/wiring procedures.
	12.06 Install engine remote control to manufacturers' specifications.
13.0	Repair lower units. The student will be able to:
	13.01 Replace lower unit gear lube.
	13.02 Pressure and vacuum test lower unit.
	13.03 Inspect, clean, and lubricate propeller shaft.
	13.04 Inspect and install propeller.
	13.05 Remove, inspect, and replace lower unit seals.
	13.06 Calculate torque and gear ratio.
	13.07 Understand by examination the principles of marine propulsion propeller theory.
	13.08 Demonstrate an understanding of lower unit operations and installation.

14.0	Perform corrosion experiments and understand corrosion control. The student will be able to:
14.01	Explain the use and function of the galvanic series.
14.02	Understand corrosion and its prevention.
14.03	Demonstrate a basic knowledge of electricity.
14.04	Identify difference in corrosion and cavitation.
14.05	Understand the causes of corrosion.
14.06	Identify and prepare metals for protective coatings.
14.07	Demonstrate theory of operation of impress currents.
14.08	Identify proper installation and troubleshooting of impress current unit onboard ship.
14.09	Identify non-metallic corrosion.
14.10	Define special tools used in the maintenance and testing of sacrificial anodes.
14.11	Understand different types of coatings.
14.12	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 co-curricular 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
Program Length	24 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Marine Engineering, Management and 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 Auxiliary Systems.

Florida Department of Education
Student Performance Standards

Program Title: **Marine Systems Technician**
CIP Numbers: **0647060513**
Program Length: **24 credit hours**

This certificate program is part of the Marine Engineering, Management and 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	Calculate the basic concepts of force, work, power, and motion.
01.02	Determine metric system measurements.
01.03	Comply with safety rules and regulations.
01.04	Understand the basic concepts of technical drawing including orthographic projections, isometric, schematics, and measurements.
01.05	Understand the concept of friction and the different types of mechanical friction.
01.06	Operate power and hand 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	Identify engine specifications and recommended propeller selection based on manufacture’s engine data.
01.12	Demonstrate the ability to analyze and solve mechanical problems.
02.0	Use service manuals and parts references. The student will be able to:
02.01	Demonstrate use of manufacturer service and parts catalogs.
02.02	Demonstrate use of specification handbooks and maintenance charts.
02.03	Demonstrate use of marine engine installation manuals.
02.04	Demonstrate use of manufacture’s service bulletins.
02.05	Describe 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, parallel, and series-parallel circuits.
03.02	Perform continuity test.
03.03	Locate and match electrical units by their symbols on a wiring diagram.
03.04	Describe the theory and operation of alternators.
03.05	Diagnose and repair or replace charging system regulator.
03.06	Service or replace battery cables and battery box.
03.07	Diagnose and repair the engine start circuit.
03.08	Perform operational inspection of lighting system.
03.09	Measure voltage drops, current flow, resistance in a circuit or component with a multi-meter.
03.10	Repair or replace switches to include ignition switches.
03.11	Repair or replace fuse block assembly.
03.12	Locate and repair shorts and open circuits in wiring.
03.13	Inspect or replace rectifier.
03.14	Replace diode assembly.
03.15	Remove, replace, and repair digital electronic control assembly.
03.16	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	Perform engine testing with a marine dynamometer.
04.08	Identify transom heights and explain the effects on engine performance/speed/horsepower.
04.09	Operate engine dynamometer.
04.10	Define heave, pitch, yaw, sway, and roll.

05.0	Perform corrosion experiments and understand corrosion control. The student will be able to:
05.01	Explain the use and function of the galvanic series.
05.02	Understand corrosion and its prevention.
05.03	Demonstrate a basic knowledge of electricity.
05.04	Identify difference in corrosion and cavitation.
05.05	Understand the causes of corrosion.
05.06	Identify and prepare metals for protective coatings.
05.07	Demonstrate theory of operation of impress currents.
05.08	Identify proper installation and troubleshooting of impress current unit onboard ship.
05.09	Identify non-metallic corrosion.
05.10	Define special tools used in the maintenance and testing of sacrificial anodes.
05.11	Understand different types of coatings.
05.12	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, transoms, and fuel tanks.
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 Use effective vocabulary, conventional sentence structure, and standard American English grammar and usage.
	07.06 Demonstrate appropriate telephone/communication skills.
08.0	Demonstrate appropriate math skills. The student will be able to:
	08.01 Perform calculations with square roots and percentage.
	08.02 Change fractions to decimals and decimals to fractions.
	08.03 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
	08.04 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet, and inches.
	08.05 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	08.06 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
	08.07 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.
11.0	Auxiliary systems. The student will be able to:
	11.01 Familiarize with fire protection systems and extinguishing agent characteristics.
	11.02 Compare the Code of Federal Regulations (CFR) to ABYC A-4 as it applies to recreational craft and firefighting equipment.

11.03	Understand on-board liquefied petroleum gas and compressed natural gas systems.
11.04	Identify the differences between LPG and CNG gasses.
11.05	Inspect CO detectors and review standard installation procedures.
11.06	Inspect approved appliances and identify the features that make them compliant with ABYC standards.
11.07	Install and Repair Piping and Plumbing/Potable Water Systems.
11.08	Drill and prepare cored composite hull for installation of a seacock.
11.09	Inspect bilge pump and scupper installations on a variety of boats to determine compliance with the two ABYC standards.
11.10	Design and build a potable hot and cold-water system mockup to include a pressurized system.
11.11	Understand gray water systems and instillation requirements on boats.
11.12	Familiarized with specific information regarding onboard tankage for fuel, water and waste.
11.13	Review ABYC Standards and USCG Federal Regulations as they apply to Gasoline and Diesel Fuel tank design and installations.
11.14	Recognize potable water storage tank requirements and ABYC Standard H-23, Potable Water Systems.
11.15	Identify issues related to waste holding tanks and cover best industry practices for their design and installation.
11.16	Learn to troubleshoot and repair tank level gauge problems.
11.17	Familiarize the student with a variety of steering system types available for power and sailing craft.
11.18	Review basic hydraulic principles as applied to steering systems, component placement and bleeding procedures as specified by the various vendors.
11.19	Review ABYC Standard P-21, Manual Hydraulic Steering Systems.
11.20	Practice steering system maintenance and adjustment procedures on steering system.
11.21	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.
11.22	Demonstrate knowledge of Federal and local regulations related to wastewater systems.
11.23	Identify Federal Laws as they apply to marine sanitation systems as installed on boats.
11.24	Explain different types of Marine Sanitation Devices (MSD) and their specialized installation, design, and service requirements.
11.25	Use of auxiliary power systems and gensets.
11.26	Installation, maintenance and repair of direct current generators.
11.27	Installation, maintenance and repair of alternate current generators.
11.28	Bow Thrusters, stabilizers, and stabilizing systems.
11.29	Maintenance and repair of stabilizers and stabilizing systems.

11.30	Understand principles of air conditioning and refrigeration systems on marine vessels.
11.31	Understand the refrigeration cycle.
11.32	Understand regulations for refrigeration.
11.33	Troubleshooting refrigeration and A/C equipment.
11.34	Demonstrate single and double flaring of copper piping.
11.35	Understand and trouble shoot hydraulic systems.
11.36	Understand and troubleshoot types of windlass systems.
11.37	Understand and troubleshoot 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 co-curricular 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)
Program Length	16 Credits
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Marine Engineering, Management and 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.

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 Auxiliary systems.

Florida Department of Education
Student Performance Standards

Program Title: **Professional Welder**
CIP Numbers: **0647060516**
Program Length: **16 credit hours**

This certificate program is part of the Marine Engineering, Management, and 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	Calculate the basic concepts of force, work, power, and motion.
01.02	Determine metric system measurements.
01.03	Comply with safety rules and regulations.
01.04	Understand the basic concepts of technical drawing including orthographic projections, isometric, schematics, and measurements.
01.05	Understand the concept of friction and the different types of mechanical friction.
01.06	Operate power and hand 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	Identify engine specifications and recommended propeller selection based on manufacture’s engine data.
01.12	Demonstrate the ability to analyze and solve mechanical problems.
02.0	Use service manuals and parts references. The student will be able to:
02.01	Demonstrate use of manufacturer service and parts catalogs.
02.02	Demonstrate use of specification handbooks and maintenance charts.
02.03	Demonstrate use of marine engine installation manuals.
02.04	Demonstrate use of manufacture’s service bulletins.
02.05	Describe processes to create quotes and estimates which include, but are not limited to, parts and labor.
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 various advanced welding techniques.
03.08	Describe techniques used to gas weld ferrous metals with or without filler rod.
03.09	Perform Gas tungsten arc welding (GTAW) on ferrous and non-ferrous metals.
03.10	Maintain a variety of welding equipment.
03.11	Use welding principles to heat and remove broken screws and bolts.
03.12	Identify five basic welding joints.
03.13	Perform shielded metal arc welding (SMAW) on ferrous metals.
03.14	Perform gas metal arc welding (GMAW) or flux-core arc welding (FCAW) on ferrous and non-ferrous metals.
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	Understand different types of 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	Use effective vocabulary, conventional sentence structure, and standard American English grammar and usage.
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	Auxiliary systems. The student will be able to:
	08.01 Familiarize with fire protection systems and 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 co-curricular 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: **Non-Destructive Testing Technology**
Career Cluster: **Transportation, Distribution & Logistics**

CCC	
CIP Number	0647060704
Program Type	College Credit Certificate (CCC)
Program Length	25 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Aviation Maintenance Administration AS degree program (1647060700).

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 & 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 & Logistics career cluster.

The content includes but is not limited to aircraft maintenance practices, covering routine procedures to advanced diagnostic techniques, aviation safety protocols, handling aerospace materials and understanding aerospace structures, aircraft systems and components, regulatory requirements in aviation maintenance and quality control and assurance methods in aviation.

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 25 credit hours.

This program is a vital technique for inspecting materials without altering their future usability. It plays an essential role in detecting imperfections while preserving the material's integrity. In various sectors, ranging from aerospace and manufacturing to theme parks and energy, Non-Destructive Testing (NDT) is crucial for assessing component performance, ensuring structural integrity, and identifying faulty parts. Consequently, NDT professionals are in demand across numerous industries, offering a broad spectrum of career opportunities.

Regulated Programs

This program collaborates with the American Society of Non-Destructive Testing (ASNT), (https://certification.asnt.org/) a leading authority in setting industry standards for training, education, and inspection methods within NDT. Through this collaboration, students gain access to ASNT certifications, which are globally recognized.

Standards

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

01.0 Demonstrate workable knowledge in the physics behind the operation of NDT instrumentation.
02.0 Exhibit proficiency in the execution of NDT methods and Interpretation of Inspection SOPs in accordance with ATA-105 and NAS-410 standards.
03.0 Follow safety protocols and compliance standards in NDT practices.
04.0 Prepare for NDT qualifying exams and subsequent OJT hours.
05.0 Demonstrate professional skills in collaboration, reporting, and workplace social dynamics.

Florida Department of Education
Student Performance Standards

Program Title: **Non-Destructive Testing Technology**
CIP Number: **TBD**
Program Length: **25 credit hours**

This certificate program is part of the Aviation Maintenance Administration AS degree program (1647060700). At the completion of this program, the student will be able to:	
01.0	Demonstrate workable knowledge in the physics behind the operation of NDT instrumentation. The student will be able to:
01.01	Define the principles of sound wave propagation as it relates to Ultrasonic Testing (UT), including concepts like frequency, velocity, and wave modes (e.g., longitudinal, shear) used to detect material flaws.
01.02	Explain the principles of electromagnetic induction in Eddy Current Testing (ECT), including how induced currents interact with materials and how changes in the material (e.g., cracks, corrosion) affect the resulting impedance.
01.03	Describe the principles of magnetism that govern Magnetic Particle Inspection (MT), including how magnetic fields are generated and how they interact with ferromagnetic materials to reveal surface and near-surface defects
01.04	Demonstrate the application of the physics of light and optics in Visual Inspection (VI), including how lighting, magnification, and human visual perception interact with surface characteristics to identify potential defects
01.05	Explain the principles of infrared radiation and thermography, focusing on how heat patterns, emissivity, and thermal conductivity of materials are used to identify hidden defects or stress areas in structures.
01.06	Apply wave propagation principles to understand how different NDT methods use waves (sound, light, or electromagnetic) to detect flaws, and how those waves interact with various material types and configurations.
01.07	Describe the role of material properties (such as density, conductivity, permeability, and elasticity) in determining the effectiveness of each NDT method and how these properties affect wave behavior or signal interpretation.
01.08	Select the operational limits and optimal settings for each NDT method, considering the physics involved (e.g., ultrasound frequency range, eddy current coil size, magnetic field strength) and how these affect test results.
01.09	Evaluate the impact of environmental conditions (such as temperature, pressure, and surface finish) on the performance of each NDT technique and instrumentation, making necessary adjustments to the method as required during live assessments or simulated real-world scenarios.
01.10	Calibrate and troubleshoot NDT equipment, applying the fundamental physics behind the instrumentation, and demonstrate the ability to correct errors, ensuring test results fall within specified tolerances for each NDT method.
02.0	Exhibit proficiency in the execution of NDT methods and Interpretation of Inspection SOPs in accordance with ATA-105 and NAS-410 standards. The student will be able to:.
02.01	Identify defects, corrosion, cracks, or other irregularities in aircraft components during Visual Inspections (VI), following ATA-105 inspection protocols to ensure compliance with commercial aviation safety standards.
02.02	Apply Ultrasonic Testing (UT) and Eddy Current Testing (ECT) on critical aircraft parts, such as wings, fuselage, or landing gear, to detect subsurface flaws, corrosion, or material discontinuities, using the appropriate NAS-410 and ATA-105 protocols to ensure accurate results.
02.03	Apply Magnetic Particle Inspection (MT) to detect surface and near-surface defects in ferromagnetic materials, including aircraft

		structural components, following ATA-105 protocols and NAS-410 standards to ensure proper execution of the method
	02.04	Apply Thermography to identify heat patterns and thermal anomalies in aircraft structures, detecting hidden defects such as corrosion or stress fractures in critical areas (e.g., fuselage, wings), following ATA-105 inspection procedures and NAS-410 standards for infrared NDT application.
03.0		Follow safety protocols and compliance standards in NDT practices. The student will be able to:
	03.01	Identify safety protocols related to the use of NDT equipment and materials, ensuring adherence to NAS-410 and ATA-105 guidelines during inspections.
	03.02	Describe the potential hazards associated with various NDT methods, such as ultrasonic testing, eddy current testing, magnetic particle inspection, and thermography, and relate safety precautions to mitigate risks.
	03.03	Demonstrate the correct use of personal protective equipment (PPE) in accordance with NAS-410 and ATA-105 standards, ensuring the safety of inspectors and personnel during NDT operations.
	03.04	Explain the importance of complying with regulatory standards and industry protocols, emphasizing the role of ATA-105 and NAS-410 in maintaining the integrity and safety of commercial and military aircraft.
	03.05	Outline procedures for reviewing and modifying inspection protocols to ensure compliance with the latest safety and regulatory requirements, adapting NDT practices to meet evolving standards.
	03.06	Describe the importance of adhering to relevant OSHA (Occupational Safety and Health Administration) standards, EPA (Environmental Protection Agency) regulations, and other safety guidelines while performing NDT operations.
04.0		Prepare for NDT qualifying exams and subsequent OJT hours. The student will be able to:
	04.01	Identify the training and experience hour requirements for NDT certification as outlined by the ASNT SNT-TC-1A standard, including the minimum hours required for Level I, Level II, and Level III certification in various NDT methods.
	04.02	Explain the key components of NDT certification exams, including written, practical, and oral examinations, and how they align with the NAS-410 and ATA-105 standards for aviation inspection.
	04.03	Demonstrate the ability to apply NDT methods through practical exercises and laboratory work, ensuring students meet or exceed a 75% proficiency rate on both written and practical exams based on classroom and lab instruction.
	04.04	Describe the role and importance of on-the-job training (OJT) in gaining real-world experience and meeting the required hours for ASNT certification, especially for each level of qualification.
	04.05	Outline a structured plan to meet the required OJT hours for each NDT method, ensuring that students understand the specific experience requirements for certification and the significance of supervised, hands-on training.
05.0		Demonstrate professional skills in collaboration, reporting, and workplace social dynamics. The student will be able to:
	05.01	Describe the importance of effective communication in NDT, including how to report findings clearly and accurately to various stakeholders (e.g., supervisors, engineers, and clients).
	05.02	Identify the key components of teamwork in NDT, including how to collaborate effectively with engineers, inspectors, and maintenance personnel to solve problems identified through NDT inspections.
	05.03	Explain the professional and ethical standards that NDT technicians must adhere to, including confidentiality, integrity in reporting, and maintaining the trust of stakeholders.
	05.04	Explain how NDT professionals should apply ethical principles when interacting with colleagues, clients, and supervisors, ensuring responsible decision-making and adherence to industry regulations.

05.05	Write professional reports that summarize inspection results, defect assessments, and recommendations for corrective actions, ensuring clarity, accuracy, and ethical responsibility.

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

Recommended General Education Courses:
The program begins with foundational coursework aimed at delivering a functional understanding of materials science and the principles of material interactions. It also emphasizes the development of mathematical skills essential for calculation, problem-solving, and modeling in NDT, effectively preparing students for their careers and subsequent core NDT coursework. The general education component includes:

- **College Algebra (MAC 1105 3 credit hours):** In this course, students will develop problem solving skills, critical thinking, computational proficiency, and contextual fluency through the study of equations, functions, and their graphs. Emphasis will be placed on quadratic, exponential, and logarithmic functions. Topics will include solving equations and inequalities, definition and properties of a function, domain and range, transformations of graphs, operations on functions, composite and inverse functions, basic polynomial and rational functions, exponential and logarithmic functions, and applications.

- **Physics for Liberal Arts with Laboratory (PHY 1020C 3 credit hours):** This course offers a comprehensive survey of physics, covering a wide range of topics including motion, Newton's laws, energy, sound, heat, electricity, magnetism, and optics. Emphasizing a conceptual understanding of physics, the course integrates critical thinking skills and real-world applications.

These general education courses are vital for ensuring adequate preparation to engage with the professional core courses, where the practical applications of materials science and applied physics converge with NDT inspection methodologies. The subsequent phase of the program aspires to deepen the mathematical and scientific knowledge acquired, imbuing individuals with the expertise necessary to confront complex challenges within the field.

Program Overview: Foundations and Professional Preparation for NDT Careers: This comprehensive structure ensures that students develop a solid theoretical foundation and practical understanding of the scientific principles underlying various NDT inspection methods. It enhances critical thinking and numerical literacy, equipping students with the knowledge needed to excel in professional NDT coursework. The program offers specialized training in various NDT techniques, aligning with ASNT's SNT-TC-1A and CP-105 standards, while incorporating ATA-105 and NAS-410 standards for aerospace NDT to ensure coherence with the parent Aviation Maintenance Management program. Additionally, the skills gained through these core NDT courses are widely applicable across different industries, reflecting the broad relevance of the knowledge provided by CP-105.

ETI-1121: Introduction to Non-Destructive Testing (NDT) (3 credit hours): An introductory course covering the fundamentals of NDT, including an overview of various testing methods and their applications.
ETI-2123C: Liquid Penetrant (DT) NDT (3 credit hours): This course delves into the principles and techniques of liquid penetrant testing for detecting surface discontinuities.
ETI-2124C: Magnetic Particle (MT) NDT (3 credit hours): Instruction on magnetic particle testing for detecting surface and near-surface flaws in ferromagnetic materials.
ETI-2125C: Eddy Current (ET) NDT (4 credit hours): Covers ultrasonic testing, utilizing high-frequency sound waves to detect internal flaws in materials.
ETI-2126C: Ultrasound (UT) NDT (4 credit hours): Covers ultrasonic testing, utilizing high-frequency sound waves to detect internal flaws in materials.
ETI-2127C: Infrared Thermography (IR) NDT (2 credit hours): Explores infrared thermography for detecting thermal anomalies in materials.
With the combination of core courses and mathematics requirements, the estimated total credit hours for the program are 24 credit hours, ensuring that students acquire a thorough understanding of NDT principles and are well-prepared for ASNT certification and successful careers in the industry.

Regulating: To regulate a Level I/Level II Nondestructive Testing (NDT) training program at a college, particularly within the context of aviation maintenance, adherence to both American Society for Nondestructive Testing (ASNT) standards and aviation-specific guidelines such as ATA-105 is essential.

Firstly, the curriculum should be developed in alignment with ASNT Recommended Practice No. SNT-TC-1A, which outlines the training and qualification requirements for NDT personnel, and ASNT CP-105, which specifies the required training hours for each NDT method and level. Given the aviation focus, the curriculum must also adhere to ATA-105 and/or NAS-410 standards, which provide specific requirements for NDT training in the aviation industry. This ensures that the program meets both general NDT standards and the specialized needs of aviation maintenance.

Instructors should be certified to at least Level II in the NDT methods they teach, with ASNT NDT Level III certification highly preferred. They should also engage in continuous professional development to remain current with advancements in NDT technologies and practices. The college must provide well-equipped laboratories with the necessary NDT tools for hands-on training, adhering to safety standards and regulations.

Program management should be overseen by a dedicated coordinator to ensure compliance with ASNT guidelines, ATA-105/ NAS-410 standards, and academic credit requirements. This includes maintaining comprehensive records of training hours, examination results, and certifications issued. Students must complete the required academic credit hours and pass both written and practical examinations based on ASNT guidelines to achieve certification. Regular audits of the program are necessary to ensure ongoing compliance, and a feedback mechanism should be in place to support continuous improvement.

An advisory board comprising industry experts, NDT professionals, and ASNT representatives will guide the development and refinement of the program. Partnerships with local industries can provide students with valuable internship opportunities, enhancing their practical experience. Continuing education courses should be available to help NDT technicians maintain and upgrade their skills, with pathways for students to advance to Level III certification or specialize in advanced NDT methods.

By integrating ATA-105 and/or NAS 410 standards with ASNT guidelines and converting training hours into college credit, the institution can develop a comprehensive and respected aerospace NDT training program. This approach ensures that students are well-prepared for careers as Level I and Level II NDT technicians, equipped with the specific skills required for aviation maintenance while meeting both academic and industry standards.

Career and Technical Student Organization (CTSO)

Florida SkillsUSA (SkillsUSA) is the co-curricular 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: **Avionics Specialist**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0647060908
Program Type	College Credit Certificate (CCC)
Program Length	33 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 33 credit hours.

Standards

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

01.0 Demonstrate proficiency in the basics of aviation maintenance technology.
02.0 Demonstrate proficiency in basic aircraft wiring and PCB practices.
03.0 Demonstrate proficiency in basic direct current (DC) circuits.
04.0 Demonstrate proficiency in advanced direct current (DC) circuits.
05.0 Demonstrate proficiency in aircraft direct current (DC) power systems.
06.0 Demonstrate proficiency in alternating current (AC) circuits.
07.0 Demonstrate proficiency in advanced alternating current (AC) circuits.
08.0 Demonstrate proficiency in alternating current (AC) circuit components.
09.0 Demonstrate proficiency in aircraft alternating current (AC) power systems.
10.0 Demonstrate proficiency with aircraft drawings.
11.0 Demonstrate proficiency in solid state devices.
12.0 Demonstrate proficiency in analog circuits.
13.0 Demonstrate an understanding of basic avionics corrosion.
14.0 Demonstrate proficiency in aircraft aerodynamic fundamentals.
15.0 Demonstrate proficiency in digital circuits.
16.0 Demonstrate proficiency in fundamental microprocessors.
17.0 Demonstrate an understanding of workplace safety practices.
18.0 Demonstrate appropriate communication skills.
19.0 Demonstrate employability skills.
20.0 Demonstrate an understanding of entrepreneurship.
21.0 Demonstrate knowledge of basic avionics systems.
22.0 Demonstrate proficiency in installing avionics systems.
23.0 Demonstrate proficiency in structural applications.
24.0 Demonstrate proficiency in avionics radio station regulations and procedures.
25.0 Demonstrate proficiency in AM and FM transmitters.
26.0 Demonstrate proficiency in AM and FM receivers.
27.0 Demonstrate proficiency in AM and FM transceivers.
28.0 Demonstrate proficiency in electromagnetic wave emissions.
29.0 Demonstrate proficiency in line maintenance of airborne communication systems.
30.0 Demonstrate proficiency in line maintenance of aircraft instrument systems.
31.0 Demonstrate proficiency in aircraft data bus systems.

32.0 Demonstrate proficiency in line maintenance of airborne navigation systems and equipment.
33.0 Demonstrate proficiency in primary and secondary radar systems.
34.0 Demonstrate proficiency with in-flight entertainment systems.
35.0 Demonstrate proficiency with engine and airframe monitoring systems.
36.0 Demonstrate proficiency with pitot-static systems.
37.0 Demonstrate proficiency with aircraft safety systems.

Florida Department of Education
Student Performance Standards

Program Title: **Avionics Specialist**
CIP Number: **0647060908**
Program Length: **33 credit hours**

This certificate program is part of the Avionics Systems Integration Specialist AS degree program (1647060911). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in the fundamentals of aviation maintenance technology. The student will be able to:
01.01	Perform basic electricity skills.
01.02	Perform basic aircraft drawing skills.
01.03	Demonstrate aircraft weight and balance skills.
01.04	Maintain aircraft fluid lines and fittings.
01.05	Perform aircraft materials and processes skills.
01.06	Perform ground operations and servicing duties.
01.07	Perform cleaning and corrosion control operations.
01.08	Demonstrate basic mathematical skills appropriate for avionics professionals.
01.09	Maintain forms and records.
01.10	Apply principles of basic physics.
01.11	Demonstrate the use of maintenance publications.
01.12	Interpret and explain mechanic privileges.
02.0	Demonstrate proficiency in basic aircraft wiring and PCB practices. The student will be able to:
02.01	Explain the theoretical concepts and safety precautions of soldering.
02.02	Use appropriate hand tools to cut, strip, crimp, splice, solder, and stamp/identify wires and cables to industry standards for aircraft installation.
02.03	Prepare, use, install, and inspect general purpose connectors.
02.04	Research and identify the proper AN-MS connectors for use in aircraft electrical systems.
02.05	Identify and use power tools properly.
02.06	Demonstrate acceptable PCB soldering techniques.
02.07	Demonstrate acceptable de-soldering techniques.

	02.08 Demonstrate electrostatic discharge (ESD) safety procedures.
	02.09 Describe the construction of printed circuit boards (PCB's).
	02.10 Demonstrate proficiency in reworking and repairing aircraft wiring and PCB’s.
03.0	Demonstrate proficiency in basic direct current (DC) circuits. The student will be able to:
	03.01 Solve problems in electronic units utilizing metric prefixes.
	03.02 Identify sources of electricity.
	03.03 Define voltage, current, resistance, power, and energy.
	03.04 Apply Ohm's law and power formulas.
	03.05 Read and interpret color codes and symbols to identify electrical components and values.
	03.06 Measure properties of a DC circuit using an analog volt-ohm (VOM) meter.
	03.07 Measure properties of a DC circuit using a digital multi-meter (DMM).
	03.08 Measure properties of a DC circuit using an oscilloscope.
	03.09 Compute conductance and compute and measure resistance of conductors and insulators.
	03.10 Apply Ohm's law to series circuits.
	03.11 Analyze and troubleshoot series circuits.
	03.12 Apply Ohm's law to parallel circuits.
	03.13 Analyze and troubleshoot parallel circuits.
04.0	Demonstrate proficiency in advanced direct current (DC) circuits. The student will be able to:
	04.01 Solve algebraic problems to include exponentials to DC.
	04.02 Relate electricity to the nature of matter.
	04.03 Apply Ohm’s law to series-parallel and parallel-series circuits.
	04.04 Verify the operation of series-parallel, parallel-series, and bridge circuits.
	04.05 Troubleshoot series-parallel and parallel-series and bridge circuits.
	04.06 Identify and define voltage divider circuits (loaded and unloaded).
	04.07 Verify the operation of voltage divider circuits (loaded and unloaded).
	04.08 Analyze and troubleshoot voltage divider circuits (loaded and unloaded).
	04.09 Describe magnetic properties of circuits and devices.

	04.10 Determine the physical and electrical characteristics of capacitors and inductors.
	04.11 Define resistor-capacitor (R-C) and resistor-inductor (R-L) time constants.
	04.12 Adjust and operate power supplies for DC circuits.
05.0	Demonstrate proficiency in aircraft direct current (DC) power systems. The student will be able to:
	05.01 Identify the types and construction of aircraft batteries.
	05.02 Define battery shop safety features and precautions when servicing various types of aircraft batteries.
	05.03 Explain the process of servicing lead-acid and nickel-cadmium batteries.
	05.04 Describe the types of aircraft DC generation systems.
	05.05 Describe the purpose and operation of aircraft DC current limiters, regulators, and reverse current relays.
06.0	Demonstrate proficiency in alternating current (AC) circuits. The student will be able to:
	06.01 Solve basic trigonometric problem as applicable to electronics.
	06.02 Measure the properties of AC circuits using multi-meters.
	06.03 Measure the properties of an AC circuit using an oscilloscope.
	06.04 Identify the sources of AC electricity.
	06.05 Use a function generator to inject signals into an AC circuit.
	06.06 Define frequency, cycle, Hertz, wavelength, sine wave, phase angle, and period.
	06.07 Calculate peak-to-peak, average, and RMS values of an AC signal.
	06.08 Identify sine waves, square waves, saw-tooth waves, and ramp waveforms.
	06.09 Use Ohm’s law to determine resistance in an AC circuit.
	06.10 Define the characteristics of AC capacitive circuits.
	06.11 Analyze and troubleshoot AC capacitive circuits.
	06.12 Define the characteristics of AC inductive circuits.
	06.13 Analyze and troubleshoot AC inductive circuits.
07.0	Demonstrate proficiency in advanced alternating current (AC) circuits. The student will be able to:
	07.01 Define characteristics of resistive, Inductive and Capacitive (RLC) circuits (series, parallel and complex).
	07.02 Define the characteristics of series and parallel resonant circuits.
	07.03 Analyze and troubleshoot R-C, R-L, and RLC circuits.

	07.04 Define the characteristics of frequency selective filter circuits.
	07.05 Analyze and troubleshoot frequency selective filter circuits.
	07.06 Define the characteristics of poly-phase circuits.
08.0	Demonstrate proficiency in alternating current (AC) circuit components. The student will be able to:
	08.01 Define and apply the principles of transformers to AC circuits.
	08.02 Calculate transformer primary and secondary voltage, turn ratio, current, and power.
	08.03 Analyze and troubleshoot step-up, step-down, and auto transformers.
	08.04 Describe the characteristics and operation of relays and switches.
	08.05 Analyze and troubleshoot relays and switches.
	08.06 Define basic AC generator theory and operation.
	08.07 Define basic AC motor theory and operation.
	08.08 Adjust and operate power supplies for AC circuits.
	08.09 Analyze and measure power in AC circuits.
09.0	Demonstrate proficiency in aircraft alternating current (AC) power systems. The student will be able to:
	09.01 Describe the types and operation of aircraft AC generation systems.
	09.02 Describe the operation of basic aircraft DC and AC power distribution systems.
	09.03 Describe the operation of aircraft multi-engine power distribution systems.
10.0	Demonstrate proficiency with aircraft drawings. The student will be able to:
	10.01 Identify and define the symbols, lines, and markings on aircraft flowcharts, drawings and diagrams.
	10.02 Read and interpret aircraft drawings and blueprints.
	10.03 Prepare sketches of aircraft repairs and alterations.
	10.04 Use of charts and graphs.
	10.05 Describe the types of CAD systems and demonstrate the basic functions of a CAD program.
11.0	Demonstrate proficiency in solid state devices. The student will be able to:
	11.01 Identify and define properties of semiconductor materials.
	11.02 Identify and define operating characteristics and applications of junction diodes.
	11.03 Identify and define operating characteristics and applications of special diodes.

11.04	Analyze and troubleshoot diode circuits.
11.05	Identify and define operating characteristics and applications of bipolar transistors.
11.06	Identify and define operating characteristics and applications of field effect transistors.
11.07	Identify and define operating characteristics and applications of single-stage amplifiers.
11.08	Analyze and troubleshoot single-stage amplifiers.
11.09	Analyze and troubleshoot thyristor circuitry.
11.10	Set up and operate DVM for solid-state devices.
11.11	Set up and operate power supplies for solid-state devices.
11.12	Set up and operate oscilloscopes for solid-state devices.
11.13	Set up and operate function generators for solid-state devices.
11.14	Demonstrate transistor testing techniques.
12.0	Demonstrate proficiency in analog circuits. The student will be able to:
12.01	Identify and define operational characteristics and applications of multistage amplifiers.
12.02	Analyze and troubleshoot multistage amplifiers.
12.03	Identify and define operating characteristics and applications of linear integrated circuits.
12.04	Identify and define operating characteristics and applications of basic power supplies and filters.
12.05	Analyze and troubleshoot differentiator and integrator circuits.
12.06	Identify and define operating characteristics and applications of differential and operational amplifiers.
12.07	Analyze and troubleshoot differential and operational amplifier circuits.
12.08	Identify and define operating characteristics of audio power amplifiers.
12.09	Analyze and troubleshoot audio power amplifiers.
12.10	Identify and define operating characteristics and applications of power supply regulator circuits.
12.11	Analyze and troubleshoot power supply regulator circuits.
12.12	Identify and define operating characteristics and applications of active filters.
12.13	Analyze and troubleshoot active filter circuits.
12.14	Identify and define operating characteristics and applications of sinusoidal and non-sinusoidal oscillator circuits.
12.15	Analyze and troubleshoot oscillator circuits.

	12.16 Identify and define operating characteristics and applications of cathode ray tubes.
	12.17 Identify and define operating characteristics and applications of optoelectronic devices.
	12.18 Define the operating characteristics of analog-type servo motors.
	12.19 Use basic electronics test equipment to measure and analyze analog circuits.
13.0	Demonstrate an understanding of basic avionics corrosion. The student will be able to:
	13.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	13.02 Describe the types of corrosion and explain their effects on avionics equipment.
	13.03 Describe the preventative processes to reduce or eliminate avionics corrosion.
14.0	Demonstrate proficiency in aircraft aerodynamic fundamentals. The student will be able to:
	14.01 Identify and explain the effects of aerodynamic forces on aircraft structures and components.
	14.02 Identify and describe the purpose aircraft flight controls and aircraft how they affect flight operations.
	14.03 Define the concept of weight and balance in aircraft to include arms, weights, moments, the Law of Lever, and the center of gravity.
	14.04 Describe the effects of installing equipment, modifying equipment, modifying airframe structures, and repositioning equipment on weight and balance.
15.0	Demonstrate proficiency in digital circuits. The student will be able to:
	15.01 Define and apply numbering systems to codes and arithmetic operations.
	15.02 Analyze and minimize logic circuits using Boolean operations.
	15.03 Set up and operate logic probes for digital circuits.
	15.04 Set up and operate power supplies for digital circuits and solve power distribution and noise problems.
	15.05 Set up and operate pulsers for digital circuits.
	15.06 Set up and operate oscilloscopes for digital circuits.
	15.07 Set up and operate logic analyzers for digital circuits.
	15.08 Set up and operate pulse generators for digital circuits.
	15.09 Identify types of logic gates and their truth tables.
	15.10 Verify combinational logic circuits made up of integrated circuits.
	15.11 Troubleshoot logic circuits.
	15.12 Analyze types of flip-flops and their truth tables.
	15.13 Troubleshoot flip-flops.

15.14	Identify, define, and measure characteristics of integrated circuit (IC) logic families.
15.15	Identify types of registers and counters.
15.16	Troubleshoot registers and counters.
15.17	Analyze clock and timing circuits.
15.18	Troubleshoot clock and timing circuits.
15.19	Identify types of arithmetic-logic circuits.
15.20	Troubleshoot arithmetic-logic circuits.
15.21	Identify types of encoding and decoding devices.
15.22	Troubleshoot encoders and decoders.
15.23	Identify types of multiplexer and de-multiplexer circuits.
15.24	Troubleshoot multiplexer and de-multiplexer circuits.
15.25	Identify types of memory circuits.
15.26	Relate the uses of digital-to-analog and analog-to-digital conversions.
15.27	Troubleshoot digital-to-analog and analog-to-digital circuits.
15.28	Identify types of digital displays.
15.29	Troubleshoot digital display circuits.
15.30	Demonstrate the operating characteristics of digital-type servo and stepper motors.
16.0	Demonstrate proficiency in fundamental microprocessors. The student will be able to:
16.01	Identify central processing unit (CPU) building blocks and their uses (architecture).
16.02	Analyze bus concepts.
16.03	Analyze various memory schemes.
16.04	Verify memory device operation.
16.05	Set up and operate oscilloscopes for microprocessor systems.
16.06	Identify types of input and output devices and peripherals.
16.07	Interface input and output ports to peripherals.
16.08	Analyze and troubleshoot input and output ports.
16.09	Develop a simple microprocessor and/or microcontroller application program.

17.0	Demonstrate an understanding of workplace safety practices. The student will be able to:
17.01	Use Safety Data Sheets (SDS) information to determine the use, safety precautions, and disposition of chemicals used in avionics applications.
17.02	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.
17.03	Describe flight line safety to include foreign object elimination, situational awareness, aircraft movement precautions, fire classifications, and fire extinguishing.
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	Demonstrate appropriate telephone/communication skills.
18.04	Make equipment failure reports.
18.05	Specify and requisition simple electronic components.
18.06	Compose technical letters and memoranda.
18.07	Draft preventive maintenance procedures.
18.08	Use an analysis of technical data to form conclusions and recommend changes.
18.09	Make oral presentations.
18.10	Read and follow written instructions.
18.11	Answer and ask questions coherently and concisely.
19.0	Demonstrate employability skills. The student will be able to:
19.01	Discuss elements of job search.
19.02	Develop sources of information about a job.
19.03	Identify documents that may be required when applying for a job.
19.04	Complete a job application correctly.
19.05	Demonstrate competence in job interview techniques.
19.06	Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
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 Demonstrate knowledge of the Federal Law as recorded in (29 CFR–1910.1200).
	19.11 Write a proper resume.
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 the risks involved in ownership of a business.
	20.05 Identify the necessary personal characteristics of an entrepreneur.
	20.06 Identify the business skills needed to operate a small business efficiently and effectively.
	20.07 Define various corporate structures. (e.g., S-Corp, C-Corp, Sole Proprietor, LLC, and ESOP).
21.0	Demonstrate knowledge of basic avionics systems. The student will be able to:
	21.01 Identify and describe aircraft communications systems.
	21.02 Identify and describe aircraft short-range navigation systems.
	21.03 Identify and describe aircraft long-range navigation systems.
	21.04 Identify the types of flight instruments and state their purpose.
22.0	Demonstrate proficiency in installing avionics systems. The student will be able to:
	22.01 Prepare an avionics installation plan.
	22.02 Design wiring interconnection for Comm, Nav, GPS, Traffic Avoidance, Audio Integrating etc.
	22.03 Install circuit protective devices, switches, lamps, and relays.
	22.04 Fabricate wiring harnesses.
	22.05 Perform a mechanical avionics installation.
	22.06 Perform an electrical installation.
	22.07 Perform an original manufacturers equipment (OEM) installation.
	22.08 Determine antenna placement with regards to noise interference.
23.0	Demonstrate proficiency in structural applications. The student will be able to:
	23.01 Select, install, and remove conventional and special fasteners.
	23.02 Layout, form, inspect, modify, and repair metal structures.

	23.03 Fabricate, modify, and repair composite structures.
	23.04 Install aircraft antennas and doubler plates.
24.0	Demonstrate proficiency in avionics radio station regulations and procedures. The student will be able to:
	24.01 Define repair station related regulatory and standardization agencies and their purposes.
	24.02 Define repair station certification requirements.
	24.03 Define requirements for certification of radio repair technicians.
	24.04 Practice proper station operation procedures.
	24.05 Prepare repair station reports and documentation.
	24.06 Describe FCC rules pertaining to AM and FM transmitter maintenance and operation.
25.0	Demonstrate proficiency in AM and FM transmitters. The student will be able to:
	25.01 Define Double Sideband (DSB), Single Sideband (SSB) and FM modulation.
	25.02 Analyze and troubleshoot AM and FM Radio Frequency (RF) oscillator circuits.
	25.03 Analyze and troubleshoot buffer and multiplier circuits.
	25.04 Analyze and troubleshoot RF power amplifier circuits.
	25.05 Analyze and troubleshoot AM and FM modulation circuits.
	25.06 Analyze and troubleshoot microphone circuits.
	25.07 Analyze and troubleshoot balanced modulators and SSB filter circuits.
	25.08 Analyze and troubleshoot AM and FM power supply circuits.
	25.09 Make power, frequency and modulation measurements of AM and FM transmitters.
	25.10 Align and troubleshoot AM and FM transmitters.
26.0	Demonstrate proficiency in AM and FM receivers. The student will be able to:
	26.01 Analyze and troubleshoot receiver audio voltage and power amplifiers and speaker/headphone circuits.
	26.02 Analyze and troubleshoot AM and FM detector circuits.
	26.03 Analyze and troubleshoot AM Intermediate Frequency (IF) amplifier circuits.
	26.04 Analyze and troubleshoot FM IF amplifier and limited circuits.
	26.05 Analyze and troubleshoot receiver oscillator and automatic frequency control (AFC) circuits.
	26.06 Analyze and troubleshoot RF mixer/heterodyne circuits.

	26.07 Analyze and troubleshoot receiver RF amplifier circuits.
	26.08 Analyze and troubleshoot automatic voltage control/automatic gain control (AVC/AGC) circuits.
	26.09 Analyze and troubleshoot receiver power supplies.
	26.10 Align and troubleshoot AM and FM receivers.
27.0	Demonstrate proficiency in AM and FM transceivers. The student will be able to:
	27.01 Analyze and troubleshoot transceiver control, metering and switching circuits.
	27.02 Analyze and troubleshoot transceiver frequency synthesizers and phase locked loop circuits.
	27.03 Analyze and troubleshoot squelch circuits.
	27.04 Align and troubleshoot transceivers.
28.0	Demonstrate proficiency in electromagnetic wave emissions. The student will be able to:
	28.01 Define the radio frequency spectrum.
	28.02 Define types and classification of RF emissions.
	28.03 Define the characteristics of radio waves.
	28.04 Define radio wave propagation method.
	28.05 Define the basic types of antennas.
	28.06 Draw the voltage and current relationships and radiation patterns for the basic types of antennas.
	28.07 Define methods for antenna tuning, gain and directivity.
	28.08 Define transmission lines in terms of electrical and physical properties.
	28.09 Define standing waves, cause and effect, and measure standing wave ratios.
	28.10 Define tuned transmission lines and describe applications.
	28.11 Construct transmission lines.
	28.12 Define waveguides, resonant cavities and their applications.
29.0	Demonstrate proficiency in line maintenance of airborne communication systems. The student will be able to:
	29.01 Identify regulatory agencies affecting aircraft electronic systems.
	29.02 Analyze and troubleshoot Aircraft Audio Integration Systems.
	29.03 Analyze and troubleshoot VHF communication systems.
	29.04 Analyze and troubleshoot HF communication systems

	29.05 Analyze and troubleshoot satellite communication systems.
	29.06 Describe the operation of a selective calling system.
	29.07 Define the operation and the types of data managed by the Aircraft Communication Automatic Reporting System (ACARS).
30.0	Demonstrate proficiency in line maintenance of aircraft instrument systems. The student will be able to:
	30.01 Identify and define the operation of basic flight instruments.
	30.02 Identify and define the operation of electronic flight instruments.
	30.03 Identify and define the operation of navigation instruments to include HSI, RMI, VOR.
	30.04 Identify, and define the operation of compass systems.
31.0	Demonstrate proficiency in aircraft data bus systems. The student will be able to:
	31.01 Define the operation of an aircraft digital data communications system.
	31.02 Compare and contrast the differences between ARINC data bus systems used in commercial aircraft.
	31.03 Identify data bus systems used in general aviation aircraft and explain their operation.
	31.04 Troubleshoot an aircraft data bus system.
32.0	Demonstrate proficiency in line maintenance of airborne navigation systems and equipment. The student will be able to:
	32.01 Use navigation principles to understand dead-reckoning, earth coordinate system, great circle navigation, short-range navigation and long-range navigation.
	32.02 Understand the operating principles of Global Position Satellite (GPS) System.
	32.03 Distinguish the operation principles of a VHF Omni Range (VOR) System.
	32.04 Define the operating characteristics of a Distance Measuring Equipment (DME) System.
	32.05 Explain the purpose and operation of, and the precautions when using, an Automatic Direction Finder (ADF) System.
	32.06 Define the elements of an Instrument Landing System (ILS) to include the characteristics of the localizer, glide slope, and marker beacon.
	32.07 Explain the operating principles of a Microwave Landing System (MLS).
	32.08 Describe the purpose and operation of ADS-B/transponder systems.
	32.09 Understand the relationships of various navigation systems to the aircraft flight management system.
	32.10 Define the operation of an autopilot, auto-throttle, and auto stabilization system.
33.0	Demonstrate proficiency in primary and secondary radar systems. The student will be able to:
	33.01 Explain the theory and operation of the primary radar system.
	33.02 Given a primary radar block diagram, explain the relationship between the major components of the system.

	33.03 Describe the operation of a Doppler radar.
	33.04 Secondary (ATC) Radar Transponder.
	33.05 Define the purpose and operation of the altitude encoding function of radar.
	33.06 Define the purpose and operation of the lightning detection function of radar.
	33.07 Describe the operation of a XM Weather System.
	33.08 Analyze and troubleshoot a radar system.
34.0	Demonstrate proficiency with in-flight entertainment systems. The student will be able to:
	34.01 Describe the types of in-flight entertainment systems and compare their operation to each other.
	34.02 Determine installation considerations when installing or upgrading an in-flight entertainment system.
35.0	Demonstrate proficiency with engine and airframe monitoring systems. The student will be able to.
	35.01 Identify and interpret data from various types of displays.
	35.02 Define aircraft built-in test equipment systems.
	35.03 Interpret data from built-in test equipment.
36.0	Demonstrate proficiency with pitot-static systems. The students will be able to:
	36.01 Understand purpose and function of pitot-static systems.
	36.02 Perform pitot-static integrity checks.
	36.03 Troubleshoot pitot-static systems.
37.0	Demonstrate proficiency with aircraft safety systems. The student will be able to:
	37.01 Understand purpose and function of caution, warning and advisory systems.
	37.02 Understand the purpose and operation of terminal collision avoidance systems (TCAS).
	37.03 Understand the purpose and operation of ground proximity warning systems (GPWS).
	37.04 Define the purpose of and data collected by the aircraft flight data computer and voice recorder.
	37.05 Describe the purpose, operation and testing of the Emergency Locator Transmitter (ELT).
	37.06 Describe the operation of the stall warning and avoidance 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 co-curricular 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.

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 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: **Commercial Pilot**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0649010202
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Professional Pilot Technology AS degree program (1649010200).

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 communications skills, employability skills, safe and efficient work practices, FAA pilot certification procedures, aircraft systems and components, flight safety, and instrumentation. This program focuses on specific, transferable skills. It stresses understanding and demonstration of the following elements of the commercial pilot industry: flight planning, managing commercial flight operations, flight 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 an understanding of safe and effective work practices.
02.0 Demonstrate an understanding of fundamentals of flight.
03.0 Understand and explain pertinent Federal Aviation Administration Regulations.
04.0 Demonstrate understanding of meteorology.
05.0 Demonstrate knowledge of aircraft communications equipment.
06.0 Demonstrate knowledge and an understanding of aircraft propulsion, and associated systems.
07.0 Demonstrate an understanding of navigation systems and procedures.
08.0 Demonstrate flight planning skills.

Florida Department of Education
Student Performance Standards

Program Title: **Commercial Pilot**
CIP Number: **0649010202**
Program Length: **24 credit hours**

This certificate program is part of the Professional Pilot Technology AS degree program (1649010200). At the completion of this program, the student will be able to:	
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 health and safety hazards, prevention and correction of environmental problems and know the solutions unique to the industry.
01.02	Demonstrate an awareness and understanding of fueling operations.
01.03	Demonstrate an understanding of situational awareness related to operational hazards.
01.04	Demonstrate an awareness of fire hazards, and awareness of proper techniques to control and extinguish fires.
01.05	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 an airfoil.
02.03	Explain how lift is produced.
02.04	Discuss how and why an airplane stalls and spins.
02.05	Describe and explain how pitot/static, vacuum, pressure, and engine instruments work.
02.06	Explain factors affecting aircraft design, performance, and operation.
02.07	Describe and explain how advanced avionics systems work.
03.0	Understand and explain Federal Aviation Administration Regulations. The student will be able to:
03.01	Explain relevant portions of Parts 1, 61, 91, 110, 119, 121, 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, general 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 Describe a typical lubrication system.
	06.03 Describe a typical magneto ignition system, including proper magneto checks.
	06.04 Describe the difference between a normally aspirated engine and one that is supercharged or turbocharged.
	06.05 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 Define radio navigation using both conventional and advanced avionics.
	07.02 Explain the magnetic compass.
	07.03 Describe and demonstrate use of VOR equipment and navigation.
	07.04 Describe and demonstrate use of GPS equipment and navigation.
	07.05 Explain DME, GPS, and RNAV principles.
	07.06 Demonstrate the use of a flight computer.
	07.07 Interpret sectional charts.
	07.08 Interpret en-route and terminal charts and approach plates.
	07.09 Explain lost communications emergency procedures under VFR and IFR.
	07.10 Read and interpret aircraft performance charts.
	07.11 Plot and explain a cross-country course.
	07.12 Describe the FAA national airspace system, including pilot and equipment requirements to fly in controlled airspace.

	07.13 Define DP’s and STAR’s.
	07.14 Read and interpret instrument approach charts and procedures.
08.0	Demonstrate flight planning skills. The student will be able to:
	08.01 Explain relevant portions of Parts 1, 91, 110, 121, 135, and NTSB 830 of the Federal Aviation 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 Determine route of flight.
	08.06 Demonstrate acquisition of appropriate weather data.
	08.07 Demonstrate proper selection of destination/enroute/alternate airports.
	08.08 Explain fuel requirements.
	08.09 Calculate aircraft performance.
	08.10 Access and analyze NOTAMS.
	08.11 Acquire, define, and validate a mission profile.
	08.12 Demonstrate the creation of and explain the effective use of a navigation log.
	08.13 Demonstrate methods in VFR/IFR flight planning and demonstrate the ability to make a valid go / no-go decision.

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

This course provides an expedited method of transition from an academic institution into the workforce. There are a number of students who wish to pursue their FAA licenses but do not want to seek a degree. Formalized training in an institution leads to safer pilot practices as demonstrated by statistical data. The Commercial Pilot Certificate supports entry level job functions in the pilot industry. The typical length of this program for the average achieving student is nine calendar months.

Prior to beginning flight training, students will be required to obtain an FAA medical certificate and comply with the TSA requirements. Community/State Colleges initiating this program are strongly encouraged to visit existing Florida Community/State Colleges with active programs.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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: **Airline / Aviation Management**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0649010403
Program Type	College Credit Certificate (CCC)
Program Length	16 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Aviation Administration AS degree program (1649010403).

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.

As part of the AS degree Aviation Administration, the purpose of this certificate program is to prepare students who are seeking employment with a fast track in the aviation/airline fields. Some of the students will able to obtain opportunities in the federal, state and local government aviation fields, while others will find opportunities in airline fields, such as initial entry level jobs in customer service and operations as well as lower to middle level management positions. Others will find positions in supporting aviation entities, such as suppliers and service providers to airlines and government aviation agencies. This program will benefit both students who do not have any other college experience, as well as those who have an associate or bachelor's degree in another area and would like to acquire the specific skills in this area.

The content includes but is not limited to, communication skills, leadership skills, directing, planning and controlling, human relations and employability skills, marketing, legal issues and Federal Aviation Regulations.

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 an understanding of basic aviation terminology and history.
02.0 Demonstrate an understanding of aviation operations practices, limitations, and procedures.
03.0 Demonstrate an understanding of federal, state, and other governmental laws, rules and policies as they relate to aviation.
04.0 Demonstrate an understanding of airline and airport management practices.
05.0 Demonstrate an understanding of aviation/airline marketing, customer service/sales, and reservations/ticketing.
06.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Airline / Aviation Management**
CIP Number: **0649010403**
Program Length: **16 credit hours**

This certificate program is part of the Aviation Administration AS degree program (1649010403). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of basic aviation terminology and history. The student will be able to:
01.01	Explain the overall scope and breadth of the aviation industry including its impact on the economy.
01.02	Distinguish the terms and vocabularies that are used in the aerospace and commercial aviation industry.
01.03	Describe the history of technological, governmental, social, and economic developments of aviation.
01.04	Explain the different types and categories of aircraft in use in the industry by distinguishing and identifying: Various wide body, narrow body types and general aviation aircraft.
01.05	Demonstrate an understanding of the oversight role of the Federal Government and its effect on the aviation industry.
02.0	Demonstrate an understanding of aviation operations practices, limitations, and procedures. The student will be able to:
02.01	Demonstrate knowledge of aircraft systems as they apply to flight operations, including engines, fuel, electrical, hydraulics, pneumatics, flight controls and avionics.
02.02	Understand the various factors of aircraft performance, including takeoff, enroute and landing limitations and weight and balance.
02.03	Demonstrate knowledge of the function of flight operations, including pilot hiring, training, standards, safety issues, security issues, FAA and TSA regulations, documentation requirements, operations specifications, operating within the ATC system, and crew scheduling as well as flight attendant and aircraft dispatcher requirements.
02.04	Describe maintenance operations and their role and effect on flight operations.
02.05	Demonstrate an understanding of the role of the flight operations professional in the economic and planning functions.
02.06	Explain FAA requirements such as flight standards, types of certificates, training and record keeping, surveillance, and investigations, as well as the operator's response and its relationship with the FAA.
02.07	Describe the role of the National Transportation Safety Board in accident investigation, NASA's role in aviation safety reporting systems and research, and industry-specific safety reporting programs.
02.08	Demonstrate knowledge of the application of information technology systems in flight operations as they relate to flight planning systems, flight management systems, satellite communication and navigation systems, weight and balance, maintenance monitoring, and management information systems.
03.0	Demonstrate an understanding of federal, state and other governmental laws, rules and policies as they relate to aviation. The student will be able to:

03.01	Demonstrate knowledge of the history and foundations of the legal and court system in the United States as it pertains to development of aviation law and regulations.
03.02	Explain the role and function of the U.S. DOT, FAA, TSA, and the NTSB as it relates to their legal responsibilities and authority.
03.03	Demonstrate knowledge of airmen rights and responsibilities, negligence, FAA enforcement, immunity, and degrees of care.
03.04	Explain state aviation law, relating to airports, fixed based operators, aircraft sales, registration, and taxation issues.
03.05	Demonstrate knowledge of the legal matters relating to the aircraft manufacturing and airline industry, including warranties, products liability, negligence, accident litigation, labor, and consumer issues.
03.06	Demonstrate knowledge of international air law, bilateral and multilateral agreements, international jurisdiction, and limits of liability and damages.
03.07	Demonstrate knowledge of legal issues that relate to aviation security.
04.0	Demonstrate an understanding of airline and airport management practices. The student will be able to:
04.01	Describe how historical and current changes in competition, social factors, government policies, and technology affect aviation and airport management.
04.02	Demonstrate understanding of organizational design and functional areas of an aviation business.
04.03	Demonstrate understanding of the various functions of an airport, including airside and landside operations and management, financial planning, airport master plans, environmental issues, and land use.
04.04	Describe the factors of effective communication, leadership styles, and motivating employees in an aviation environment with an emphasis on individual performance.
04.05	Demonstrate an understanding of labor relations contract negotiations, and the grievance process in an aviation environment, including issues specific to airline labor relations.
04.06	Explain how strategic planning and control processes are used in the aviation industry.
05.0	Demonstrate an understanding of aviation/airline marketing, customer service/sales, and reservations/ticketing. The student will be able to:
05.01	Explain the Marketing Concept and how it differs from the Product and Sales Concepts.
05.02	Analyze the various environmental factors that affect aviation/airline marketing.
05.03	Demonstrate an understanding of market demographics, segmentation, methods of market research and analysis, and pricing strategies.
05.04	Analyze why a customer buys a particular product or service.
05.05	Explain the advantages and disadvantages of the media available for aviation industry advertising and promotion.
05.06	Describe the factors of delivering quality customer service, why companies lose customer, and how to salvage a bad customer experience.
05.07	Explain the principles of reservations, ticketing, internet sales, e-ticketing, and travel agency functions.
06.0	Demonstrate employability skills. The student will be able to:

06.01	Describe positions available and requirements for careers in aviation administration.
06.02	Describe qualification and certification requirements for careers in aviation administration.

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 co-curricular 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: **Air Cargo Management**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0649010404
Program Type	College Credit Certificate (CCC)
Program Length	16 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Aviation Administration AS degree program (1649010403).

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.

As part of the AS degree Aviation Administration, the purpose of this certificate program is to prepare students who are seeking employment in the aviation/airline/air cargo fields in a fast track. Some of the students will able to obtain opportunities in airline fields, such as initial entry level jobs in air cargo and customer service as well as lower level management positions. Others will find positions in supporting aviation entities, such as suppliers and service providers to air cargo airlines and government aviation agencies.

The content includes but is not limited to, customer service, human relations and employability skills, safe and efficient work practices, technical skills such air cargo documentation and terminology, records management, Federal Aviation Regulations, and air cargo processes and practices.

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 an understanding of basic aviation terminology and history.
02.0 Demonstrate an understanding of aviation operations practices, limitations, and procedures.
03.0 Demonstrate an understanding of aviation/airline marketing, customer service/sales, and reservations/ticketing.
04.0 Demonstrate an understanding of air cargo operations and procedures.
05.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Air Cargo Management**
CIP Number: **0649010404**
Program Length: **16 credit hours**

This certificate program is part of the Aviation Administration AS degree program (1649010403). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of basic aviation terminology and history. The student will be able to:
01.01	Explain the overall scope and breadth of the aviation industry including its impact on the economy.
01.02	Distinguish the terms and vocabularies that are used in the aerospace and commercial aviation industry.
01.03	Describe the history of technological, governmental, social, and economic developments of aviation.
01.04	Explain the different types and categories of aircraft in use in the industry by distinguishing and identifying: Various wide body, narrow body types and general aviation aircraft.
01.05	Demonstrate an understanding of the oversight role of the Federal Government and its effect on the aviation industry.
02.0	Demonstrate an understanding of aviation operations practices, limitations, and procedures. The student will be able to:
02.01	Demonstrate knowledge of aircraft systems as they apply to flight operations, including engines, fuel, electrical, hydraulics, pneumatics, flight controls and avionics.
02.02	Understand the various factors of aircraft performance, including takeoff, enroute and landing limitations and weight and balance.
02.03	Demonstrate knowledge of the function of flight operations, including pilot hiring, training, standards, safety issues, security issues, FAA and TSA regulations, documentation requirements, operations specifications, operating within the ATC system, and crew scheduling as well as flight attendant and aircraft dispatcher requirements.
02.04	Describe maintenance operations and their role and effect on flight operations.
02.05	Demonstrate an understanding of the role of the flight operations professional in the economic and planning functions.
02.06	Explain FAA requirements such as flight standards, types of certificates, training and record keeping, surveillance, and investigations, as well as the operator’s response and its relationship with the FAA.
02.07	Describe the role of the National Transportation Safety Board in accident investigation, NASA’s role in aviation safety reporting systems and research, and industry-specific safety reporting programs.
02.08	Demonstrate knowledge of the application of information technology systems in flight operations as they relate to flight planning systems, flight management systems, satellite communication and navigation systems, weight and balance, maintenance monitoring, and management information systems.
03.0	Demonstrate an understanding of aviation/airline marketing, customer service/sales, and reservations/ticketing. The student will be able to:

03.01	Explain the Marketing Concept and how it differs from the Product and Sales Concepts.
03.02	Analyze the various environmental factors that affect aviation/airline marketing.
03.03	Demonstrate an understanding of market demographics, segmentation, methods of market research and analysis, and pricing strategies.
03.04	Analyze why a customer buys a particular product or service.
03.05	Explain the advantages and disadvantages of the media available for aviation industry advertising and promotion.
03.06	Describe the factors of delivering quality customer service, why companies lose customer, and how to salvage a bad customer experience.
03.07	Explain the principles of reservations, ticketing, internet sales, e-ticketing, and travel agency functions.
04.0	Demonstrate an understanding of air cargo operations and procedures. The student will be able to:
04.01	Describe the importance of air cargo to the economy.
04.02	Describe air cargo customers, freight forwarders, customs brokers, and how marketing is done in the air cargo industry.
04.03	Explain the different classes of air cargo, and the required documentation of each.
04.04	Describe and discuss cargo packaging and how cargo is loaded on an aircraft.
04.05	Describe HAZMAT classification, labeling, packaging, shipping requirements, and related incident/accident procedures and required reports.
04.06	Describe the security requirements for air cargo personnel, facilities, and aircraft.
05.0	Demonstrate employability skills. The student will be able to:
05.01	Describe positions available and requirements for careers in aviation administration.
05.02	Describe qualification and certification requirements for careers in aviation administration.

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 co-curricular 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: **Airport Management**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0649010405
Program Type	College Credit Certificate (CCC)
Program Length	16 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Aviation Administration AS degree program (1649010403).

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.

As part of the AS degree Aviation Administration, the purpose of this certificate program is to prepare students who are seeking employment a fast track in the airport management field. Some of the students will able to obtain opportunities in the federal, state and local government aviation fields, some will find opportunities in initial entry level jobs in airport customer service and operations as well as lower to middle level management positions. Others will find positions in supporting aviation entities, such as suppliers and service providers to government aviation agencies. This program will benefit both students who do not have any other college experience, as well as those who have an associate or bachelor's degree in another area and would like to acquire the specific skills in this area.

The content includes but is not limited to, communication skills, leadership skills, directing, planning and controlling, human relations and employability skills, safe and efficient work practices, airport facilities and planning, security issues, Federal Aviation Regulations, and other law related to aviation/airports.

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 an understanding of basic aviation terminology and history.
02.0 Demonstrate an understanding of aviation operations practices, limitations, and procedures.
03.0 Demonstrate an understanding of federal, state, and other governmental laws, rules and policies as they relate to aviation.
04.0 Demonstrate an understanding of airline and airport management practices.
05.0 Demonstrate an understanding of aviation security.
06.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Airport Management**
CIP Number: **0649010405**
Program Length: **16 credit hours**

This certificate program is part of the Aviation Administration AS degree program (1649010403). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of basic aviation terminology and history. The student will be able to:
01.01	Explain the overall scope and breadth of the aviation industry including its impact on the economy.
01.02	Distinguish the terms and vocabularies that are used in the aerospace and commercial aviation industry.
01.03	Describe the history of technological, governmental, social and economic developments of aviation.
01.04	Explain the different types and categories of aircraft in use in the industry by distinguishing and identifying: Various wide body, narrow body types and general aviation aircraft.
01.05	Demonstrate an understanding of the oversight role of the Federal Government and its effect on the aviation industry.
02.0	Demonstrate an understanding of aviation operations practices, limitations, and procedures. The student will be able to:
02.01	Demonstrate knowledge of aircraft systems as they apply to flight operations, including engines, fuel, electrical, hydraulics, pneumatics, flight controls and avionics.
02.02	Understand the various factors of aircraft performance, including takeoff, enroute and landing limitations and weight and balance.
02.03	Demonstrate knowledge of the function of flight operations, including pilot hiring, training, standards, safety issues, security issues, FAA and TSA regulations, documentation requirements, operations specifications, operating within the ATC system, and crew scheduling as well as flight attendant and aircraft dispatcher requirements.
02.04	Describe maintenance operations and their role and effect on flight operations.
02.05	Demonstrate an understanding of the role of the flight operations professional in the economic and planning functions.
02.06	Explain FAA requirements such as flight standards, types of certificates, training and record keeping, surveillance, and investigations, as well as the operator’s response and its relationship with the FAA.
02.07	Describe the role of the National Transportation Safety Board in accident investigation, NASA’s role in aviation safety reporting systems and research, and industry-specific safety reporting programs.
02.08	Demonstrate knowledge of the application of information technology systems in flight operations as they relate to flight planning systems, flight management systems, satellite communication and navigation systems, weight and balance, maintenance monitoring, and management information systems.
03.0	Demonstrate an understanding of federal, state and other governmental laws, rules and policies as they relate to aviation. The student will be able to:

03.01	Demonstrate knowledge of the history and foundations of the legal and court system in the United States as it pertains to development of aviation law and regulations.
03.02	Explain the role and function of the U.S. DOT, FAA, TSA, and the NTSB as it relates to their legal responsibilities and authority.
03.03	Demonstrate knowledge of airmen rights and responsibilities, negligence, FAA enforcement, immunity, and degrees of care.
03.04	Explain state aviation law, relating to airports, fixed based operators, aircraft sales, registration, and taxation issues.
03.05	Demonstrate knowledge of the legal matters relating to the aircraft manufacturing and airline industry, including warranties, products liability, negligence, accident litigation, labor, and consumer issues.
03.06	Demonstrate knowledge of international air law, bilateral and multilateral agreements, international jurisdiction, and limits of liability and damages.
03.07	Demonstrate knowledge of legal issues that relate to aviation security.
04.0	Demonstrate an understanding of airline and airport management practices. The student will be able to:
04.01	Describe how historical and current changes in competition, social factors, government policies, and technology affect aviation and airport management.
04.02	Demonstrate understanding of organizational design and functional areas of an aviation business.
04.03	Demonstrate understanding of the various functions of an airport, including airside and landside operations and management, financial planning, airport master plans, environmental issues, and land use.
04.04	Describe the factors of effective communication, leadership styles, and motivating employees in an aviation environment with an emphasis on individual performance.
04.05	Demonstrate an understanding of labor relations contract negotiations, and the grievance process in an aviation environment, including issues specific to airline labor relations.
04.06	Explain how strategic planning and control processes are used in the aviation industry.
05.0	Demonstrate an understanding of aviation security. The student will be able to:
05.01	Describe aviation security threats and responses.
05.02	Discuss aspects of aviation security, such the Aviation Safety and Security Act of 2001, and FAR Parts 108 and 109.
05.03	Describe the components of a layered aviation security system, including personnel selection and training, and performance of security personnel.
05.04	Explain the importance of planning for security threats and having contingency plans and responsive measures.
05.05	Explain the ground security measures and technology, including restricted access, inspections of personnel, baggage and goods, and effective screening techniques.
05.06	Discuss inflight threats and security procedures.
06.0	Demonstrate employability skills. The student will be able to:
06.01	Describe positions available and requirements for careers in aviation administration.
06.02	Describe qualification and certification requirements for careers in aviation administration.

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 co-curricular 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: **Passenger Service Agent**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0649010406
Program Type	College Credit Certificate (CCC)
Program Length	16 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Aviation Administration AS degree program (1649010403).

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.

As part of the AS degree Aviation Administration, the purpose of this certificate program is to prepare students who are seeking employment in the aviation/airline/airport fields as a passenger service agent. Some of the students will able to obtain opportunities in the federal, state and local government aviation fields, while others will find opportunities in airline fields, such as initial entry level jobs in customer service and operations and ticketing.

The content includes but is not limited to, communication skills, customer service skills, ticketing and reservations, aviation security, human relations and employability skills, operations and terminology.

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 an understanding of aviation operations practices, limitations, and procedures.
02.0 Demonstrate an understanding of aviation security.
03.0 Demonstrate an understanding of aviation/airline marketing, customer service/sales, and reservations/ticketing.
04.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Passenger Service Agent**
CIP Number: **0649010406**
Program Length: **16 credit hours**

This certificate program is part of the Aviation Administration AS degree program (1649010403). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of aviation operations practices, limitations, and procedures. The student will be able to:
01.01	Demonstrate knowledge of aircraft systems as they apply to flight operations, including engines, fuel, electrical, hydraulics, pneumatics, flight controls and avionics.
01.02	Understand the various factors of aircraft performance, including takeoff, enroute and landing limitations and weight and balance.
01.03	Demonstrate knowledge of the function of flight operations, including pilot hiring, training, standards, safety issues, security issues, FAA and TSA regulations, documentation requirements, operations specifications, operating within the ATC system, and crew scheduling as well as flight attendant and aircraft dispatcher requirements.
01.04	Describe maintenance operations and their role and effect on flight operations.
01.05	Demonstrate an understanding of the role of the flight operations professional in the economic and planning functions.
01.06	Explain FAA requirements such as flight standards, types of certificates, training and record keeping, surveillance, and investigations, as well as the operator's response and its relationship with the FAA.
01.07	Describe the role of the National Transportation Safety Board in accident investigation, NASA's role in aviation safety reporting systems and research, and industry-specific safety reporting programs.
01.08	Demonstrate knowledge of the application of information technology systems in flight operations as they relate to flight planning systems, flight management systems, satellite communication and navigation systems, weight and balance, maintenance monitoring, and management information systems.
02.0	Demonstrate an understanding of aviation security. The student will be able to:
02.01	Describe aviation security threats and responses.
02.02	Discuss aspects of aviation security, such the Aviation Safety and Security Act of 2001, and FAR Parts 108 and 109.
02.03	Describe the components of a layered aviation security system, including personnel selection and training, and performance of security personnel.
02.04	Explain the importance of planning for security threats and having contingency plans and responsive measures.
02.05	Explain the ground security measures and technology, including restricted access, inspections of personnel, baggage and goods, and effective screening techniques.
02.06	Discuss inflight threats and security procedures.

03.0	Demonstrate an understanding of aviation/airline marketing, customer service/sales, and reservations/ticketing. The student will be able to:
03.01	Explain the Marketing Concept and how it differs from the Product and Sales Concepts.
03.02	Analyze the various environmental factors that affect aviation/airline marketing.
03.03	Demonstrate an understanding of market demographics, segmentation, methods of market research and analysis, and pricing strategies.
03.04	Analyze why a customer buys a particular product or service.
03.05	Explain the advantages and disadvantages of the media available for aviation industry advertising and promotion.
03.06	Describe the factors of delivering quality customer service, why companies lose customer, and how to salvage a bad customer experience.
03.07	Explain the principles of reservations, ticketing, internet sales, e-ticketing, and travel agency functions.
04.0	Demonstrate employability skills. The student will be able to:
04.01	Describe positions available and requirements for careers in aviation administration.
04.02	Describe qualification and certification requirements for careers in aviation administration.

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 co-curricular 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: **Aviation Mechanic**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0649010408
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Aviation Maintenance Management AS degree program (1649010401).

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 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 as an Aviation Maintenance General Technician.

The content includes but is not limited to the Federal Aviation Regulations (FAR) Part 65 pertaining to eligibility for a mechanic certificate and rating(s). Instruction is designed to qualify students for Federal Aviation Administration (FAA) examinations for aviation maintenance airframe technician certification as prescribed by FAR 147. The program content should also include training in communication, management leadership, human relations, supervisory 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.

Standards

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

01.0 Perform basic electricity skills.
02.0 Perform basic aircraft drawing skills.
03.0 Demonstrate aircraft weight and balance skills.
04.0 Maintain aircraft fluid lines and fittings.
05.0 Perform aircraft materials and process skills.
06.0 Perform ground operations and servicing duties.
07.0 Perform cleaning and corrosion control operations.
08.0 Demonstrate mathematics skills.
09.0 Maintain forms and records.
10.0 Apply principles of basic physics.
11.0 Demonstrate the use of maintenance publications.
12.0 Interpret mechanic privileges.
13.0 Secure information about the requirements for an AMT in a particular firm.
14.0 Demonstrate the human relations skills necessary for success in supervision.
15.0 Demonstrate knowledge of skills and attitudes the supervisor needs for effective performance.
16.0 Demonstrate a practical approach to job management.
17.0 Demonstrate appropriate communication skills.
18.0 Demonstrate employability skills.
19.0 Demonstrate an understanding of computer skills.

Florida Department of Education
Student Performance Standards

Program Title: **Aviation Mechanic**
CIP Numbers: **0649010408**
Program Length: **12 credit hours**

This certificate program is part of the Aviation Maintenance Management AS degree program (1649010401). At the completion of this program, the student will be able to:		**FAA FAR Part 147**
01.0	Perform basic electricity skills. The student will be able to:	
01.01	Calculate and measure capacitance and inductance.	App. B, A, 1. Level 2
01.02	Calculate and measure electrical power.	App. B, A, 2. Level 2
01.03	Measure voltage, current, resistance, and continuity.	App. B, A, 3. Level 3
01.04	Determine the relationship of voltage, current, and resistance in electrical circuits.	App. B, A, 4. Level 3
01.05	Read and interpret aircraft electrical-circuit diagrams, including solid-state devices and logic functions.	App. B, A, 5. Level 3
01.06	Inspect and service batteries.	App. B, A, 6. Level 3
01.07	Utilize proper electrical safety procedures.	
01.08	Troubleshoot electrical systems.	
02.0	Perform basic aircraft drawing skills. The student will be able to:	
02.01	Use aircraft drawings, symbols, and system schematics.	App. B, B, 7. Level 2
02.02	Draw sketches of repairs and alterations.	App. B, B, 8. Level 3
02.03	Use blueprint information.	App. B, B, 9. Level 3
02.04	Use graphs and charts.	App. B, B, 10. Level 3
03.0	Demonstrate aircraft weight and balance skills. The student will be able to:	
03.01	Properly configure aircraft for weighing and capable of setting up and using weighing equipment.	
03.02	Weigh aircraft.	App. B, C, 11. Level 2
03.03	Perform complete weight-and-balance check and record data.	App. B, C, 12. Level 3
04.0	Maintain aircraft fluid lines and fittings. The student will be able to:	
04.01	Utilize proper personal safety procedures for fluid lines and fittings.	

	04.02 Fabricate and install rigid and flexible fluid lines and fittings.	App. B, D, 13. Level 3
05.0	Perform aircraft materials and processes skills. The student will be able to:	
	05.01 Identify and select appropriate nondestructive testing methods.	App. B, E, 14. Level 1
	05.02 Perform dye penetrant, eddy current, ultrasonic, and magnetic particle inspections.	App. B, E, 15. Level 2
	05.03 Perform basic heat-treating processes.	App. B, E, 16. Level 1
	05.04 Identify and select aircraft hardware and materials.	App. B, E, 17. Level 3
	05.05 Inspect and check welds.	App. B, E, 18. Level 3
	05.06 Perform precision measurements.	App. B, E, 19. Level 3
	05.07 Perform safety wiring techniques.	
06.0	Perform ground operations and servicing duties. The student will be able to:	
	06.01 Start, ground operate, move, service, and secure aircraft and identify typical ground-operations hazards.	App. B, F, 20. Level 2
	06.02 Identify and select fuels.	App. B, F, 21. Level 2
	06.03 Comply with prescribed shop and personal safety procedures.	
07.0	Perform cleaning and corrosion control operations. The student will be able to:	
	07.01 Identify and select cleaning materials.	App. B, G, 22. Level 3
	07.02 Inspect, identify, remove, and treat aircraft corrosion and perform aircraft cleaning.	App. B, G, 23. Level 3
	07.03 Identify and utilize appropriate equipment for cleaning and corrosion control.	
	07.04 Observe appropriate personal safety procedures for corrosive chemicals.	
08.0	Demonstrate mathematical skills. The student will be able to:	
	08.01 Extract roots and raise numbers to a given power.	App. B, H, 24. Level 3
	08.02 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
	08.03 Solve ratio, proportion, and percentage problems.	App. B, H, 26. Level 3
	08.04 Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.	App. B, H, 27. Level 3
	08.05 Solve linear inequalities in one variable and applied problems.	
	08.06 Factor polynomials.	
	08.07 Simplify algebraic fractions, complex fractions and solve rational and literal equations and applied problems.	

	08.08 Determine areas and volumes of various geometrical shapes.	
	08.09 Solve ratio, proportion, and percentage problems.	
	08.10 Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.	
	08.11 Graph linear equations and inequalities in two variables and solve graph systems of linear equations and inequalities in two variables.	
	08.12 Solve and graph quadratic equations and inequalities with real solutions and solve related word problems.	
	08.13 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.	
	08.14 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.	
	08.15 Determine the correct purchase price, to include sales tax, for a materials list containing a minimum of six items.	
	08.16 Demonstrate an understanding of federal, state and local taxes and their computation.	
09.0	Maintain forms and records. The student will be able to:	
	09.01 Write descriptions of work performed including aircraft discrepancies and corrective actions using typical aircraft maintenance records.	App. B, I, 28. Level 3
	09.02 Complete required maintenance forms, records, and inspection reports.	App. B, I, 29. Level 3
10.0	Apply principles of basic physics. The student will be able to:	
	10.01 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
	10.02 Understand molecular action as a result of temperature extremes, chemical reactions, and moisture content.	
	10.03 Draw conclusions or make inferences from data.	
	10.04 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.	
	10.05 Understand pressure measurement in terms of P.S.I., inches of mercury and K.P.A.	
11.0	Demonstrate the use of maintenance publications. The student will be able to:	
	11.01 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
	11.02 Identify the information in Federal Aviation Regulations (FAR) Part 65 pertaining to eligibility for Aviation Maintenance Technician (AMT) certification and ratings.	
	11.03 Identify the FAA requirements that must be satisfied in order to display the FAA Airframe and	

	Powerplant license.	
	11.04 Read technical data.	App. B, K, 32. Level 3
12.0	Interpret mechanic privileges. The student will be able to:	
	12.01 Exercise mechanic privileges within the limitations prescribed by Part 65 of this chapter.	App. B, L, 33. Level 3
13.0	Demonstrate employability skills for an Aviation Maintenance Powerplant Technician (AMT) with an FAA Powerplant rating. The student will be able to:	
	13.01 Conduct a job search for an AMT position.	
	13.02 Secure information about the requirements for an AMT in a particular firm.	
14.0	Demonstrate the human relations skills necessary for success in supervision. The student will be able to:	
	14.01 Exhibit the ability to get along with others.	
	14.02 Discuss the importance of human relations.	
	14.03 Develop and demonstrate the unique human relations skills needed for successful job attainment and progress in supervising others.	
15.0	Demonstrate knowledge of skills and attitudes the supervisor needs for effective performance. The student will be able to:	
	15.01 Describe leadership theory and its complexity.	
	15.02 Discuss how a new supervisor is introduced to leadership responsibilities.	
	15.03 Identify the legal and social environment for supervision.	
	15.04 Discuss pertinent legislation and the role of government intervention.	
	15.05 Describe problems in union and non-union organizations.	
16.0	Demonstrate a practical approach to job management. The student will be able to:	
	16.01 Assume responsibility in planning and coordinating resources.	
	16.02 Demonstrate effective decision making and problem-solving techniques.	
	16.03 Implement methods of work improvement.	
17.0	Demonstrate appropriate communication skills. The student will be able to:	
	17.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.	
	17.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.	
	17.03 Read and follow written and oral instructions.	

	17.04 Answer and ask questions coherently and concisely.	
	17.05 Read critically by recognizing assumptions and implications and by evaluating ideas.	
	17.06 Demonstrate appropriate telephone/communication skills.	
	17.07 Describe the importance of clear and concise writing.	
	17.08 Demonstrate proficiency in the effective use of speech and vocabulary.	
	17.09 Explain the importance of good listening skills.	
	17.10 Discuss the role communication plays in management.	
	17.11 Demonstrate the components of the communication process.	
	17.12 Demonstrate effective written communication skills.	
	17.13 Demonstrate effective oral communication skills.	
	17.14 Write technical reports.	
18.0	Demonstrate employability skills. The student will be able to:	
	18.01 Conduct a job search.	
	18.02 Secure information about a job.	
	18.03 Identify documents which may be required when applying for a job.	
	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 and grooming habits.	
	18.10 Exhibit punctuality, initiative, courtesy, loyalty and honesty.	
	18.11 Demonstrate knowledge of the Federal as recorded in (29 CFR-1910.1200).	
19.0	Demonstrate an understanding of computer skills. The student will be able to:	
	19.01 Demonstrate use of spreadsheets, databases, and word processing.	
	19.02 Demonstrate use of Internet including locating information, copying, and printing web-based information.	
	19.03 Demonstrate general knowledge of computer components.	

19.04 Demonstrate the location and use of antivirus capability.	
19.05 Demonstrate the ability to communicate by e-mail.	

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 as aircraft mechanics. Graduates will be eligible to pursue FAA certification as general mechanics and will be trained to troubleshoot maintenance problems in the aviation industry. This program also provides supplemental training for persons previously or currently employed in this occupation.

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

An important note to consider is that each FAR PART 147 school must be approved by the FAA before any students can be placed in the program.

Required FAA exams include GENERAL written, oral, and practical. The only way a person can get authorization to take these examinations 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.

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.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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: **Aviation Airframe Mechanics**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0649010409
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Aviation Maintenance Management AS degree program (1649010401).

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 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 Maintenance General Technician, and an Aviation Airframe Maintenance Technician.

The content includes but is not limited to the Federal Aviation Regulations (FAR) Part 65 pertaining to eligibility for a mechanic certificate and rating(s). Instruction is designed to qualify students for Federal Aviation Administration (FAA) examinations for aviation maintenance airframe technician certification as prescribed by FAR 147. The program content should also include training in communication, management leadership, human relations, supervisory 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.

Standards

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

01.0 Maintain wood structures.
02.0 Perform aircraft covering.
03.0 Apply aircraft finishes.
04.0 Repair sheet metal structures.
05.0 Perform aircraft welding.
06.0 Perform airframe assembly and rigging.
07.0 Perform airframe inspection.
08.0 Maintain aircraft landing gear systems.
09.0 Maintain hydraulic and pneumatic power systems.
10.0 Maintain cabin atmosphere control systems.
11.0 Maintain aircraft instrument systems.
12.0 Maintain communication and navigation systems.
13.0 Inspect and repair aircraft fuel systems.
14.0 Inspect or repair aircraft electrical systems.
15.0 Inspect and repair position and warning systems.
16.0 Maintain ice and rain control systems.
17.0 Inspect and repair aircraft fire protection systems.
18.0 Secure information about the requirements for an AMT in a particular firm.
19.0 Demonstrate the human relations skills necessary for success in supervision.
20.0 Demonstrate knowledge of skills and attitudes the supervisor needs for effective performance.
21.0 Demonstrate a practical approach to job management.
22.0 Demonstrate appropriate communication skills.
23.0 Demonstrate employability skills.
24.0 Demonstrate an understanding of computer skills.

Florida Department of Education
Student Performance Standards

Program Title: **Aviation Airframe Mechanics**
CIP Numbers: **0649010409**
Program Length: **24 credit hours**

This certificate program is part of the Aviation Maintenance Management AS degree program (1649010401). At the completion of this program, the student will be able to:		FAA FAR Part 147
01.0	Maintain wood structures. The student will be able to:	
01.01	Service and repair wood structures.	App. C, I, A, 1. Level 1
01.02	Identify wood defects.	App. C, I, A, 2. Level 1
01.03	Inspect wood structures.	App. C, I, A, 3. Level 1
02.0	Perform aircraft covering. The student will be able to:	
02.01	Select and apply fabric and fiberglass covering materials.	App. C, I, B, 4. Level 1
02.02	Inspect, test and repair fabric and fiberglass.	App. C, I, B, 5. Level 1
03.0	Apply aircraft finishes. The student will be able to:	
03.01	Apply trim, letters and touch-up paint.	App. C, I, C, 6. Level 1
03.02	Identify and select aircraft finishing materials.	App. C, I, C, 7. Level 2
03.03	Apply finishing materials.	App. C, I, C, 8. Level 2
03.04	Inspect finishes and identify defects.	App. C, I, C, 9. Level 2
03.05	Demonstrate an understanding of common safety practices dealing with paints and solvents.	
04.0	Repair sheet metal structures. The student will be able to:	
04.01	Select, install, and remove special fasteners for metallic, bonded, and composite structures.	App. C, I, D, 10. Level 2
04.02	Inspect bonded structures.	App. C, I, D, 11. Level 2
04.03	Inspect, test, and repair fiberglass, plastics, honeycomb, composite, and laminated primary and secondary structures.	App. C, I, D, 12. Level 2
04.04	Inspect, check, service, and repair windows, doors, and interior furnishings.	App. C, I, D, 13. Level 2
04.05	Inspect and repair sheet-metal structures.	App. C, I, D, 14. Level 3
04.06	Install conventional rivets.	App. C, I, D, 15. Level 3

	04.07 Form, lay out, and bend sheet metal.	App. C, I, D, 16. Level 3
05.0	Perform aircraft welding. The student will be able to:	
	05.01 Weld magnesium and titanium.	App. C, I, E, 17. Level 1
	05.02 Solder stainless steel.	App. C, I, E, 18. Level 1
	05.03 Fabricate tubular structures.	App. C, I, E, 19. Level 1
	05.04 Solder, braze, gas-weld and arc-weld steel.	App. C, I, E, 20. Level 2
	05.05 Weld aluminum and stainless steel.	App. C, I, E, 21. Level 1
06.0	Perform airframe assembly and rigging. The student will be able to:	
	06.01 Rig rotary-wing aircraft.	App. C, I, F, 22. Level 1
	06.02 Rig fixed-wing aircraft.	App. C, I, F, 23. Level 2
	06.03 Check alignment of structures.	App. C, I, F, 24. Level 2
	06.04 Assemble aircraft components, including flight control surfaces.	App. C, I, F, 25. Level 3
	06.05 Balance, rig, and inspect movable primary and secondary flight control surfaces.	App. C, I, F, 26. Level 3
	06.06 Jack aircraft.	App. C, I, F, 27. Level 3
07.0	Perform airframe inspection. The student will be able to:	
	07.01 Perform conformity and airworthiness inspections.	App. C, I, G, 28. Level 3
08.0	Maintain aircraft landing gear systems. The student will be able to:	
	08.01 Inspect, check, service, and repair landing gear, retraction systems, shock struts, bakes, wheels, tires, and steering systems.	App. C, II, A, 29. Level 3
	08.02 Utilize proper safety procedures and equipment when working on aircraft with electrical or hydraulic power on.	
	08.03 Utilize proper safety procedures when working on landing gear struts or wheel and tire assemblies.	
09.0	Maintain hydraulic and pneumatic power systems. The student will be able to:	
	09.01 Repair hydraulic and pneumatic power system components.	App. C, II, B, 30. Level 2
	09.02 Identify and select hydraulic fluids.	App. C, II, B, 31. Level 3
	09.03 Inspect, check, service, troubleshoot, and repair hydraulic and pneumatic power systems.	App. C, II, B, 32. Level 3
10.0	Maintain cabin atmosphere control systems. The student will be able to:	
	10.01 Inspect, check, troubleshoot, service, and repair heating, cooling, air-conditioning, pressurization systems, and air cycle machines.	App. C, II, C 33. Level 1
	10.02 Inspect, check, troubleshoot, service, and repair heating, cooling, air-conditioning, and pressurization	App. C, II, C 34. Level 1

	systems.	
10.03	Inspect, check, troubleshoot, service and repair oxygen systems.	App. C, II, C 35. Level 2
11.0	Maintain aircraft instrument systems. The student will be able to:	
11.01	Inspect, check, service, troubleshoot and repair electronic flight instrument systems and both mechanical and electrical heading, speed, altitude, temperature, pressure, and position indicating systems to include the use of built-in test equipment.	App. C, II, D, 36. Level 1
11.02	Install instruments and perform a static pressure system leak test	App. C, II, D, 37. Level 2
12.0	Maintain communication and navigation systems. The student will be able to:	
12.01	Inspect, check, and troubleshoot autopilot servos and approach coupling systems.	App. C, II, E, 38. Level 1
12.02	Inspect, check, and service aircraft electronic communications and navigation systems, including VHF, ILS, LORAN, Radar beacon transponders, flight management computers, and GPWS.	App. C, II, E, 39. Level 1
12.03	Inspect and repair antenna and electronic equipment installations.	App. C, II, E, 40. Level 2
13.0	Inspect and repair aircraft fuel systems. The student will be able to:	
13.01	Check and service fuel dump systems.	App. C, II, F, 41. Level 1
13.02	Perform fuel management, transfer, and defueling.	App. C, II, F, 42. Level 1
13.03	Inspect, check, and repair pressure fueling systems.	App. C, II, F, 43. Level 1
13.04	Repair aircraft fuel system components.	App. C, II, F, 44. Level 2
13.05	Inspect and repair fluid quantity indicating systems.	App. C, II, F, 45. Level 2
13.06	Troubleshoot, service and repair fluid and temperature warning systems.	App. C, II, F, 46. Level 2
13.07	Inspect, check, service, troubleshoot and repair aircraft fuel systems.	App. C, II, F, 47. Level 3
14.0	Inspect and repair aircraft electrical systems. The student will be able to:	
14.01	Repair and inspect aircraft electrical system components; crimp and splice wiring to manufacturers' specifications; and repair pins and sockets of aircraft connectors.	App. C, II, G, 48. Level 2
14.02	Install, check, and service airframe electrical wiring, controls, switches, indicators, and protective devices.	App. C, II, G, 49. Level 2
14.03	Inspect, check, troubleshoot, service and repair alternating and direct current electrical systems.	App. C, II, G, 50a. Level 3
14.04	Inspect, check, and troubleshoot constant speed and integrated speed drive generators.	App. C, II, G, 50b. Level 1
15.0	Inspect and repair position and warning systems. The student will be able to:	
15.01	Inspect, check, and service speed and configuration warning systems, electrical brake controls, and anti-skid systems.	App. C, II, H, 51. Level 2
15.02	Inspect, check, troubleshoot, and service landing gear position indicating and warning systems.	App. C, II, H, 52. Level 3

16.0	Maintain ice and rain control systems. The student will be able to:	
	16.01 Inspect, check, troubleshoot, service, and repair airframe ice and rain control systems.	App. C, II, I, 53. Level 2
17.0	Inspect and repair aircraft fire protection systems. The student will be able to:	
	17.01 Inspect, check and service smoke and carbon monoxide detection systems.	App. C, II, J, 54. Level 1
	17.02 Inspect, check, service, troubleshoot, and repair aircraft fire detection and extinguishing systems.	App. C, II, J, 55. Level 3
18.0	Demonstrate employability skills for an Aviation Maintenance Powerplant Technician (AMT) with an FAA Powerplant rating. The student will be able to:	
	18.01 Conduct a job search for an AMT position.	
	18.02 Secure information about the requirements for an AMT in a particular firm.	
19.0	Demonstrate the human relations skills necessary for success in supervision. The student will be able to:	
	19.01 Exhibit the ability to get along with others.	
	19.02 Discuss the importance of human relations.	
	19.03 Develop and demonstrate the unique human relations skills needed for successful job attainment and progress in supervising others.	
20.0	Demonstrate knowledge of skills and attitudes the supervisor needs for effective performance. The student will be able to:	
	20.01 Describe leadership theory and its complexity.	
	20.02 Discuss how a new supervisor is introduced to leadership responsibilities.	
	20.03 Identify the legal and social environment for supervision.	
	20.04 Discuss pertinent legislation and the role of government intervention.	
	20.05 Describe problems in union and non-union organizations.	
21.0	Demonstrate a practical approach to job management. The student will be able to:	
	21.01 Assume responsibility in planning and coordinating resources.	
	21.02 Demonstrate effective decision making and problem-solving techniques.	
	21.03 Implement methods of work improvement.	
22.0	Demonstrate appropriate communication skills. The student will be able to:	
	22.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.	
	22.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.	

	22.03 Read and follow written and oral instructions.	
	22.04 Answer and ask questions coherently and concisely.	
	22.05 Read critically by recognizing assumptions and implications and by evaluating ideas.	
	22.06 Demonstrate appropriate telephone/communication skills.	
	22.07 Describe the importance of clear and concise writing.	
	22.08 Demonstrate proficiency in the effective use of speech and vocabulary.	
	22.09 Explain the importance of good listening skills.	
	22.10 Discuss the role communication plays in management.	
	22.11 Demonstrate the components of the communication process.	
	22.12 Demonstrate effective written communication skills.	
	22.13 Demonstrate effective oral communication skills.	
	22.14 Write technical reports.	
23.0	Demonstrate employability skills. The student will be able to:	
	23.01 Conduct a job search.	
	23.02 Secure information about a job.	
	23.03 Identify documents which may be required when applying for a job.	
	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 and grooming habits.	
	23.10 Exhibit punctuality, initiative, courtesy, loyalty, and honesty.	
	23.11 Demonstrate knowledge of the Federal as recorded in (29 CFR-1910.1200).	
24.0	Demonstrate an understanding of computer skills. The student will be able to:	
	24.01 Demonstrate use of spreadsheets, databases, and word processing.	
	24.02 Demonstrate use of Internet including locating information, copying and printing web-based information.	

24.03 Demonstrate general knowledge of computer components.	
24.04 Demonstrate the location and use of antivirus capability.	
24.05 Demonstrate the ability to communicate by e-mail.	

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 as aircraft mechanics. Graduates will be eligible to pursue FAA certification as airframe mechanics and will be trained to troubleshoot maintenance problems in the aviation industry. This program also provides supplemental training for persons previously or currently employed in this occupation.

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

An important note to consider is that each FAR PART 147 school must be approved by the FAA before any students can be placed in the program.

Required FAA exams include GENERAL written, oral, and practical; and AIRFRAME written, oral, and practical. The only way a person can get authorization to take these examinations 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.

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.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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: **Aviation Powerplant Mechanics**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0649010410
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Aviation Maintenance Management AS degree program (1649010401).

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 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 Powerplant 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 Maintenance General Technician, and an Aviation Powerplant Maintenance Technician.

The content includes but is not limited to the Federal Aviation Regulations (FAR) Part 65 pertaining to eligibility for a mechanic certificate and rating(s). Instruction is designed to qualify students for Federal Aviation Administration (FAA) examinations for aviation maintenance powerplant technician certification as prescribed by FAR 147. The program content should also include training in communication, management leadership, human relations, supervisory 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.

Standards

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

01.0 Perform basic reciprocating engine skills.
02.0 Perform basic turbine engine skills.
03.0 Perform engine inspection.
04.0 Maintain engine instrument systems.
05.0 Maintain engine fire protection systems.
06.0 Maintain engine electrical systems.
07.0 Maintain lubrication systems.
08.0 Maintain ignition systems.
09.0 Maintain fuel metering systems.
10.0 Maintain engine fuel systems.
11.0 Maintain induction and engine airflow systems.
12.0 Maintain engine cooling systems.
13.0 Maintain engine exhaust systems.
14.0 Maintain aircraft propellers.
15.0 Maintain unducted fans.
16.0 Maintain auxiliary power units.
17.0 Demonstrate employability skills for an Aviation Maintenance Powerplant Technician (AMT) with an FAA Powerplant rating.
18.0 Demonstrate the human relations skills necessary for success in supervision.
19.0 Demonstrate knowledge of skills and attitudes the supervisor needs for effective performance.
20.0 Demonstrate a practical approach to job management.
21.0 Demonstrate appropriate communication skills.
22.0 Demonstrate employability skills.
23.0 Demonstrate an understanding of computer skills.

Florida Department of Education
Student Performance Standards

Program Title: **Aviation Powerplant Mechanics**
CIP Numbers: **0649010410**
Program Length: **24 credit hours**

This certificate program is part of the Aviation Maintenance Management AS degree program (1649010401). At the completion of this program, the student will be able to:		**FAA FAR Part 147**
01.0	Perform basic reciprocating engine skills. The student will be able to:	
01.01	Inspect and repair a radial engine.	App. D, I, A, 1. Level 1
01.02	Overhaul reciprocating engine.	App. D, I, A, 2. Level 2
01.03	Inspect, check, service, and repair reciprocating engines and engine installations.	App. D, I, A, 3. Level 3
01.04	Install, troubleshoot, and remove reciprocating engines.	App. D, I, A, 4. Level 3
02.0	Perform basic turbine engine skills. The student will be able to:	
02.01	Overhaul turbine engine.	App. D, I, B, 5. Level 2
02.02	Inspect, check, service, and repair turbine engines and turbine engine installations.	App. D, I, B, 6. Level 3
02.03	Install, troubleshoot, and remove turbine engines.	App. D, I, B, 7. Level 3
03.0	Perform engine inspection. The student will be able to:	
03.01	Perform powerplant conformity and air worthiness inspections.	App. D, I, C, 8. Level 3
04.0	Maintain engine instrument systems. The student will be able to:	
04.01	Troubleshoot, service, and repair electrical and mechanical fluid rate-of-flow indicating systems.	App. D, II, A, 9. Level 2
04.02	Inspect, check, service, troubleshoot, and repair electrical and mechanical engine temperature, pressure, and revolutions per minute (rpm) indicating systems.	App. D, II, A, 10. Level 2
05.0	Maintain engine fire protection systems. The student will be able to:	
05.01	Inspect, check service, troubleshoot, and repair engine fire detection and extinguishing systems.	App. D, II, B, 11. Level 3
06.0	Maintain engine electrical systems. The student will be able to:	
06.01	Repair engine electrical system components.	App. D, II, C, 12. Level 2
06.02	Install, check and service engine electrical wiring, controls, indicators, and protective devices.	App. D, II, C, 13. Level 3
07.0	Maintain lubrication systems. The student will be able to:	

	07.01 Identify and select lubricants.	App. D, II, D, 14. Level 2
	07.02 Repair engine lubrication system components.	App. D, II, D, 15. Level 2
	07.03 Inspect, check, service, troubleshoot, and repair engine lubrication system.	App. D, II, D, 16. Level 3
08.0	Maintain ignition systems. The student will be able to:	
	08.01 Overhaul magneto and ignition harness.	App. D, II, E, 17. Level 2
	08.02 Inspect, service, troubleshoot, and repair reciprocating and turbine engine ignition systems and components.	App. D, II, E, 18. Level 2
	08.03 Inspect, service, troubleshoot, and repair turbine engine electrical starting systems.	App. D, II, E, 19a. Level 3
	08.04 Inspect, service, and troubleshoot turbine engine pneumatic starting systems.	
09.0	Maintain fuel metering systems. The student will be able to:	
	09.01 Troubleshoot and adjust turbine engine fuel metering systems and electronic engine fuel controls.	App. D, II, F, 20. Level 1
	09.02 Overhaul carburetor.	App. D, II, F, 21. Level 1
	09.03 Repair engine fuel metering system components.	App. D, II, F, 22. Level 2
	09.04 Inspect, check, troubleshoot, and repair reciprocating and turbine engine fuel metering systems.	App. D, II, F, 23. Level 3
10.0	Maintain engine fuel systems. The student will be able to:	
	10.01 Repair engine fuel system components.	App. D, II, G, 24. Level 2
	10.02 Inspect, check, service, troubleshoot, and repair engine fuel systems.	App. D, II, G, 25. Level 3
11.0	Maintain induction and engine airflow systems. The student will be able to:	
	11.01 Inspect, check, troubleshoot, service and repair engine ice and rain control systems.	App. D, II, H, 26. Level 2
	11.02 Inspect, check, service, troubleshoot and repair heat exchangers, superchargers and turbine engine airflow and temperature control systems.	App. D, II, H, 27. Level 1
	11.03 Inspect, check, service, and repair carburetor air intake and induction manifolds.	App. D, II, H, 28. Level 3
12.0	Maintain engine cooling systems. The student will be able to:	
	12.01 Repair engine cooling system components.	App. D, II, I, 29. Level 2
	12.02 Inspect, check, troubleshoot, service and repair engine cooling systems.	App. D, II, I, 30. Level 3
13.0	Maintain engine exhaust systems. The student will be able to:	
	13.01 Repair engine exhaust system components.	App. D, II, J, 31. Level 2
	13.02 Inspect, check, troubleshoot, service and repair engine exhaust systems.	App. D, II, J, 32a. Level 3
	13.03 Troubleshoot and repair engine thrust reverser systems and related components.	App. D, II, J, 32b. Level 1

14.0	Maintain aircraft propellers. The student will be able to:	
	14.01 Inspect, check, service and repair propeller synchronizing and ice control systems.	App. D, II, K, 33. Level 1
	14.02 Identify and select propeller lubricants.	App. D, II, K, 34. Level 2
	14.03 Balance propellers.	App. D, II, K, 35. Level 1
	14.04 Repair propeller control system components.	App. D, II, K, 36. Level 2
	14.05 Inspect, check, service, and repair fixed-pitch, constant-speed, and feathering propellers, and propeller governing systems.	App. D, II, K, 37. Level 3
	14.06 Install, troubleshoot, and remove propellers.	App. D, II, K, 38. Level 3
	14.07 Repair aluminum alloy propeller blades.	App. D, II, K, 39. Level 3
15.0	Maintain unducted fans. The student will be able to:	
	15.01 Inspect and troubleshoot unducted fan systems and components.	App. D, II, L, 40. Level 1
16.0	Maintain auxiliary power units. The student will be able to:	
	16.01 Inspect, check, service, and troubleshoot turbine-driven auxiliary power units.	
17.0	Demonstrate employability skills for an Aviation Maintenance Powerplant Technician (AMT) with an FAA Powerplant rating. The student will be able to:	
	17.01 Conduct a job search for an AMT position.	
	17.02 Secure information about the requirements for an AMT in a particular firm.	
18.0	Demonstrate the human relations skills necessary for success in supervision. The student will be able to:	
	18.01 Exhibit the ability to get along with others.	
	18.02 Discuss the importance of human relations.	
	18.03 Develop and demonstrate the unique human relations skills needed for successful job attainment and progress in supervising others.	
19.0	Demonstrate knowledge of skills and attitudes the supervisor needs for effective performance. The student will be able to:	
	19.01 Describe leadership theory and its complexity.	
	19.02 Discuss how a new supervisor is introduced to leadership responsibilities.	
	19.03 Identify the legal and social environment for supervision.	
	19.04 Discuss pertinent legislation and the role of government intervention.	
	19.05 Describe problems in union and non-union organizations.	
20.0	Demonstrate a practical approach to job management. The student will be able to:	

	20.01 Assume responsibility in planning and coordinating resources.	
	20.02 Demonstrate effective decision making and problem-solving techniques.	
	20.03 Implement methods of work improvement.	
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 Read and follow written and oral instructions.	
	21.04 Answer and ask questions coherently and concisely.	
	21.05 Read critically by recognizing assumptions and implications and by evaluating ideas.	
	21.06 Demonstrate appropriate telephone/communication skills.	
	21.07 Describe the importance of clear and concise writing.	
	21.08 Demonstrate proficiency in the effective use of speech and vocabulary.	
	21.09 Explain the importance of good listening skills.	
	21.10 Discuss the role communication plays in management.	
	21.11 Demonstrate the components of the communication process.	
	21.12 Demonstrate effective written communication skills.	
	21.13 Demonstrate effective oral communication skills.	
	21.14 Write technical reports.	
22.0	Demonstrate employability skills. The student will be able to:	
	22.01 Conduct a job search.	
	22.02 Secure information about a job.	
	22.03 Identify documents which may be required when applying for a job.	
	22.04 Complete a job application form correctly.	
	22.05 Demonstrate competence in job interview techniques.	
	22.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.	
	22.07 Identify acceptable work habits.	

	22.08 Demonstrate knowledge of how to make appropriate job changes.	
	22.09 Demonstrate acceptable employee health and grooming habits.	
	22.10 Exhibit punctuality, initiative, courtesy, loyalty and honesty.	
	22.11 Demonstrate knowledge of the Federal as recorded in (29 CFR-1910.1200).	
23.0	Demonstrate an understanding of computer skills. The student will be able to:	
	23.01 Demonstrate use of spreadsheets, databases and word processing.	
	23.02 Demonstrate use of Internet including locating information, copying and printing web-based information.	
	23.03 Demonstrate general knowledge of computer components.	
	23.04 Demonstrate the location and use of antivirus capability.	
	23.05 Demonstrate the ability to communicate by e-mail.	

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 as aircraft mechanics. Graduates will be eligible to pursue FAA certification as powerplant mechanics and will be trained to troubleshoot maintenance problems in the aviation industry. This program also provides supplemental training for persons previously or currently employed in this occupation.

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

An important note to consider is that each FAR PART 147 school must be approved by the FAA before any students can be placed in the program.

Required FAA exams include GENERAL written, oral, and practical; and POWERPLANT written, oral, and practical. The only way a person can get authorization to take these examinations 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.

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.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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: **Airline Maintenance Procedures and Records Management**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0649010411
Program Type	College Credit Certificate (CCC)
Program Length	18 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Aviation Maintenance Management AS degree program (1649010401).

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 organize, review, and classify aircraft records to comply with FAA regulations, as well as successfully manage records at aircraft manufacturers, airlines, and maintenance repair operators. The program content should promote a wide range of classroom and hands-on training that will provide the student with the knowledge to successfully manage the aircraft records department in an aviation company. The program content should also include training in communication, management leadership, human relations, supervisory 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 18 credit hours.

Standards

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

01.0 Perform aircraft materials and process skills.
02.0 Maintain forms and records.
03.0 Demonstrate the use of maintenance publications.
04.0 Interpret mechanic privileges.
05.0 Perform engine inspection.
06.0 Perform airframe inspection.
07.0 Inspect and repair aircraft fuel systems.
08.0 Inspect or repair aircraft electrical systems.
09.0 Inspect and repair position and warning systems.
10.0 Inspect and repair aircraft fire protection systems.
11.0 Demonstrate employability skills for an Aviation Maintenance Powerplant Technician (AMT) with an FAA Powerplant rating.
12.0 Demonstrate the human relations skills necessary for success in supervision.
13.0 Demonstrate knowledge of skills and attitudes the supervisor needs for effective performance.
14.0 Demonstrate a practical approach to job management.
15.0 Demonstrate appropriate communication skills.
16.0 Demonstrate employability skills.
17.0 Demonstrate an understanding of computer skills.

Florida Department of Education
Student Performance Standards

Program Title: **Airline Maintenance Procedures and Records Management**
CIP Numbers: **0649010411**
Program Length: **18 credit hours**

This certificate program is part of the Aviation Maintenance Management AS degree program (1649010401). At the completion of this program, the student will be able to:		**FAA FAR Part 147**
01.0	Perform aircraft materials and processes skills. The student will be able to:	
01.01	Identify and select appropriate nondestructive testing methods.	App. B, E, 14. Level 1
01.02	Perform dye penetrant, eddy current, ultrasonic, and magnetic particle inspections.	App. B, E, 15. Level 2
01.03	Perform basic heat-treating processes.	App. B, E, 16. Level 1
01.04	Identify and select aircraft hardware and materials.	App. B, E, 17. Level 3
01.05	Inspect and check welds.	App. B, E, 18. Level 3
01.06	Perform precision measurements.	App. B, E, 19. Level 3
01.07	Perform safety wiring techniques.	
02.0	Maintain forms and records. The student will be able to:	
02.01	Write descriptions of work performed including aircraft discrepancies and corrective actions using typical aircraft maintenance records.	App. B, I, 28. Level 3
02.02	Complete required maintenance forms, records, and inspection reports.	App. B, I, 29. Level 3
03.0	Demonstrate the use of maintenance publications. The student will be able to:	
03.01	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
03.02	Identify the information in Federal Aviation Regulations (FAR) Part 65 pertaining to eligibility for Aviation Maintenance Technician (AMT) certification and ratings.	
03.03	Identify the FAA requirements that must be satisfied in order to display the FAA Airframe and Powerplant license.	
03.04	Read technical data.	App. B, K, 32. Level 3
04.0	Interpret mechanic privileges. The student will be able to:	
04.01	Exercise mechanic privileges within the limitations prescribed by Part 65 of this chapter.	App. B, L, 33. Level 3

05.0	Perform engine inspection. The student will be able to:	
	05.01 Perform powerplant conformity and air worthiness inspections.	App. D, I, C, 8. Level 3
06.0	Perform airframe inspection. The student will be able to:	
	06.01 Perform conformity and airworthiness inspections.	App. C, I, G, 28. Level 3
07.0	Inspect and repair aircraft fuel systems. The student will be able to:	
	07.01 Check and service fuel dump systems.	App. C, II, F, 41. Level 1
	07.02 Perform fuel management, transfer, and defueling.	App. C, II, F, 42. Level 1
	07.03 Inspect, check and repair pressure fueling systems.	App. C, II, F, 43. Level 1
	07.04 Repair aircraft fuel system components.	App. C, II, F, 44. Level 2
	07.05 Inspect and repair fluid quantity indicating systems.	App. C, II, F, 45. Level 2
	07.06 Troubleshoot, service and repair fluid and temperature warning systems.	App. C, II, F, 46. Level 2
	07.07 Inspect, check, service, troubleshoot and repair aircraft fuel systems.	App. C, II, F, 47. Level 3
08.0	Inspect and repair aircraft electrical systems. The student will be able to:	
	08.01 Repair and inspect aircraft electrical system components; crimp and splice wiring to manufacturers' specifications; and repair pins and sockets of aircraft connectors.	App. C, II, G, 48. Level 2
	08.02 Install, check, and service airframe electrical wiring, controls, switches, indicators, and protective devices.	App. C, II, G, 49. Level 2
	08.03 Inspect, check, troubleshoot, service and repair alternating and direct current electrical systems.	App. C, II, G, 50a. Level 3
	08.04 Inspect, check, and troubleshoot constant speed and integrated speed drive generators.	App. C, II, G, 50b. Level 1
09.0	Inspect and repair position and warning systems. The student will be able to:	
	09.01 Inspect, check, and service speed and configuration warning systems, electrical brake controls, and anti-skid systems.	App. C, II, H, 51. Level 2
	09.02 Inspect, check, troubleshoot, and service landing gear position indicating and warning systems.	App. C, II, H, 52. Level 3
10.0	Inspect and repair aircraft fire protection systems. The student will be able to:	
	10.01 Inspect, check and service smoke and carbon monoxide detection systems.	App. C, II, J, 54. Level 1
	10.02 Inspect, check, service, troubleshoot, and repair aircraft fire detection and extinguishing systems.	App. C, II, J, 55. Level 3
11.0	Demonstrate employability skills for an Aviation Maintenance Powerplant Technician (AMT) with an FAA Powerplant rating. The student will be able to:	
	11.01 Conduct a job search for an AMT position.	
	11.02 Secure information about the requirements for an AMT in a particular firm.	

12.0	Demonstrate the human relations skills necessary for success in supervision. The student will be able to:	
	12.01 Exhibit the ability to get along with others.	
	12.02 Discuss the importance of human relations.	
	12.03 Develop and demonstrate the unique human relations skills needed for successful job attainment and progress in supervising others.	
13.0	Demonstrate knowledge of skills and attitudes the supervisor needs for effective performance. The student will be able to:	
	13.01 Describe leadership theory and its complexity.	
	13.02 Discuss how a new supervisor is introduced to leadership responsibilities.	
	13.03 Identify the legal and social environment for supervision.	
	13.04 Discuss pertinent legislation and the role of government intervention.	
	13.05 Describe problems in union and non-union organizations.	
14.0	Demonstrate a practical approach to job management. The student will be able to:	
	14.01 Assume responsibility in planning and coordinating resources.	
	14.02 Demonstrate effective decision making and problem-solving techniques.	
	14.03 Implement methods of work improvement.	
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.	
	15.07 Describe the importance of clear and concise writing.	
	15.08 Demonstrate proficiency in the effective use of speech and vocabulary.	
	15.09 Explain the importance of good listening skills.	
	15.10 Discuss the role communication plays in management.	
	15.11 Demonstrate the components of the communication process.	

	15.12 Demonstrate effective written communication skills.	
	15.13 Demonstrate effective oral communication skills.	
	15.14 Write technical reports.	
16.0	Demonstrate employability skills. The student will be able to:	
	16.01 Conduct a job search.	
	16.02 Secure information about a job.	
	16.03 Identify documents which may be required when applying for a job.	
	16.04 Complete a job application form correctly.	
	16.05 Demonstrate competence in job interview techniques.	
	16.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.	
	16.07 Identify acceptable work habits.	
	16.08 Demonstrate knowledge of how to make appropriate job changes.	
	16.09 Demonstrate acceptable employee health and grooming habits.	
	16.10 Exhibit punctuality, initiative, courtesy, loyalty, and honesty.	
	16.11 Demonstrate knowledge of the Federal as recorded in (29 CFR-1910.1200).	
17.0	Demonstrate an understanding of computer skills. The student will be able to:	
	17.01 Demonstrate use of spreadsheets, databases, and word processing.	
	17.02 Demonstrate use of Internet including locating information, copying, and printing web-based information.	
	17.03 Demonstrate general knowledge of computer components.	
	17.04 Demonstrate the location and use of antivirus capability.	
	17.05 Demonstrate the ability to communicate by e-mail.	

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 as aircraft mechanics. Graduates will be eligible to pursue FAA certification as airframe mechanics and will be trained to troubleshoot maintenance problems in the aviation industry. This program also provides supplemental training for persons previously or currently employed in this occupation.

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

An important note to consider is that each FAR PART 147 school must be approved by the FAA before any students can be placed in the program.

Required FAA exams include GENERAL written, oral, and practical; and AIRFRAME written, oral, and practical. The only way a person can get authorization to take these examinations 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.

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.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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: **International Freight Transportation**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0652020302
Program Type	College Credit Certificate (CCC)
Program Length	15 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Transportation and Logistics AS degree program (1652020301).

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 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 related business, accounting, and financial practices such as standard policies and operating procedures, negotiation techniques, planning, organizing, purchasing and inventory control theory.

The purpose of this program is to prepare students for initial employment with an occupational title or to provide supplemental training for persons previously or currently employed in these occupations with cross-functional skills necessary for planning, and operations of transportation systems and the flow and distribution of goods and people.

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 an understanding of the basic concepts and terms used in transportation and logistics.
02.0 Demonstrate an understanding of the transportation and logistics regulatory environment.
03.0 Identify risks and safety and security measures in transportation and logistics.
04.0 Demonstrate the ability to use technology as it relates to transportation and logistics.
05.0 Demonstrate knowledge of documentation (domestic, international, and customs) related to transportation and logistics.
06.0 Demonstrate the ability to manipulate quantitative data including international weights and measures, as it relates to the movement of goods.
07.0 Demonstrate an understanding of reverse logistics.
08.0 Demonstrate knowledge of border security.
09.0 Demonstrate knowledge of procurement, contracts, and contract administration as it applies to transportation and logistics.
10.0 Demonstrate knowledge of geography, culture, customs, and language in international trade.
11.0 Demonstrate knowledge of pricing as it relates to shipping methods.
12.0 Demonstrate knowledge of the air, sea, truck, and rail operations in the movement of freight.
13.0 Distinguish the difference between domestic and international freight movements.

Florida Department of Education
Student Performance Standards

Program Title: **International Freight Transportation**
CIP Numbers: **0652020302**
Program Length: **15 credit hours**

This certificate program is part of the Transportation and Logistics AS degree program (1652020301). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of the basic concepts and terms used in transportation and logistics. The student will be able to:
01.01	Compare various shipping options.
01.02	Analyze types of goods and products and impact on logistics.
01.03	Identify the characteristics of a full-service transportation organization.
01.04	Demonstrate an understanding of intermodalism.
01.05	Demonstrate knowledge of mode-specific logistics.
01.06	Demonstrate knowledge of Incoterms versus Uniform Commercial Code (UCC).
01.07	Demonstrate knowledge of how goods move through freight forwarder and customs broker.
01.08	Demonstrate knowledge of inventory and warehousing concepts.
01.09	Explain the relevance of Just-in-Time (JIT) logistics.
01.10	Demonstrate knowledge of shipment process for perishables.
01.11	Demonstrate knowledge of packaging and labeling requirements.
01.12	Demonstrate knowledge of the advantages and disadvantages of combining given modes of transportation air/sea/land).
01.13	Identify the various governmental regulatory agencies by their names and initials.
01.14	Demonstrate the ability to read, write, and conduct a conversation using common terms of freight movement by transportation mode.
02.0	Demonstrate an understanding of the transportation and logistics regulatory environment. The student will be able to:
02.01	Demonstrate knowledge of the “alphabet soup” of regulatory agencies.
02.02	Identify which agency(ies) have jurisdiction over a given transportation system.
02.03	Demonstrate knowledge of DOT regulations.
02.04	Identify who has regulatory authority over a given project.

	02.05 Identify regulatory requirements.
	02.06 Identify permits needed for a given project.
	02.07 Identify consequences of violations of regulatory requirements.
	02.08 Identify policy issues and political factors in a regulatory environment.
	02.09 Demonstrate skill in regulatory research.
	02.10 Demonstrate knowledge of labor laws.
03.0	Identify risks and safety and security measures in transportation and logistics. The student will be able to:
	03.01 Establish an emergency management plan.
	03.02 Identify the need for security background check requirements.
	03.03 Demonstrate knowledge of OSHA and all agencies involved in the movement of goods including Customs and Border Protection, Transportation and Security Administration, U.S. Department of Agriculture.
	03.04 Demonstrate knowledge of the impact of technology on countering threats to transportation systems and border security.
	03.05 Identify differences in dealing with security threats for passenger versus freight/cargo transportation systems including the impact on supply chain logistics.
	03.06 Outline the primary federal, state, and local agencies in the U.S. that are affiliated with border security and transportation security.
	03.07 Identify the ethical parameters in which border security agencies operate.
	03.08 Identify the difference in safety and security threats as they relate to rail, seaport, trucking, and aviation.
	03.09 Identify the cost/benefit analysis of various safety and security measures.
	03.10 Implement a schedule.
	03.11 Analyze system performance.
	03.12 Develop process maps.
	03.13 Develop knowledge of process analysis.
04.0	Demonstrate the ability to use technology as it relates to transportation and logistics. The student will be able to:
	04.01 Demonstrate the ability to use spreadsheet, word processing, and presentation software.
	04.02 Demonstrate the ability to use scheduling/planning software.
	04.03 Identify the electronic systems used in a modern transportation system.
	04.04 Utilize Internet resources.
	04.05 Demonstrate ability to use logistics software for bookings, shipments, consolidations, and shipment verifications.
05.0	Demonstrate knowledge of documentation (domestic, international, and customs) related to transportation and logistics. The student will

	be able to:
	05.01 Identify basic documents used in freight forwarding and customs brokering.
	05.02 Prepare an airway bill.
	05.03 Demonstrate knowledge of letters of credit.
	05.04 Identify components of a bill of lading.
06.0	Demonstrate the ability to manipulate quantitative data including international weights and measures, as it relates to the movement of goods. The student will be able to:
	06.01 Convert standard weights and measures to metric and vice versa.
	06.02 Conduct currency exchange calculations.
	06.03 Demonstrate skill in practical math for transportation.
	06.04 Develop quantitative methods for assessing transportation loads.
07.0	Demonstrate an understanding of reverse logistics. The student will be able to:
	07.01 Assess the nature and scope of reverse logistics.
	07.02 Explain the waste management process.
08.0	Demonstrate knowledge of border security. The student will be able to:
	08.01 Identify the various agencies affiliated with border security.
	08.02 Construct a historical timeline reflecting significant transportation-related terrorist threats and events involving border security.
	08.03 Demonstrate an understanding of the social and cultural issues involved in border security.
	08.04 Classify the roles, functions, and interdependency between local, federal, and international law enforcement and military agencies to foster border security.
09.0	Demonstrate knowledge of procurement, contracts, and contract administration as it applies to transportation and logistics. The student will be able to:
	09.01 Identify the basic components of a contract.
	09.02 Identify the difference between “void” and “voidable” contracts.
	09.03 Demonstrate an understanding of the importance of being in compliance with the terms of a contract.
	09.04 Determine appropriate methods of procurement.
	09.05 Explain competitive bids, quotations, and proposals.
	09.06 Evaluate competitive bids to determine the best offer.
	09.07 Manage contracts and purchase orders from award to completion.

	09.08 Resolve contract and/or purchase order differences with suppliers.
	09.09 Explain payment problems with suppliers and user departments.
	09.10 Discuss the scope of compliance requirements.
	09.11 Conduct a negotiation.
10.0	Demonstrate knowledge of geography, culture, customs, and language in international trade. The student will be able to:
	10.01 Demonstrate an understanding of world geography.
	10.02 Demonstrate knowledge of various cultural customs as it relates to conducting business.
	10.03 Abstain from the use of idioms when dealing with foreign customers and colleagues.
	10.04 Demonstrate knowledge of time and date differences in international trade.
	10.05 Identify customer service techniques that account for cultural differences when working with international clients.
11.0	Demonstrate knowledge of pricing as it relates to shipping methods. The student will be able to:
	11.01 Identify the importance of time in a given shipment.
	11.02 Identify issues such as perishability, weight, fragility, and packing method.
	11.03 Identify best combination of shipping methods given knowledge of product and customer's requirements.
	11.04 Describe pricing strategies.
12.0	Demonstrate knowledge of the air, sea, truck and rail operations for the movement of freight. The student will be able to:
	12.01 Describe the knowledge of the organizational structure for each mode of transportation relative to the movement of freight.
	12.02 Describe the basic function of each mode.
	12.03 Identify the important markets for each mode.
	12.04 Identify the major companies in each mode.
	12.05 Compare the various key specializations within an intermodal cargo operation.
13.0	Distinguish the difference between domestic and international freight movements. The student will be able to:
	13.01 Describe how legal standards vary.
	13.02 Describe how safety rules vary.
	13.03 Distinguish the cultural, political, and geographic effects on the international cargo operations.
	13.04 Describe the use of a foreign (free) trade zone its advantages.

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 co-curricular 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: **Intermodal Freight Transportation**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0652020303
Program Type	College Credit Certificate (CCC)
Program Length	18 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Transportation and Logistics AS degree program (1652020301).

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 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 related business, accounting, and financial practices such as standard policies and operating procedures, negotiation techniques, planning, organizing, purchasing and inventory control theory.

The purpose of this program is to prepare students for initial employment with an occupational title or to provide supplemental training for persons previously or currently employed in these occupations with cross-functional skills necessary for planning, and operations of transportation systems and the flow and distribution of goods.

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 an understanding of the basic concepts and terms used in transportation and logistics.
02.0 Demonstrate an understanding of the transportation and logistics regulatory environment.
03.0 Identify risks and safety and security measures in transportation and logistics.
04.0 Demonstrate the ability to use technology as it relates to transportation and logistics.
05.0 Demonstrate knowledge of contemporary issues in transportation and logistics.
06.0 Demonstrate knowledge of documentation (domestic, international, and customs) related to transportation and logistics.
07.0 Demonstrate an understanding of reverse logistics.
08.0 Demonstrate knowledge of border security.
09.0 Identify characteristics and benefits of intermodal transportation.
10.0 Demonstrate knowledge of the air, sea, truck, and rail operations in the movement of freight.
11.0 Describe the various control processes in freight movement.
12.0 Demonstrate knowledge of the Port freight operations.
13.0 Demonstrate knowledge of rail freight operations.
14.0 Demonstrate knowledge of trucking operations.
15.0 Demonstrate knowledge of air cargo operations.

Florida Department of Education
Student Performance Standards

Program Title: **Intermodal Freight Transportation**
CIP Numbers: **0652020303**
Program Length: **18 credit hours**

This certificate program is part of the Transportation and Logistics AS degree program (1652020301). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of the basic concepts and terms used in transportation and logistics. The student will be able to:
01.01	Compare various shipping options.
01.02	Analyze types of goods and products and impact on logistics.
01.03	Identify the characteristics of a full-service transportation organization.
01.04	Demonstrate an understanding of intermodalism.
01.05	Demonstrate knowledge of mode-specific logistics.
01.06	Demonstrate knowledge of Incoterms versus Uniform Commercial Code (UCC).
01.07	Demonstrate knowledge of how goods move through freight forwarder and customs broker.
01.08	Demonstrate knowledge of inventory and warehousing concepts.
01.09	Explain the relevance of Just-in-Time (JIT) logistics.
01.10	Demonstrate knowledge of shipment process for perishables.
01.11	Demonstrate knowledge of packaging and labeling requirements.
01.12	Demonstrate knowledge of the advantages and disadvantages of combining given modes of transportation air/sea/land).
01.13	Identify the various governmental regulatory agencies by their names and initials.
01.14	Demonstrate the ability to read, write, and conduct a conversation using common terms of freight movement by transportation mode.
02.0	Demonstrate an understanding of the transportation and logistics regulatory environment. The student will be able to:
02.01	Demonstrate knowledge of the “alphabet soup” of regulatory agencies.
02.02	Identify which agency/agencies have jurisdiction over a given transportation system.
02.03	Demonstrate knowledge of DOT regulations.
02.04	Identify who has regulatory authority over a given project.

	02.05 Identify regulatory requirements.
	02.06 Identify permits needed for a given project.
	02.07 Identify consequences of violations of regulatory requirements.
	02.08 Identify policy issues and political factors in a regulatory environment.
	02.09 Demonstrate skill in regulatory research.
	02.10 Demonstrate knowledge of labor laws.
03.0	Identify risks and safety and security measures in transportation and logistics. The student will be able to:
	03.01 Establish an emergency management plan.
	03.02 Identify the need for security background check requirements.
	03.03 Demonstrate knowledge of OSHA and all agencies involved in the movement of goods including Customs and Border Protection, Transportation and Security Administration, U.S. Department of Agriculture.
	03.04 Demonstrate knowledge of the impact of technology on countering threats to transportation systems and border security.
	03.05 Identify differences in dealing with security threats for passenger versus freight/cargo transportation systems including the impact on supply chain logistics.
	03.06 Outline the primary federal, state, and local agencies in the U.S. that are affiliated with border security and transportation security.
	03.07 Identify the ethical parameters in which border security agencies operate.
	03.08 Identify the difference in safety and security threats as they relate to rail, seaport, trucking, and aviation.
	03.09 Identify the cost/benefit analysis of various safety and security measures.
	03.10 Implement a schedule.
	03.11 Analyze system performance.
	03.12 Develop process maps.
	03.13 Develop knowledge of process analysis.
04.0	Demonstrate the ability to use technology as it relates to transportation and logistics. The student will be able to:
	04.01 Demonstrate the ability to use spreadsheet, word processing, and presentation software.
	04.02 Demonstrate the ability to use scheduling/planning software.
	04.03 Identify the electronic systems used in a modern transportation system.
	04.04 Utilize Internet resources.
	04.05 Demonstrate ability to use logistics software for bookings, shipments, consolidations, and shipment verifications.
05.0	Demonstrate knowledge of contemporary issues in transportation and logistics. The student will be able to:

	05.01 Identify the factors that influence changes in costs among the various modes of transportation.
	05.02 Demonstrate an understanding of current trends in containerized shipping.
	05.03 Identify current security issues among the various modes of transportation.
	05.04 Demonstrate knowledge of the effect of current technology on intermodal transportation systems.
	05.05 Describe the pros and cons of free trade agreements.
	05.06 Describe “push” versus “pull” logistics.
	05.07 Demonstrate knowledge of current trends in currency exchange rates.
	05.08 Demonstrate knowledge of advantages and disadvantages of logistics centers, intermodal container transfer facilities and intermodal rail yards.
06.0	Demonstrate knowledge of documentation (domestic, international, and customs) related to transportation and logistics. The student will be able to:
	06.01 Identify basic documents used in freight forwarding and customs brokering.
	06.02 Prepare an airway bill.
	06.03 Demonstrate knowledge of letters of credit.
	06.04 Identify components of a bill of lading.
07.0	Demonstrate an understanding of reverse logistics. The student will be able to:
	07.01 Assess the nature and scope of reverse logistics.
	07.02 Explain the waste management process.
08.0	Demonstrate knowledge of border security. The student will be able to:
	08.01 Identify the various agencies affiliated with border security.
	08.02 Construct a historical timeline reflecting significant transportation-related terrorist threats and events involving border security.
	08.03 Demonstrate an understanding of the social and cultural issues involved in border security.
	08.04 Classify the roles, functions, and interdependency between local, federal, and international law enforcement and military agencies to foster border security.
09.0	Identify characteristics and benefits of intermodal transportation. The student will be able to:
	09.01 Compare various shipping options.
	09.02 Analyze types of goods and products and impact on logistics.
	09.03 Identify the characteristics of a full-service transportation organization.
	09.04 Demonstrate knowledge of mode-specific logistics.

	09.05 Demonstrate knowledge of contemporary issues in intermodal transportation.
	09.06 Demonstrate knowledge of Incoterms versus Uniform Commercial Codes (UCC).
	09.07 Demonstrate knowledge of how goods move through freight forwarder and customs broker.
	09.08 Demonstrate knowledge of warehousing.
	09.09 Demonstrate knowledge of packaging and labeling requirements.
	09.10 Demonstrate knowledge of the advantages and disadvantages of combining given modes of transportation (air/sea/truck/rail).
10.0	Demonstrate knowledge of the air, sea, truck and rail operations for the movement of freight. The student will be able to:
	10.01 Describe the knowledge of the organizational structure for each mode of transportation relative to the movement of freight.
	10.02 Describe the basic function of each mode.
	10.03 Identify the important markets for each mode.
	10.04 Identify the major companies in each mode.
	10.05 Compare the various key specializations within an intermodal cargo operation.
11.0	Describe the various control processes in freight movement. The student will be able to:
	11.01 Demonstrate knowledge of budgeting and auditing.
	11.02 Demonstrate knowledge of quality measurements such as on-time performance.
	11.03 Demonstrate knowledge of customer complaints and quality issues.
12.0	Demonstrate knowledge of the Port freight operations. The student will be able to:
	12.01 Describe the different types of Ports including seaports, waterway ports and inland ports.
	12.02 Identify the types of water-borne and inland freight and the types of cargo documentation required.
	12.03 Describe Port facilities for processing domestic and international cargo.
	12.04 Describe the types and functions of intermodal facilities at a Port.
	12.05 Describe the typical organizational structure of a Port and its operations.
	12.06 Define the role and impact of government and other regulatory agencies in this industry.
	12.07 Define various terms and abbreviations used in Port freight operations.
	12.08 Identify the types of hazardous materials moved through Ports and the rules governing this type of shipment.
	12.09 Describe process for movement of perishable goods.
13.0	Demonstrate knowledge of rail freight operations. The student will be able to:

13.01	Demonstrate knowledge of scheduling shipments and documentation procedures required.
13.02	Identify the railroad companies serving the state and what areas their lines serve.
13.03	Describe the function of intermodal rail yards, on-Port rail facilities, and intermodal container facilities.
13.04	Identify the types of cargo moved by rail and the types of documentation required.
13.05	Identify the types of hazardous materials moved by rail and the rules governing this type of shipment.
13.06	Describe the role of rail at logistics centers.
13.07	Describe the typical organizations structure of a railroad company and its operations.
13.08	Describe the role and impact of government and other regulatory agencies in the rail industry.
13.09	Define various terms and abbreviations used in the rail industry.
13.10	Describe process for movement of perishable goods.
14.0	Demonstrate knowledge of trucking operations. The student will be able to:
14.01	Identify the advantages and disadvantages of trucking company versus owner-operator.
14.02	Demonstrate knowledge of processing truck shipments and the driver scheduling issues.
14.03	Identify the types of carriers and equipment.
14.04	Demonstrate knowledge of weight and load distribution.
14.05	Identify the types of cargo moved by truck and the types of cargo documentation required.
14.06	Describe the role of trucking at logistics centers.
14.07	Identify the types of hazardous materials moved by truck and the rules governing this type of shipment.
14.08	Demonstrate knowledge of intrastate, interstate, and international trucking operations.
14.09	Define the role and impact of government and other regulatory agencies in the trucking industry.
14.10	Define various terms and abbreviations used in the trucking industry.
14.11	Describe process for movement of perishable goods.
15.0	Demonstrate knowledge of air cargo operations. The student will be able to:
15.01	Demonstrate knowledge of intrastate, interstate, and international air cargo operations.
15.02	Describe the air industry as it is found today: the different types of cargo, the different types of carriers, the major players, upstarts, and the future of the industry.
15.03	Identify sales and marketing ideals used in the industry, the various rates, and the various tariffs in the air cargo industry.
15.04	Differentiate the various types of terminal facilities and equipment, including aircraft, used by the air cargo companies to run an operation.

15.05	Define the role and impact of the government and other regulatory agencies in the air cargo industry.
15.06	Define various terms and abbreviations used in the air cargo industry.
15.07	Categorize the various types of cargo and its major classifications.
15.08	Identify the types of hazardous materials moved by air and the regulations governing this type shipment.
15.09	Describe the process for movement of perishable goods.

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 co-curricular 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: **Logistics and Transportation Specialist**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0652020901
Program Type	College Credit Certificate (CCC)
Program Length	18 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Supply Chain Management AS degree program (1652020901).

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.).

The purpose of this program is to prepare students for further education and employment in the Transportation, Distribution and Logistics career cluster. The program is designed to develop the student's general employability by improving their work attitudes, communication, critical thinking, technical skills, problem-solving skills and occupation-specific skills relative to supply chain management.

The program content is broad-based to reflect the cross-functional relationships prevalent in supply chain management. Students are exposed to related business practices such as standard operating procedures, negotiation techniques, planning, organizing, and accounting concepts, purchasing, sustainability, warehousing, project management, quality control, import/export, and asset management theory. Emphasis is placed on understanding the planning, acquisition, flow, and distribution of goods and services while managing the complexity of operational linkages in a fast-paced global supply chain. Learning is promoted via team work, case studies, practitioner guest lectures, and visits to work sites.

This program prepares students for employment in roles such as: Integrated Logistics Planner, Purchasing Analyst, Cargo Scheduler, International Logistics Clerk, Quality Associate, Inventory Control Manager, Logistics Analyst, Junior Buyer, Customer Service Associate, Materials Analyst, Material Manager, Supply Manager, Dispatcher, Supply Technician, Operations Supervisor, Order Fulfillment Associate, Transportation Coordinator, Distribution Planning Analyst, Packing Supervisor, Transportation Clerk, Cargo Sales, Receiving/Shipping Supervisor, Transportation Specialist, Procurement Clerk, Product Tracing and Tracking Clerk, Warehouse Shift Supervisor, Import/Export Clerk, and Purchasing Agent.

The content includes but is not limited to related business and accounting practices such as: standard policies and operating procedures, negotiation techniques, planning, organizing, logistics concepts, purchasing and inventory control theory. Emphasis is placed on the development of business and managerial skills necessary for the efficient and effective performance of all operations within a company's supply chain.

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 an understanding of personal development and professional networking.
02.0 Demonstrate an understanding of professional effectiveness.
03.0 Demonstrate an understanding of logistics, and supply chain management basics.
04.0 Demonstrate an understanding of transportation systems.
05.0 Demonstrate an understanding of warehousing and materials handling.
06.0 Demonstrate an understanding of packaging.
07.0 Demonstrate an understanding of inventory and supply planning.
08.0 Demonstrate an understanding of reverse logistics.
09.0 Demonstrate an understanding of procurement/contracting.
10.0 Demonstrate an understanding of production.
11.0 Demonstrate an understanding of product management.
12.0 Demonstrate an understanding of pricing.
13.0 Demonstrate an understanding of customer relationship management.
14.0 Demonstrate an understanding of management practices.
15.0 Demonstrate an understanding of supply chain risk management.
16.0 Demonstrate an understanding of project and quality management.
17.0 Demonstrate an understanding of domestic and global business law, ethics, and legal issues.
18.0 Demonstrate an understanding of writing and presenting documentation.
19.0 Demonstrate an understanding of the differences between a manufacturing and a services supply chain.

Florida Department of Education
Student Performance Standards

Program Title: **Logistics and Transportation Specialist**
CIP Number: **0652020901**
Program Length: **18 credit hours**

This certificate program is part of the Supply Chain Management AS degree program (1652020901). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of personal development and professional networking. The student will be able to:
01.01	Explore career pathways in supply chain management.
01.02	Explore professional development opportunities for a supply chain management professional.
01.03	Prepare for career advancement in supply chain management.
02.0	Demonstrate an understanding of professional effectiveness. The student will be able to:
02.01	Explain professional responsibilities in supply chain management.
02.02	Develop self-management skills.
02.03	Demonstrate appropriate work ethics as they apply to supply chain management.
02.04	Apply problem-solving techniques.
02.05	Manage stressful situations.
02.06	Build professional communication skills.
02.07	Disseminate information.
02.08	Develop and achieve goals.
02.09	Manage change.
02.10	Identify time-management skills.
03.0	Demonstrate an understanding of logistics, and supply chain management basics. The student will be able to:
03.01	Define and characterize supply chain management and logistics.
03.02	Describe the role of other business functional areas in supply chain management.
04.0	Demonstrate an understanding of transportation systems. The student will be able to:
04.01	Assess the importance of the transportation system.
04.02	Explain the scope of the domestic and global transportation system.

	04.03 Describe various services in the transportation industry and how these services are coordinated.
	04.04 Explain the infrastructure and equipment used by the various modes of transportation.
	04.05 Determine the costs/benefits of company-owned versus for-hire transportation.
	04.06 Explain the scope and complexities of international transportation.
	04.07 Explain the general costs included in transportation rates.
	04.08 Calculate and analyze rate structures and transportation possibilities using electronic spreadsheets.
	04.09 Determine multimodal rates.
	04.10 Explain common transportation documents.
	04.11 Explain procedures to expedite deliveries and conduct follow-up procedures as needed.
05.0	Demonstrate an understanding of warehousing and materials handling. The student will be able to:
	05.01 Explain the reasons for maintaining warehousing.
	05.02 Explain the functions of warehouses and distribution centers.
	05.03 Compare and contrast public and private warehouses.
	05.04 Explain common warehouse documents.
	05.05 Describe materials handling functions.
	05.06 Explain the elements that influence space layout in warehousing (e.g., productivity, damage, safety, security, etc.)
	05.07 Create a cost-benefit analysis.
	05.08 Explain the product characteristics that impact logistics.
	05.09 Explain order fulfillment procedures.
	05.10 Analyze rate structures.
06.0	Demonstrate an understanding of packaging. The student will be able to:
	06.01 Assess types of packaging including customer requirements, and industry required labels.
	06.02 Explain the functions of packaging.
	06.03 Explain how packaging influences other logistic activities.
07.0	Demonstrate an understanding of inventory and supply planning. The student will be able to:
	07.01 Explain the importance of inventory.
	07.02 Explain how inventory is measured and managed.

	07.03 Analyze just-in time (JIT) inventory process.
	07.04 Understand the use and output of various resource planning systems.
	07.05 Calculate, analyze, and incorporate various inventory management tools, including spreadsheets, in order to understand the impact on logistics.
08.0	Demonstrate an understanding of reverse logistics. The student will be able to:
	08.01 Assess the nature and scope of reverse logistics.
	08.02 Explain the waste management process.
	08.03 Explain the disposition of assets.
09.0	Demonstrate an understanding of procurement/contracting. The student will be able to:
	09.01 Develop a procurement/acquisition plan.
	09.02 Analyze organizational requirements for procurement requisitions.
	09.03 Determine appropriate methods of procurement.
	09.04 Work collaboratively to develop and review specifications, statements of work, performance terms, and/or acceptance criteria.
	09.05 Identify and select potential sources of materials or services.
	09.06 Explain competitive bids, quotations, and proposals.
	09.07 Prepare and solicit competitive bids, quotations, and proposals.
	09.08 Evaluate competitive bids to determine the best offer.
	09.09 Conduct supplier visits and/or evaluations to determine suitability when needed.
	09.10 Analyze elements of contracts.
	09.11 Issue contracts.
	09.12 Review legal implications of contracting, including the difference between a business decision and legal case.
	09.13 Manage contracts and purchase orders from award to completion.
	09.14 Resolve contract and/or purchase order differences with suppliers.
	09.15 Explain payment problems with suppliers and user departments.
	09.16 Discuss the scope of compliance requirements.
	09.17 Conduct a negotiation.
10.0	Demonstrate an understanding of production. The student will be able to:
	10.01 Explain the relationship between manufacturing, purchasing, and logistics.

	10.02 Explain the concept of production.
	10.03 Plan production.
	10.04 Apply best practices for production operations.
	10.05 Explain impact of new production technology for profitability.
	10.06 Analyze job costing using appropriate application software.
11.0	Demonstrate an understanding of product management. The student will be able to:
	11.01 Describe the factors involved in product/service operations.
	11.02 Plan product/service management strategies.
	11.03 Explain types of products and their impact on logistics.
	11.04 Explain the impact of packaging on product/service management.
	11.05 Explain the impact of product promotions within supply chain and logistics.
12.0	Demonstrate an understanding of pricing. The student will be able to:
	12.01 Explain pricing fundamentals.
	12.02 Evaluate pricing fundamentals.
	12.03 Explain how logistics cost can influence pricing decisions.
	12.04 Determine prices for products/services.
13.0	Demonstrate an understanding of customer relationship management. The student will be able to:
	13.01 Explain basic customer relationship management (CRM) concepts.
	13.02 Demonstrate quality customer service focus.
	13.03 Describe the concept of order cycle time.
	13.04 Explain the importance of logistic performance on customer service in generating revenue and managing profit and loss.
	13.05 Explain the role of technology in order processing, tracking, and customer research.
	13.06 Process orders and returns.
14.0	Demonstrate an understanding of management practices. The student will be able to:
	14.01 Explain basic management concepts.
	14.02 Assess and manage human resources and integrated teams at domestic and international levels.
	14.03 Provide leadership to procurement, acquisition, logistic, and supply chain management employees at domestic and international levels.

	14.04 Apply sound decision-making strategies.
15.0	Demonstrate an understanding of supply chain risk management. The student will be able to:
	15.01 Explain types of risk.
	15.02 Explain risk management.
	15.03 Analyze safety/security risks.
16.0	Demonstrate an understanding of project and quality management. The student will be able to:
	16.01 Plan and coordinate the diverse components of a project.
	16.02 Assess and manage a project.
	16.03 Build interpersonal skills with individuals and teams.
	16.04 Explain quality assurance.
	16.05 Select and employ quality methodologies and tools. (i.e., Lean, Six Sigma, TL9000/ISO9001, etc.)
	16.06 Examine quality cost implications.
17.0	Demonstrate an understanding of domestic and global business law, ethics, and legal issues. The student will be able to:
	17.01 Review and discuss current legal and ethical considerations as they relate to supply chain management.
	17.02 Evaluate policies for managing privacy and ethical issues.
18.0	Demonstrate an understanding of writing and presenting documentation. The student will be able to:
	18.01 Assess report writing requirements.
	18.02 Create, write, and present reports using APA format.
19.0	Demonstrate an understanding of the differences between a manufacturing and a services supply chain. The student will be able to:
	19.01 Describe the basic concepts of manufacturing and service operations and their role in meeting customer needs.
	19.02 Define the key elements and processes in manufacturing and service operations.
	19.03 Describe how to assess the performance of manufacturing and service operations.

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 co-curricular 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: **Unmanned Vehicle Systems Operations**
Career Cluster: **Transportation, Distribution & Logistics**

AS	
CIP Number	1615080102
Program Type	College Credit
Program Length	62 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 communications, ethics, mathematics, science, management, psychology, unmanned systems, private pilot ground school, electronics data acquisition and control, robotics, underwater and surface unmanned systems, operation and application of unmanned systems and techniques to defeat an unmanned vehicle.

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 62 credit hours.

Standards

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

01.0 Demonstrate the ability to communicate effectively.
02.0 Demonstrate the ability to think critically and ethically.
03.0 Apply appropriate mathematical and computational models and methods in problem solving.
04.0 Demonstrate a clear and logical understanding of the fundamental physics principles, laws, and applications.
05.0 Demonstrate a comprehensive understanding of the theory, practice, ideals and realities of government and politics in the United States.
06.0 Demonstrate an understanding of weather variables, atmospheric motion participation and topics in modern weather science.
07.0 Apply fundamentals of management to solve problems and improve the organization and operation of business enterprises.
08.0 Demonstrate an understanding of human behavior.
09.0 Demonstrate understanding of unmanned vehicle systems emphasizing the military and commercial history growth and application of UVS's.
10.0 Demonstrate ability to operate a UVS in normal and abnormal conditions.
11.0 Demonstrate aeronautical knowledge required for certification as a private pilot with Airplane Single Engine Land rating.
12.0 Demonstrate personal, interpersonal, intellectual, and social skills necessary to succeed in a flight-related college degree program.
13.0 Demonstrate competency in measurement of resistance, current and voltage in any electrical circuit.
14.0 Analyze and report sensor information pertinent to safety of flight and mission accomplishment.
15.0 Demonstrate a practical understanding of remote sensing systems, their respective capabilities, and their relationship to unmanned vehicle systems (UVS).
16.0 Demonstrate the ability to operate an unmanned vehicle through either direct visual observation or the remote use of sensors.
17.0 Demonstrate fundamental knowledge of VFR tower terminal operations within US air traffic control system.
18.0 Demonstrate ability to apply knowledge of rules and regulations governing the legal, safe, and ethical use of unmanned vehicle systems.
19.0 Demonstrate understanding of how to defeat an unmanned vehicle.

Florida Department of Education
Student Performance Standards

Program Title: **Unmanned Vehicle Systems Operations**
CIP Number: **1615080102**
Program Length: **62 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate the ability to communicate effectively. The student will be able to:
01.01	Communicate effectively and accurately in writing.
01.02	Talk with others to effectively convey information.
01.03	Listen to others taking time to understand points being made.
01.04	Understand written sentences and paragraphs in work related documents.
02.0	Demonstrate the ability to think critically and ethically. The student will be able to:
02.01	Use logic and analysis to identify strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
02.02	Weigh the relative costs and benefits of a potential action to choose the most appropriate one.
02.03	Adhere to the highest level of ethical standards in the operation of unmanned vehicle systems.
03.0	Apply appropriate mathematical and computational models and methods in problem solving. The student will be able to:
03.01	Add, subtract, multiply and divide using fractions, decimals, whole numbers, percentages, and ratios.
03.02	Demonstrate knowledge of arithmetic, algebra and geometry, calculus, statistics, and their applications
04.0	Demonstrate a clear and logical understanding of the fundamental physics principles, laws, and applications. The student will be able to:
04.01	Understand the basic concepts of physics and the methods scientist use to explore natural phenomena.
04.02	Describe the fundamental laws of physics and the application of each.
04.03	Apply problem solving skills regarding physical phenomena using relevant mathematical models.
05.0	Demonstrate a comprehensive understanding of the theory, practice, ideals and realities of government and politics in the United States. The student will be able to:
05.01	Understand the structure and development of the American system of government.
05.02	Identify the structure and roles of the institutions of government.
06.0	Demonstrate an understanding of weather variables, atmospheric motion participation and topics in modern weather science. The student will be able to:

	06.01 Describe the compositions, circulation and stability of the atmosphere.
	06.02 Demonstrate an understanding of air mass development, the movement of fronts and their effect on aviation.
	06.03 Demonstrate an awareness of weather hazards to aviation and an understanding of how to avoid them.
	06.04 Demonstrate the ability to access weather information prior to and during flights through a variety of media.
	06.05 Interpret printed reports, forecasts, and graphic weather products.
07.0	Apply fundamentals of management to solve problems and improve the organization and operation of business enterprises. The student will be able to:
	07.01 Identify what management is and what it does.
	07.02 Describe and illustrate basic management functions.
	07.03 Understand the planning, organizing, leading and controlling functions.
	07.04 Create an awareness of the use of operating plans, policies, procedures and rules.
08.0	Demonstrate an understanding of human behavior. The student will be able to:
	08.01 Understand the vocabulary and concepts of psychology.
	08.02 Understand how critical thinking skills are developed.
	08.03 Understand the research upon which the knowledge of human thought and behavior is based.
09.0	Demonstrate understanding of unmanned vehicle systems emphasizing the military and commercial history growth and application of UVS. The student will be able to:
	09.01 Understand the history of UVS in the military.
	09.02 Understand the history of unmanned vehicle systems in the commercial sector.
	09.03 Describe the pros and cons of UVS in each sector.
	09.04 Explain the concerns and challenges associated with the use of UVS in both sectors.
10.0	Demonstrate ability to operate a UVS in normal and abnormal conditions. The student will be able to:
	10.01 Operate a UVS in normal conditions.
	10.02 Operate a UVS in abnormal conditions.
11.0	Demonstrate aeronautical knowledge required for certification as a private pilot with Airplane Single Engine Land rating. The student will be able to:
	11.01 Demonstrate understanding of the National Airspace System.
	11.02 Demonstrate an understanding of aviation charts.
	11.03 Demonstrate an understanding of operational weather factors and a practical understanding of obtaining a weather briefing and making the go-no decision.

	11.04 Demonstrate understanding of the factors which affect airplane performance and a working knowledge of ground reference maneuvers.
	11.05 Calculate weight and balance.
	11.06 Demonstrate understanding of aerodynamics.
	11.07 Demonstrate the ability to make good decisions.
	11.08 Describe the FAA regulations and rules which individuals, private pilots, unmanned aircraft system operators, and general aviation flight must adhere to.
	11.09 Understand the factors that impact safety in flight.
	11.10 Demonstrate understanding of pre-solo maneuvers.
	11.11 Demonstrate knowledge of take-off, landing and enroute performance.
	11.12 Understand airports and airport procedures.
	11.13 Understand pre-solo requirements.
	11.14 Understand the fundamentals of visual navigation.
	11.15 Understand flight planning and weather in planning for solo cross-country flight.
	11.16 Demonstrate practical understanding of radio navigation and enroute navigation.
12.0	Demonstrate personal, interpersonal, intellectual and social skills necessary to succeed in a flight-related college degree program. The student will be able to:
	12.01 Understand strategies for effectively managing time.
	12.02 Describe effective study skills.
	12.03 Explain principles of learning.
	12.04 Describe the importance of clarifying goals.
	12.05 Identify strategies for coping with challenges.
13.0	Demonstrate competency in measurement of resistance, current, and voltage in any electrical circuit. The student will be able to:
	13.01 Perform measurements and work with electricity in a safe manner.
	13.02 Understand basic concepts.
	13.03 Understand electrical quantities and units.
	13.04 Understand basic circuits, laws and measurements.
14.0	Analyze and report sensor information pertinent to safety of flight and mission accomplishment. The student will be able to:
	14.01 Understand and be able to process and analyze remote sensory data.

15.0	Demonstrate a practical understanding of remote sensing systems, their respective capabilities and their relationship to unmanned vehicle systems (UVS). The student will be able to:
	15.01 Understand the overall concepts of sensors and uses.
	15.02 Understand the applications of remote sensory data.
16.0	Demonstrate the ability to operate an unmanned vehicle through either direct visual observation or the remote use of sensors. The student will be able to:
	16.01 Examine control and system programming in the context of specific missions.
	16.02 Operate unmanned vehicle systems.
17.0	Demonstrate fundamental knowledge of VFR tower terminal operations within US air traffic control system. The student will be able to:
	17.01 Understand controller and pilot phraseology.
	17.02 Understand role and responsibilities of tower terminal operations.
18.0	Demonstrate ability to apply knowledge of rules and regulations governing the legal, safe and ethical use of unmanned vehicle systems. The student will be able to:
	18.01 Understand and be able to apply local, state and federal regulations regarding the operation of UVS.
	18.02 Adhere to the highest ethical standards in the operation of UVS.
19.0	Demonstrate understanding of how to defeat an unmanned vehicle system. The student will be able to:
	19.01 Understand the components of UVS systems that are vulnerable to hacking.
	19.02 Understand the concepts of GPS spoofing.
	19.03 Understand spoofing attacks countermeasures.
	19.04 Understand GPS signal jamming.
	19.05 Understand the use of cyber-attacks malware against UVS.

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

In order for this AS degree to be offered by a Florida college the facility and devices must undergo a safety inspection according to the guidelines of a recognized and/or accredited organization with expertise in the safe operation of unmanned vehicles. All faculty/instructors must also successfully complete safety training by a recognized organization with expertise in the safe operation of unmanned vehicles.

Schools offering this AS degree must ensure full compliance with Federal Aviation Administration (FAA) Federal Aviation Regulations (FAR) Part 107 in order to operate unmanned aerial systems.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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 (CCC):

Small Unmanned Aircraft Systems Applications (0615040700) – 24 credit hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Aviation Maintenance Administration**
Career Cluster: **Transportation, Distribution and Logistics**

AS	
CIP Number	1647060700
Program Type	College Credit
Program Length	60 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 who are seeking employment as a supervisor or frontline manager in the aviation maintenance industry. Some students will be able to obtain opportunities in maintenance and repair facilities, corporate or airline maintenance operations, and similar fields.

The content includes but is not limited to, communications skills; leadership skills; directing, planning, and controlling job tasks; human relations and employability skills; safe and efficient work practices. Students will be required to complete an Aviation Maintenance Technician (AMT) Airframe and Powerplant certification prior to the completion of the degree.

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

Program Structure

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

Standards

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

01.0 Demonstrate an understanding of basic aviation terminology and history.
02.0 Demonstrate an understanding of aviation operations practices, limitations, and procedures.
03.0 Demonstrate an understanding of federal, state, and other governmental laws, rules and policies as they relate to aviation.
04.0 Demonstrate understanding of meteorology.
05.0 Demonstrate an understanding of aviation safety and human factors, including accident prevention.
06.0 Demonstrate the human relations skills necessary for success in supervision.
07.0 Demonstrate a practical approach to job management.
08.0 Demonstrate effective communication skills.
09.0 Demonstrate employability skills.

(Optional) Standards 10-14 are for the Non-Destructive Testing Technology Specialization

10.0 Demonstrate workable knowledge in the physics behind the operation of NDT instrumentation.
11.0 Exhibit proficiency in the execution of NDT methods and Interpretation of Inspection SOPs in accordance with ATA-105 and NAS-410 standards.
12.0 Follow safety protocols and compliance standards in NDT practices.
13.0 Prepare for NDT qualifying exams and subsequent OJT hours.
14.0 Demonstrate professional skills in collaboration, reporting, and workplace social dynamics.

Florida Department of Education
Student Performance Standards

Program Title: **Aviation Maintenance Administration**
CIP Numbers: **1647060700**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of basic aviation terminology and history. The student will be able to:
01.01	Explain the overall scope and breadth of the aviation industry including its impact on the economy.
01.02	Distinguish the terms and vocabularies that are used in the aerospace and commercial aviation industry.
01.03	Describe the history of technological, governmental, social, and economic developments of aviation.
01.04	Explain the different types and categories of aircraft in use in the industry by distinguishing and identifying: Various wide body, narrow body types and general aviation aircraft.
01.05	Demonstrate an understanding of the oversight role of the Federal Government and its effect on the aviation industry.
02.0	Demonstrate an understanding of aviation operations practices, limitations, and procedures. The student will be able to:
02.01	Demonstrate knowledge of aircraft systems as they apply to flight operations, including engines, fuel, electrical, hydraulics, pneumatics, flight controls and avionics.
02.02	Understand the various factors of aircraft performance, including takeoff, enroute and landing limitations and weight and balance.
02.03	Demonstrate knowledge of the function of flight operations, including pilot hiring, training, standards, safety issues, security issues, FAA and TSA regulations, documentation requirements, operations specifications, operating within the ATC system, and crew scheduling as well as flight attendant and aircraft dispatcher requirements.
02.04	Describe maintenance operations and their role and effect on flight operations.
02.05	Demonstrate an understanding of the role of the flight operations professional in aviation economic and planning functions.
02.06	Explain FAA requirements such as flight standards, types of certificates, training and record keeping, surveillance, and investigations, as well as the operator's response and its relationship with the FAA.
02.07	Describe the role of the National Transportation Safety Board in accident investigation, NASA's role in aviation safety reporting systems and research, and industry-specific safety reporting programs.
03.0	Demonstrate an understanding of federal, state, and other governmental laws, rules and policies as they relate to aviation. The student will be able to:
03.01	Demonstrate knowledge of the history and foundations of the legal and court system in the United States as it pertains to development of aviation law and regulations.
03.02	Describe the state and federal system of trial, appellate and supreme courts as well as subject matter jurisdiction.

	03.03 Explain the role and function of the U.S. DOT, FAA, TSA, and the NTSB as it relates to their legal responsibilities and authority.
	03.04 Demonstrate knowledge of airmen rights and responsibilities, negligence, FAA enforcement, immunity, and degrees of care.
	03.05 Demonstrate knowledge of the legal matters relating to the aircraft manufacturing and airline industry, including warranties, products liability, negligence, accident litigation, labor, and consumer issues.
	03.06 Demonstrate knowledge of international air law, bilateral and multilateral agreements, ICAO, IATA, international jurisdiction, and limits of liability and damages.
	03.07 Demonstrate knowledge of legal issues that relate to aviation security.
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 an understanding of aviation safety and human factors, including accident prevention. The student will be able to:
	05.01 Describe the nature of human factors and sources of errors.
	05.02 Discuss the issues of fatigue, body rhythms and sleep.
	05.03 Describe the effects of fitness and health on human performance.
	05.04 Discuss how motivation and leadership affects safety in aviation.
	05.05 Discuss the role of training devices and education in reducing errors and increasing safety.
	05.06 Describe how an aviation safety program is designed to create an environment of safety awareness and accident prevention.
06.0	Demonstrate the human relations skills necessary for success in supervision. The student will be able to:
	06.01 Develop and demonstrate the unique human relations skills needed for successful job attainment and progress in supervising others.
	06.02 Identify the legal and social environment for supervision.
	06.03 Discuss pertinent legislation and the role of government intervention.
	06.04 Compare and contrast union and non-union organizations.
07.0	Demonstrate a practical approach to job management. The student will be able to:
	07.01 Identify techniques and strategies in planning and coordinating resources.
	07.02 Demonstrate effective decision making and problem-solving techniques.

	07.03 Compare and contrast methods of work improvement, including quality assurance techniques.
08.0	Demonstrate effective communication skills. The student will be able to:
	08.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
	08.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupational area.
	08.03 Read and follow written and oral English instructions.
	08.04 Answer and ask questions coherently and concisely.
	08.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
	08.06 Demonstrate appropriate telephone/communication skills.
	08.07 Demonstrate knowledge and use of appropriate computer skills.
	08.08 Demonstrate effective interpersonal skills.
09.0	Demonstrate employability skills. The student will be able to:
	09.01 Describe positions available and requirements for careers in aviation administration.
	09.02 Describe qualification and certification requirements for careers in aviation administration.
	09.03 Describe the process of obtaining the FAA Aviation Maintenance Technician - Airframe Certificate.
	09.04 Describe the process of obtaining the FAA Aviation Maintenance Technician - Powerplant Certificate.
(Optional) Standards 10-14 are for the Non-Destructive Testing Technology Specialization	
10.0	Demonstrate workable knowledge in the physics behind the operation of NDT instrumentation. The student will be able to:
	10.01 Define the principles of sound wave propagation as it relates to Ultrasonic Testing (UT), including concepts like frequency, velocity, and wave modes (e.g., longitudinal, shear) used to detect material flaws.
	10.02 Explain the principles of electromagnetic induction in Eddy Current Testing (ECT), including how induced currents interact with materials and how changes in the material (e.g., cracks, corrosion) affect the resulting impedance.
	10.03 Describe the principles of magnetism that govern Magnetic Particle Inspection (MT), including how magnetic fields are generated and how they interact with ferromagnetic materials to reveal surface and near-surface defects
	10.04 Demonstrate the application of the physics of light and optics in Visual Inspection (VI), including how lighting, magnification, and human visual perception interact with surface characteristics to identify potential defects
	10.05 Explain the principles of infrared radiation and thermography, focusing on how heat patterns, emissivity, and thermal conductivity of materials are used to identify hidden defects or stress areas in structures.
	10.06 Apply wave propagation principles to understand how different NDT methods use waves (sound, light, or electromagnetic) to detect flaws, and how those waves interact with various material types and configurations.

	10.07	Describe the role of material properties (such as density, conductivity, permeability, and elasticity) in determining the effectiveness of each NDT method and how these properties affect wave behavior or signal interpretation.
	10.08	Select the operational limits and optimal settings for each NDT method, considering the physics involved (e.g., ultrasound frequency range, eddy current coil size, magnetic field strength) and how these affect test results.
	10.09	Evaluate the impact of environmental conditions (such as temperature, pressure, and surface finish) on the performance of each NDT technique and instrumentation, making necessary adjustments to the method as required during live assessments or simulated real-world scenarios.
	10.10	Calibrate and troubleshoot NDT equipment, applying the fundamental physics behind the instrumentation, and demonstrate the ability to correct errors, ensuring test results fall within specified tolerances for each NDT method.
11.0	Exhibit proficiency in the execution of NDT methods and Interpretation of Inspection SOPs in accordance with ATA-105 and NAS-410 standards. The student will be able to:.	
	11.01	Identify defects, corrosion, cracks, or other irregularities in aircraft components during Visual Inspections (VI), following ATA-105 inspection protocols to ensure compliance with commercial aviation safety standards.
	11.02	Apply Ultrasonic Testing (UT) and Eddy Current Testing (ECT) on critical aircraft parts, such as wings, fuselage, or landing gear, to detect subsurface flaws, corrosion, or material discontinuities, using the appropriate NAS-410 and ATA-105 protocols to ensure accurate results.
	11.03	Apply Magnetic Particle Inspection (MT) to detect surface and near-surface defects in ferromagnetic materials, including aircraft structural components, following ATA-105 protocols and NAS-410 standards to ensure proper execution of the method
	11.04	Apply Thermography to identify heat patterns and thermal anomalies in aircraft structures, detecting hidden defects such as corrosion or stress fractures in critical areas (e.g., fuselage, wings), following ATA-105 inspection procedures and NAS-410 standards for infrared NDT application.
12.0	Follow safety protocols and compliance standards in NDT practices. The student will be able to:	
	12.01	Identify safety protocols related to the use of NDT equipment and materials, ensuring adherence to NAS-410 and ATA-105 guidelines during inspections.
	12.02	Describe the potential hazards associated with various NDT methods, such as ultrasonic testing, eddy current testing, magnetic particle inspection, and thermography, and relate safety precautions to mitigate risks.
	12.03	Demonstrate the correct use of personal protective equipment (PPE) in accordance with NAS-410 and ATA-105 standards, ensuring the safety of inspectors and personnel during NDT operations.
	12.04	Explain the importance of complying with regulatory standards and industry protocols, emphasizing the role of ATA-105 and NAS-410 in maintaining the integrity and safety of commercial and military aircraft.
	12.05	Outline procedures for reviewing and modifying inspection protocols to ensure compliance with the latest safety and regulatory requirements, adapting NDT practices to meet evolving standards.
	12.06	Describe the importance of adhering to relevant OSHA (Occupational Safety and Health Administration) standards, EPA (Environmental Protection Agency) regulations, and other safety guidelines while performing NDT operations.
13.0	Prepare for NDT qualifying exams and subsequent OJT hours. The student will be able to:	
	13.01	Identify the training and experience hour requirements for NDT certification as outlined by the ASNT SNT-TC-1A standard, including the minimum hours required for Level I, Level II, and Level III certification in various NDT methods.
	13.02	Explain the key components of NDT certification exams, including written, practical, and oral examinations, and how they align with the NAS-410 and ATA-105 standards for aviation inspection.

	13.03	Demonstrate the ability to apply NDT methods through practical exercises and laboratory work, ensuring students meet or exceed a 75% proficiency rate on both written and practical exams based on classroom and lab instruction.
	13.04	Describe the role and importance of on-the-job training (OJT) in gaining real-world experience and meeting the required hours for ASNT certification, especially for each level of qualification.
	13.05	Outline a structured plan to meet the required OJT hours for each NDT method, ensuring that students understand the specific experience requirements for certification and the significance of supervised, hands-on training.
14.0	Demonstrate professional skills in collaboration, reporting, and workplace social dynamics. The student will be able to:	
	14.01	Describe the importance of effective communication in NDT, including how to report findings clearly and accurately to various stakeholders (e.g., supervisors, engineers, and clients).
	14.02	Identify the key components of teamwork in NDT, including how to collaborate effectively with engineers, inspectors, and maintenance personnel to solve problems identified through NDT inspections.
	14.03	Explain the professional and ethical standards that NDT technicians must adhere to, including confidentiality, integrity in reporting, and maintaining the trust of stakeholders.
	14.04	Explain how NDT professionals should apply ethical principles when interacting with colleagues, clients, and supervisors, ensuring responsible decision-making and adherence to industry regulations.
	14.05	Write professional reports that summarize inspection results, defect assessments, and recommendations for corrective actions, ensuring clarity, accuracy, and ethical responsibility.

Additional Information

Laboratory Activities

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

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

Florida SkillsUSA is the co-curricular 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:

Non-Destructive Testing Technology (0647060704) – 25 Credit Hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Avionics Systems Integration Specialist**
Career Cluster: **Transportation, Distribution and Logistics**

AS	
CIP Number	1647060911
Program Type	College Credit
Program Length	60 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 systems integration specialists. The course content includes, but is not limited to, adjusting equipment to ensure optimal performance; analyzing test or performance data to assess equipment operation; assembling electrical components, subsystems, or systems; developing equipment or component configurations; fabricating parts or components; installing electrical components, equipment, or systems; laying out work according to specifications; maintaining repair or maintenance records; repairing worn, damaged, or defective mechanical parts; testing electrical equipment or systems to ensure proper functioning; troubleshooting equipment or systems operation problems; planning and installing aircraft in-flight entertainment and wi-fi systems; modifying aircraft for ADS-B compliance; preparing for the next generation of avionics communication, navigation, and surveillance components. The course content also includes training in communication, leadership, human relations and employability skills as well as safe and 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 60 credit hours.

Standards

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

01.0 Demonstrate proficiency in the basics of aviation maintenance technology.
02.0 Demonstrate proficiency in basic aircraft wiring and PCB practices.
03.0 Demonstrate proficiency in basic direct current (DC) circuits.
04.0 Demonstrate proficiency in advanced direct current (DC) circuits.
05.0 Demonstrate proficiency in aircraft direct current (DC) power systems.
06.0 Demonstrate proficiency in alternating current (AC) circuits.
07.0 Demonstrate proficiency in advanced alternating current (AC) circuits.
08.0 Demonstrate proficiency in alternating current (AC) circuit components.
09.0 Demonstrate proficiency in aircraft alternating current (AC) power systems.
10.0 Demonstrate proficiency with aircraft drawings.
11.0 Demonstrate proficiency in solid state devices.
12.0 Demonstrate proficiency in analog circuits.
13.0 Demonstrate an understanding of basic avionics corrosion.
14.0 Demonstrate proficiency in aircraft aerodynamic fundamentals.
15.0 Demonstrate proficiency in digital circuits.
16.0 Demonstrate proficiency in fundamental microprocessors.
17.0 Demonstrate an understanding of workplace safety practices.
18.0 Demonstrate appropriate communication skills.
19.0 Demonstrate employability skills.
20.0 Demonstrate an understanding of entrepreneurship.
21.0 Demonstrate knowledge of basic avionics systems.
22.0 Demonstrate proficiency in installing avionics systems.
23.0 Demonstrate proficiency in structural applications.
24.0 Demonstrate proficiency in avionics radio station regulations and procedures.
25.0 Demonstrate proficiency in AM and FM transmitters.
26.0 Demonstrate proficiency in AM and FM receivers.
27.0 Demonstrate proficiency in AM and FM transceivers.
28.0 Demonstrate proficiency in electromagnetic wave emissions.
29.0 Demonstrate proficiency in line maintenance of airborne communication systems.
30.0 Demonstrate proficiency in line maintenance of aircraft instrument systems.
31.0 Demonstrate proficiency in aircraft data bus systems.
32.0 Demonstrate proficiency in line maintenance of airborne navigation systems and equipment.
33.0 Demonstrate proficiency in primary and secondary radar systems.
34.0 Demonstrate proficiency with in-flight entertainment systems.
35.0 Demonstrate proficiency with engine and airframe monitoring systems.
36.0 Demonstrate proficiency with pitot-static systems.

37.0 Demonstrate proficiency with aircraft safety systems.
38.0 Explain the origin and use of modern-day avionics systems.
39.0 Demonstrate proficiency in the integration of avionics systems as they relate to aircraft control.
40.0 Demonstrate proficiency in the integration of avionics systems as they relate to aircraft engine sensors.
41.0 Demonstrate proficiency in the integration of avionics systems as they relate to aircraft weather systems.
42.0 Demonstrate proficiency in the integration of avionics systems as they relate to aircraft pitot static systems.
43.0 Explain cockpit-tower communication and messaging systems.
44.0 Identify and properly operate data communication systems used in the aviation industry.
45.0 Understand cabin entertainment to include operation and configurations of aircraft Wi-Fi and satellite communication systems.
46.0 Understand the Iridium constellation and the upgraded capabilities.

Florida Department of Education
Student Performance Standards

Program Title: **Avionics Systems Integration Specialist**
CIP Number: **1647060911**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in the fundamentals of aviation maintenance technology. The student will be able to:
01.01	Perform basic electricity skills.
01.02	Perform basic aircraft drawing skills.
01.03	Demonstrate aircraft weight and balance skills.
01.04	Maintain aircraft fluid lines and fittings.
01.05	Perform aircraft materials and processes skills.
01.06	Perform ground operations and servicing duties.
01.07	Perform cleaning and corrosion control operations.
01.08	Demonstrate basic mathematical skills appropriate for avionics professionals.
01.09	Maintain forms and records.
01.10	Apply principles of basic physics.
01.11	Demonstrate the use of maintenance publications.
01.12	Interpret and explain mechanic privileges.
02.0	Demonstrate proficiency in basic aircraft wiring and PCB practices. The student will be able to:
02.01	Explain the theoretical concepts and safety precautions of soldering.
02.02	Use appropriate hand tools to cut, strip, crimp, splice, solder, and stamp/identify wires and cables to industry standards for aircraft installation.
02.03	Prepare, use, install, and inspect general purpose connectors.
02.04	Research and identify the proper AN-MS connectors for use in aircraft electrical systems.
02.05	Identify and use power tools properly.
02.06	Demonstrate acceptable PCB soldering techniques.

	02.07 Demonstrate acceptable de-soldering techniques.
	02.08 Demonstrate electrostatic discharge (ESD) safety procedures.
	02.09 Describe the construction of printed circuit boards (PCB's).
	02.10 Demonstrate proficiency in reworking and repairing aircraft wiring and PCB's.
03.0	Demonstrate proficiency in basic direct current (DC) circuits. The student will be able to:
	03.01 Solve problems in electronic units utilizing metric prefixes.
	03.02 Identify sources of electricity.
	03.03 Define voltage, current, resistance, power, and energy.
	03.04 Apply Ohm's law and power formulas.
	03.05 Read and interpret color codes and symbols to identify electrical components and values.
	03.06 Measure properties of a DC circuit using an analog volt-ohm (VOM) meter.
	03.07 Measure properties of a DC circuit using a digital multi-meter (DMM).
	03.08 Measure properties of a DC circuit using an oscilloscope.
	03.09 Compute conductance and compute and measure resistance of conductors and insulators.
	03.10 Apply Ohm's law to series circuits.
	03.11 Analyze and troubleshoot series circuits.
	03.12 Apply Ohm's law to parallel circuits.
	03.13 Analyze and troubleshoot parallel circuits.
04.0	Demonstrate proficiency in advanced direct current (DC) circuits. The student will be able to:
	04.01 Solve algebraic problems to include exponentials to DC.
	04.02 Relate electricity to the nature of matter.
	04.03 Apply Ohm's law to series-parallel and parallel-series circuits.
	04.04 Verify the operation of series-parallel, parallel-series, and bridge circuits.
	04.05 Troubleshoot series-parallel and parallel-series and bridge circuits.
	04.06 Identify and define voltage divider circuits (loaded and unloaded).
	04.07 Verify the operation of voltage divider circuits (loaded and unloaded).
	04.08 Analyze and troubleshoot voltage divider circuits (loaded and unloaded).

	04.09 Describe magnetic properties of circuits and devices.
	04.10 Determine the physical and electrical characteristics of capacitors and inductors.
	04.11 Define resistor-capacitor (R-C) and resistor-inductor (R-L) time constants.
	04.12 Adjust and operate power supplies for DC circuits.
05.0	Demonstrate proficiency in aircraft direct current (DC) power systems. The student will be able to:
	05.01 Identify the types and construction of aircraft batteries.
	05.02 Define battery shop safety features and precautions when servicing various types of aircraft batteries.
	05.03 Explain the process of servicing lead-acid and nickel-cadmium batteries.
	05.04 Describe the types of aircraft DC generation systems.
	05.05 Describe the purpose and operation of aircraft DC current limiters, regulators, and reverse current relays.
06.0	Demonstrate proficiency in alternating current (AC) circuits. The student will be able to:
	06.01 Solve basic trigonometric problem as applicable to electronics.
	06.02 Measure the properties of AC circuits using multi-meters.
	06.03 Measure the properties of an AC circuit using an oscilloscope.
	06.04 Identify the sources of AC electricity.
	06.05 Use a function generator to inject signals into an AC circuit.
	06.06 Define frequency, cycle, Hertz, wavelength, sine wave, phase angle, and period.
	06.07 Calculate peak-to-peak, average, and RMS values of an AC signal.
	06.08 Identify sine waves, square waves, saw-tooth waves, and ramp waveforms.
	06.09 Use Ohm’s law to determine resistance in an AC circuit.
	06.10 Define the characteristics of AC capacitive circuits.
	06.11 Analyze and troubleshoot AC capacitive circuits.
	06.12 Define the characteristics of AC inductive circuits.
	06.13 Analyze and troubleshoot AC inductive circuits.
07.0	Demonstrate proficiency in advanced alternating current (AC) circuits. The student will be able to:
	07.01 Define characteristics of resistive, Inductive and Capacitive (RLC) circuits (series, parallel and complex).
	07.02 Define the characteristics of series and parallel resonant circuits.

	07.03 Analyze and troubleshoot R-C, R-L, and RLC circuits.
	07.04 Define the characteristics of frequency selective filter circuits.
	07.05 Analyze and troubleshoot frequency selective filter circuits.
	07.06 Define the characteristics of poly-phase circuits.
08.0	Demonstrate proficiency in alternating current (AC) circuit components. The student will be able to:
	08.01 Define and apply the principles of transformers to AC circuits.
	08.02 Calculate transformer primary and secondary voltage, turn ratio, current, and power.
	08.03 Analyze and troubleshoot step-up, step-down, and auto transformers.
	08.04 Describe the characteristics and operation of relays and switches.
	08.05 Analyze and troubleshoot relays and switches.
	08.06 Define basic AC generator theory and operation.
	08.07 Define basic AC motor theory and operation.
	08.08 Adjust and operate power supplies for AC circuits.
	08.09 Analyze and measure power in AC circuits.
09.0	Demonstrate proficiency in aircraft alternating current (AC) power systems. The student will be able to:
	09.01 Describe the types and operation of aircraft AC generation systems.
	09.02 Describe the operation of basic aircraft DC and AC power distribution systems.
	09.03 Describe the operation of aircraft multi-engine power distribution systems.
10.0	Demonstrate proficiency with aircraft drawings. The student will be able to:
	10.01 Identify and define the symbols, lines, and markings on aircraft flowcharts, drawings and diagrams.
	10.02 Read and interpret aircraft drawings and blueprints.
	10.03 Prepare sketches of aircraft repairs and alterations.
	10.04 Use of charts and graphs.
	10.05 Describe the types of CAD systems and demonstrate the basic functions of a CAD program.
11.0	Demonstrate proficiency in solid state devices. The student will be able to:
	11.01 Identify and define properties of semiconductor materials.
	11.02 Identify and define operating characteristics and applications of junction diodes.

11.03	Identify and define operating characteristics and applications of special diodes.
11.04	Analyze and troubleshoot diode circuits.
11.05	Identify and define operating characteristics and applications of bipolar transistors.
11.06	Identify and define operating characteristics and applications of field effect transistors.
11.07	Identify and define operating characteristics and applications of single-stage amplifiers.
11.08	Analyze and troubleshoot single-stage amplifiers.
11.09	Analyze and troubleshoot thyristor circuitry.
11.10	Set up and operate DVM for solid-state devices.
11.11	Set up and operate power supplies for solid-state devices.
11.12	Set up and operate oscilloscopes for solid-state devices.
11.13	Set up and operate function generators for solid-state devices.
11.14	Demonstrate transistor testing techniques.
12.0	Demonstrate proficiency in analog circuits. The student will be able to:
12.01	Identify and define operational characteristics and applications of multistage amplifiers.
12.02	Analyze and troubleshoot multistage amplifiers.
12.03	Identify and define operating characteristics and applications of linear integrated circuits.
12.04	Identify and define operating characteristics and applications of basic power supplies and filters.
12.05	Analyze and troubleshoot differentiator and integrator circuits.
12.06	Identify and define operating characteristics and applications of differential and operational amplifiers.
12.07	Analyze and troubleshoot differential and operational amplifier circuits.
12.08	Identify and define operating characteristics of audio power amplifiers.
12.09	Analyze and troubleshoot audio power amplifiers.
12.10	Identify and define operating characteristics and applications of power supply regulator circuits.
12.11	Analyze and troubleshoot power supply regulator circuits.
12.12	Identify and define operating characteristics and applications of active filters.
12.13	Analyze and troubleshoot active filter circuits.
12.14	Identify and define operating characteristics and applications of sinusoidal and non-sinusoidal oscillator circuits.

	12.15 Analyze and troubleshoot oscillator circuits.
	12.16 Identify and define operating characteristics and applications of cathode ray tubes.
	12.17 Identify and define operating characteristics and applications of optoelectronic devices.
	12.18 Define the operating characteristics of analog-type servo motors.
	12.19 Use basic electronics test equipment to measure and analyze analog circuits.
13.0	Demonstrate an understanding of basic avionics corrosion. The student will be able to:
	13.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	13.02 Describe the types of corrosion and explain their effects on avionics equipment.
	13.03 Describe the preventative processes to reduce or eliminate avionics corrosion.
14.0	Demonstrate proficiency in aircraft aerodynamic fundamentals. The student will be able to:
	14.01 Identify and explain the effects of aerodynamic forces on aircraft structures and components.
	14.02 Identify and describe the purpose aircraft flight controls and aircraft how they affect flight operations.
	14.03 Define the concept of weight and balance in aircraft to include arms, weights, moments, the Law of Lever, and the center of gravity.
	14.04 Describe the effects of installing equipment, modifying equipment, modifying airframe structures and repositioning equipment on weight and balance.
15.0	Demonstrate proficiency in digital circuits. The student will be able to:
	15.01 Define and apply numbering systems to codes and arithmetic operations.
	15.02 Analyze and minimize logic circuits using Boolean operations.
	15.03 Set up and operate logic probes for digital circuits.
	15.04 Set up and operate power supplies for digital circuits and solve power distribution and noise problems.
	15.05 Set up and operate pulsers for digital circuits.
	15.06 Set up and operate oscilloscopes for digital circuits.
	15.07 Set up and operate logic analyzers for digital circuits.
	15.08 Set up and operate pulse generators for digital circuits.
	15.09 Identify types of logic gates and their truth tables.
	15.10 Verify combinational logic circuits made up of integrated circuits.
	15.11 Troubleshoot logic circuits.
	15.12 Analyze types of flip-flops and their truth tables.

15.13	Troubleshoot flip-flops.
15.14	Identify, define and measure characteristics of integrated circuit (IC) logic families.
15.15	Identify types of registers and counters.
15.16	Troubleshoot registers and counters.
15.17	Analyze clock and timing circuits.
15.18	Troubleshoot clock and timing circuits.
15.19	Identify types of arithmetic-logic circuits.
15.20	Troubleshoot arithmetic-logic circuits.
15.21	Identify types of encoding and decoding devices.
15.22	Troubleshoot encoders and decoders.
15.23	Identify types of multiplexer and de-multiplexer circuits.
15.24	Troubleshoot multiplexer and de-multiplexer circuits.
15.25	Identify types of memory circuits.
15.26	Relate the uses of digital-to-analog and analog-to-digital conversions.
15.27	Troubleshoot digital-to-analog and analog-to-digital circuits.
15.28	Identify types of digital displays.
15.29	Troubleshoot digital display circuits.
15.30	Demonstrate the operating characteristics of digital-type servo and stepper motors.
16.0	Demonstrate proficiency in fundamental microprocessors. The student will be able to:
16.01	Identify central processing unit (CPU) building blocks and their uses (architecture).
16.02	Analyze bus concepts.
16.03	Analyze various memory schemes.
16.04	Verify memory device operation.
16.05	Set up and operate oscilloscopes for microprocessor systems.
16.06	Identify types of input and output devices and peripherals.
16.07	Interface input and output ports to peripherals.
16.08	Analyze and troubleshoot input and output ports.

	16.09 Develop a simple microprocessor and/or microcontroller application program.
17.0	Demonstrate an understanding of workplace safety practices. The student will be able to:
	17.01 Use Safety Data Sheets (SDS) information to determine the use, safety precautions, and disposition of chemicals used in avionics applications.
	17.02 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.
	17.03 Describe flight line safety to include foreign object elimination, situational awareness, aircraft movement precautions, fire classifications, and fire extinguishing.
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 Demonstrate appropriate telephone/communication skills.
	18.04 Make equipment failure reports.
	18.05 Specify and requisition simple electronic components.
	18.06 Compose technical letters and memoranda.
	18.07 Draft preventive maintenance procedures.
	18.08 Use an analysis of technical data to form conclusions and recommend changes.
	18.09 Make oral presentations.
	18.10 Read and follow written instructions.
	18.11 Answer and ask questions coherently and concisely.
19.0	Demonstrate employability skills. The student will be able to:
	19.01 Discuss elements of job search.
	19.02 Develop sources of information about a job.
	19.03 Identify documents that may be required when applying for a job.
	19.04 Complete a job application correctly.
	19.05 Demonstrate competence in job interview techniques.
	19.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
	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 Demonstrate knowledge of the Federal Law as recorded in (29 CFR–1910.1200).
	19.11 Write a proper resume.
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 the risks involved in ownership of a business.
	20.05 Identify the necessary personal characteristics of an entrepreneur.
	20.06 Identify the business skills needed to operate a small business efficiently and effectively.
	20.07 Define various corporate structures. (e.g., S-Corp, C-Corp, Sole Proprietor, LLC, and ESOP).
21.0	Demonstrate knowledge of basic avionics systems. The student will be able to:
	21.01 Identify and describe aircraft communications systems.
	21.02 Identify and describe aircraft short-range navigation systems.
	21.03 Identify and describe aircraft long-range navigation systems.
	21.04 Identify the types of flight instruments and state their purpose.
22.0	Demonstrate proficiency in installing avionics systems. The student will be able to:
	22.01 Prepare an avionics installation plan
	22.02 Design wiring interconnection for Comm, Nav, GPS, Traffic Avoidance, Audio Integrating etc.
	22.03 Install circuit protective devices, switches, lamps, and relays.
	22.04 Fabricate wiring harnesses.
	22.05 Perform a mechanical avionics installation.
	22.06 Perform an electrical installation.
	22.07 Perform an original manufacturers' equipment (OEM) installation.
	22.08 Determine antenna placement with regards to noise interference.
23.0	Demonstrate proficiency in structural applications. The student will be able to:
	23.01 Select, install, and remove conventional and special fasteners.

	23.02 Layout, form, inspect, modify, and repair metal structures.
	23.03 Fabricate, modify, and repair composite structures.
	23.04 Install aircraft antennas and doubler plates.
24.0	Demonstrate proficiency in avionics radio station regulations and procedures. The student will be able to:
	24.01 Define repair station related regulatory and standardization agencies and their purposes.
	24.02 Define repair station certification requirements.
	24.03 Define requirements for certification of radio repair technicians.
	24.04 Practice proper station operation procedures.
	24.05 Prepare repair station reports and documentation.
	24.06 Describe FCC rules pertaining to AM and FM transmitter maintenance and operation.
25.0	Demonstrate proficiency in AM and FM transmitters. The student will be able to:
	25.01 Define Double Sideband (DSB), Single Sideband (SSB) and FM modulation.
	25.02 Analyze and troubleshoot AM and FM Radio Frequency (RF) oscillator circuits.
	25.03 Analyze and troubleshoot buffer and multiplier circuits.
	25.04 Analyze and troubleshoot RF power amplifier circuits.
	25.05 Analyze and troubleshoot AM and FM modulation circuits.
	25.06 Analyze and troubleshoot microphone circuits.
	25.07 Analyze and troubleshoot balanced modulators and SSB filter circuits.
	25.08 Analyze and troubleshoot AM and FM power supply circuits.
	25.09 Make power, frequency and modulation measurements of AM and FM transmitters.
	25.10 Align and troubleshoot AM and FM transmitters.
26.0	Demonstrate proficiency in AM and FM receivers. The student will be able to:
	26.01 Analyze and troubleshoot receiver audio voltage and power amplifiers and speaker/headphone circuits.
	26.02 Analyze and troubleshoot AM and FM detector circuits.
	26.03 Analyze and troubleshoot AM Intermediate Frequency (IF) amplifier circuits.
	26.04 Analyze and troubleshoot FM IF amplifier and limited circuits.
	26.05 Analyze and troubleshoot receiver oscillator and automatic frequency control (AFC) circuits.

	26.06 Analyze and troubleshoot RF mixer/heterodyne circuits.
	26.07 Analyze and troubleshoot receiver RF amplifier circuits.
	26.08 Analyze and troubleshoot automatic voltage control/automatic gain control (AVC/AGC) circuits.
	26.09 Analyze and troubleshoot receiver power supplies.
	26.10 Align and troubleshoot AM and FM receivers.
27.0	Demonstrate proficiency in AM and FM transceivers. The student will be able to:
	27.01 Analyze and troubleshoot transceiver control, metering and switching circuits.
	27.02 Analyze and troubleshoot transceiver frequency synthesizers and phase locked loop circuits.
	27.03 Analyze and troubleshoot squelch circuits.
	27.04 Align and troubleshoot transceivers.
28.0	Demonstrate proficiency in electromagnetic wave emissions. The student will be able to:
	28.01 Define the radio frequency spectrum.
	28.02 Define types and classification of RF emissions.
	28.03 Define the characteristics of radio waves.
	28.04 Define radio wave propagation method.
	28.05 Define the basic types of antennas.
	28.06 Draw the voltage and current relationships and radiation patterns for the basic types of antennas.
	28.07 Define methods for antenna tuning, gain and directivity.
	28.08 Define transmission lines in terms of electrical and physical properties.
	28.09 Define standing waves, cause and effect, and measure standing wave ratios.
	28.10 Define tuned transmission lines and describe applications.
	28.11 Construct transmission lines.
	28.12 Define waveguides, resonant cavities and their applications.
29.0	Demonstrate proficiency in line maintenance of airborne communication systems. The student will be able to:
	29.01 Identify regulatory agencies affecting aircraft electronic systems.
	29.02 Analyze and troubleshoot Aircraft Audio Integration Systems.
	29.03 Analyze and troubleshoot VHF communication systems.

	29.04 Analyze and troubleshoot HF communication systems
	29.05 Analyze and troubleshoot satellite communication systems.
	29.06 Describe the operation of a selective calling system.
	29.07 Define the operation and the types of data managed by the Aircraft Communication Automatic Reporting System (ACARS).
30.0	Demonstrate proficiency in line maintenance of aircraft instrument systems. The student will be able to:
	33.01 Identify and define the operation of basic flight instruments.
	33.02 Identify and define the operation of electronic flight instruments.
	33.03 Identify and define the operation of navigation instruments to include HSI, RMI, VOR.
	33.04 Identify, and define the operation of compass systems.
31.0	Demonstrate proficiency in aircraft data bus systems. The student will be able to:
	31.01 Define the operation of an aircraft digital data communications system.
	31.02 Compare and contrast the differences between ARINC data bus systems used in commercial aircraft.
	31.03 Identify data bus systems used in general aviation aircraft and explain their operation.
	31.04 Troubleshoot an aircraft data bus system.
32.0	Demonstrate proficiency in line maintenance of airborne navigation systems and equipment. The student will be able to:
	32.01 Use navigation principles to understand dead-reckoning, earth coordinate system, great circle navigation, short-range navigation and long-range navigation.
	32.02 Understand the operating principles of Global Position Satellite (GPS) System.
	32.03 Distinguish the operation principles of a VHF Omni Range (VOR) System.
	32.04 Define the operating characteristics of a Distance Measuring Equipment (DME) System.
	32.05 Explain the purpose and operation of, and the precautions when using, an Automatic Direction Finder (ADF) System.
	32.06 Define the elements of an Instrument Landing System (ILS) to include the characteristics of the localizer, glide slope, and marker beacon.
	32.07 Explain the operating principles of a Microwave Landing System (MLS).
	32.08 Describe the purpose and operation of ADS-B/transponder systems.
	32.09 Understand the relationships of various navigation systems to the aircraft flight management system.
	32.10 Define the operation of an autopilot, auto-throttle, and auto stabilization system.
33.0	Demonstrate proficiency in primary and secondary radar systems. The student will be able to:
	33.01 Explain the theory and operation of the primary radar system.

	33.02 Given a primary radar block diagram, explain the relationship between the major components of the system.
	33.03 Describe the operation of a Doppler radar.
	33.04 Secondary (ATC) Radar Transponder.
	33.05 Define the purpose and operation of the altitude encoding function of radar.
	33.06 Define the purpose and operation of the lightning detection function of radar.
	33.07 Describe the operation of a XM Weather System.
	33.08 Analyze and troubleshoot a radar system.
34.0	Demonstrate proficiency with in-flight entertainment systems. The student will be able to:
	34.01 Describe the types of in-flight entertainment systems and compare their operation to each other.
	34.02 Determine installation considerations when installing or upgrading an in-flight entertainment system.
35.0	Demonstrate proficiency with engine and airframe monitoring systems. The student will be able to.
	35.01 Identify and interpret data from various types of displays.
	35.02 Define aircraft built-in test equipment systems.
	35.03 Interpret data from built-in test equipment.
36.0	Demonstrate proficiency with pitot-static systems. The students will be able to:
	36.01 Understand purpose and function of pitot-static systems.
	36.02 Perform pitot-static integrity checks.
	36.03 Troubleshoot pitot-static systems.
37.0	Demonstrate proficiency with aircraft safety systems. The student will be able to:
	37.01 Understand purpose and function of caution, warning and advisory systems.
	37.02 Understand the purpose and operation of terminal collision avoidance systems (TCAS).
	37.03 Understand the purpose and operation of ground proximity warning systems (GPWS).
	37.04 Define the purpose of and data collected by the aircraft flight data computer and voice recorder.
	37.05 Describe the purpose, operation and testing of the Emergency Locator Transmitter (ELT).
	37.06 Describe the operation of the stall warning and avoidance systems.
38.0	Explain the origin and use of modern-day avionics systems. The student will be able to:
	38.01 Explain and demonstrate GPS and receiver use and reliance as integrated to avionics sub-systems.

	38.02 Explain the origin and use up to Iridium communications including Wi-Fi providers' theory.
	38.03 Explain the origin and mandates and integrations of GPWS/EGPWS/TAWS.
	38.04 Explain the origin and mandates and integrations of FDR/CVR/ULB/ELT.
	38.05 Explain the origin and mandates and integrations of TCAS and transponders.
39.0	Demonstrate proficiency in the integration of avionics systems as they relate to aircraft control. The student will be able to:
	39.01 Explain the origin, mandates, and integrations of engine instrumentation systems.
	39.02 Explain the origin and mandates and integrations of navigational aids previously learned as Flight Director and compare and contrast the difference from autopilot.
	39.03 Describe the origin and mandates, standards and integrations of data wire transmission and data bus fundamentals of operation and IO ports in avionics.
	39.04 Describe flight control sensors and servos.
40.0	Demonstrate proficiency in the integration of avionics systems as they relate to aircraft engine sensors. The student will be able to:
	40.01 Explain the origin, mandates, and integrations of engine instrumentation systems.
	40.02 Demonstrate how sensors work and how they are used by engine analog-to-digital converters.
	40.03 Explain calibrations to include DEEC downloads, flight control and fuel calibration and indication both resistive and capacitive circuits.
	40.04 Explain how sensor discreet are converted to a digital signal.
41.0	Demonstrate proficiency in the integration of avionics systems as they relate to aircraft weather systems. The student will be able to:
	41.01 Explain the origin and mandates and integrations of weather radar and storm scope and compare and contrast the two systems.
	41.02 Explain how RADAR and wave guides work and how they have been condensed and modernized into RTAs.
	41.03 Explain satellite weather and terms associated as well as subscription requirements.
42.0	Demonstrate proficiency in the integration of avionics systems as they relate to aircraft pitot static systems. The students will be able to:
	42.01 Explain CPDLC DCL and associated terms.
	42.02 Categorize CAT I, II, III ratings.
	42.03 Explain where the pitot static information is used by the aircraft and how instruments operate.
43.0	Explain cockpit-tower communication and messaging systems. The student will be able to:
	43.01 Explain the origin and mandates and integrations of cockpit to tower communications.
	43.02 Explain the origin and mandates and integrations of FANS-1A certified.
	43.03 Compare and contrast US and European standards.

	43.04 Explain CPDLC DCL and associated terms.
44.0	Identify and properly operate data communication systems used in the aviation industry. The students will be able to:
	44.01 Identify, explain and understand components and operation of ADS-B, and TIS-B and understand the difference (and the difference from TCAS) and interface to the aviation community in operation.
	44.02 Identify, explain and understand components and operation of CPDLC DCL, and FANS1/A+ and understand the difference and the interface to the aviation community in operation.
	44.03 Demonstrate proper termination techniques with multiple sizes and types of pins and cannon plugs to include pressure bulkhead plugs.
	44.04 Demonstrate ability to properly terminate, construct, install and test coax cables from multiple sizes and manufacturers.
45.0	Understand cabin entertainment to include operation and configurations of aircraft Wi-Fi and satellite communication systems. The student will be able to:
	45.01 Compare and contrast receivers and routers.
	45.02 Compare and contrast Wi-Fi and other cabin systems (Direct TV, Airshow etc.).
	45.03 Compare and contrast ground based and satellite-based networks as well as subscription requirements.
46.0	Understand the Iridium constellation and the upgraded capabilities. The student will be able to:
	46.01 Explain the Iridium constellation and the upgraded capabilities.
	46.02 Explain tracking networks, information, services, subscriptions and fleet tracking equipment.

Additional Information

Laboratory Activities

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

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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 AS degree program includes the following College Credit Certificates:

Avionics Technician (0647060908) – 33 credit hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Professional Pilot Technology**
Career Cluster: **Transportation, Distribution and Logistics**

AS	
CIP Number	1649010200
Program Type	College Credit
Program Length	64 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 initial employment with occupational titles as aircraft pilot, airplane pilot, commercial, or to provide supplemental training for persons previously or currently employed in these occupations.

The content includes but is not limited to, communications skills, leadership skills, human relations and employability skills, safe and efficient work practices, Federal Aviation Administration (FAA) pilot certification procedures, aircraft systems and components, flight safety, physics and aerodynamics, and instrumentation.

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 64 credit hours.

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 pertinent Federal Aviation Administration Regulations.
04.0 Demonstrate understanding of meteorology.
05.0 Demonstrate knowledge of aircraft communications equipment.
06.0 Demonstrate knowledge and an 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 Demonstrate employability skills.
13.0 Demonstrate aircraft operations.

Florida Department of Education
Student Performance Standards

Program Title: **Professional Pilot Technology**
CIP Numbers: **1649010200**
Program Length: **64 credit hours**

At the completion of this program, the student will be able to:	
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 health and safety hazards, prevention and correction of environmental problems and know the solutions unique to the industry.
01.02	Demonstrate an awareness and understanding of fueling operations.
01.03	Demonstrate an understanding of situational awareness related to operational hazards.
01.04	Demonstrate an awareness of fire hazards, and awareness of proper techniques to control and extinguish fires.
01.05	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 an airfoil.
02.03	Explain how lift is produced.
02.04	Discuss how and why an airplane stalls and spins.
02.05	Describe and explain how pitot/static, vacuum, pressure, and engine instruments work.
02.06	Explain factors affecting aircraft design, performance, and operation.
02.07	Describe and explain how advanced avionics systems work.
03.0	Understand and explain Federal Aviation Administration Regulations. The student will be able to:
03.01	Explain relevant portions of Parts 1, 61, 91, 110, 119, 121, 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, general 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 Describe a typical engine lubrication system.
	06.03 Describe a typical magneto ignition system, including proper magneto checks.
	06.04 Describe the difference between a normally aspirated engine and one that is supercharged or turbocharged.
	06.05 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 Define radio navigation using both conventional and advanced avionics.
	07.02 Explain the magnetic compass.
	07.03 Describe and demonstrate use of VOR equipment and navigation.
	07.04 Describe and demonstrate use of GPS equipment and navigation.
	07.05 Explain DME, GPS, and RNAV principles.
	07.06 Demonstrate the use of a flight computer.
	07.07 Interpret sectional charts.
	07.08 Interpret enroute and terminal charts and approach plates.
	07.09 Explain lost communications emergency procedures under VFR and IFR.
	07.10 Read and interpret aircraft performance charts.
	07.11 Plot and explain a cross-country course.
	07.12 Describe the FAA national airspace system, including pilot and equipment requirements to fly in controlled airspace.

	07.13 Define DP's and STAR's.
	07.14 Read and interpret instrument approach charts and procedures.
08.0	Demonstrate flight planning skills. The student will be able to:
	08.01 Explain relevant portions of Parts 1, 91, 110, 121, 135, and NTSB 830 of the Federal Aviation 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 Determine route of flight.
	08.06 Demonstrate acquisition of appropriate weather data.
	08.07 Demonstrate proper selection of destination/enroute/alternate airports.
	08.08 Explain fuel requirements.
	08.09 Calculate aircraft performance.
	08.10 Access and analyze NOTAMS.
	08.11 Acquire, define, and validate a mission profile.
	08.12 Demonstrate the creation of, and explain the effective use of a navigation log.
	08.13 Demonstrate methods in VFR/IFR flight planning and demonstrate the ability to make a valid go/no-go decision.
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 Read critically by recognizing assumptions and implications and by evaluating ideas.
	09.06 Demonstrate telephone/communication skills.
	09.07 Demonstrate knowledge and use of appropriate computer skills.
	09.08 Demonstrate effective interpersonal skills.
10.0	Demonstrate analytical skills. The student will be able to:
	10.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.

	10.02 Add, subtract, multiply and divide using fractions, decimals, whole numbers, percentages, and ratios.
	10.03 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	Demonstrate employability skills. The student will be able to:
	12.01 Explain the process for obtaining an FAA commercial pilot certification, single or multi-engine instrument rating.
13.0	Demonstrate aircraft operations. The student will be able to:
	13.01 Demonstrate the operation of aircraft in accordance with FARs, AFMs, and approved procedures and policies.
	13.02 Identify specific aircraft handling characteristics.
	13.03 Explain and demonstrate effective Single-Pilot and Crew Resource Management skills.
	13.04 Demonstrate proper passenger briefing procedures.
	13.05 Demonstrate completion of post-flight documentation.
	13.06 Demonstrate situational awareness.
	13.07 Demonstrate effective decision-making skills.
	13.08 Discuss the issues of fatigue, body rhythms and sleep.
	13.09 Describe the effects of fitness and health on human performance.
	13.10 Discuss how motivation and leadership affects safety in aviation.
	13.11 Discuss the role of training devices and education in reducing errors and increasing safety.
	13.12 Describe how the physical layout of displays and controls and space relate to human factors errors.
	13.13 Explain how documentation problems such as manuals and checklists, maps and charts can cause safety issues.
	13.14 Describe how an aviation safety program is designed to create an environment of safety awareness and accident prevention.
	13.15 Describe the importance of effective single-pilot and crew resource management skills, as well as dispatcher resource management skills.

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

Prior to beginning flight training, students will be required to obtain an FAA medical certificate and comply with the TSA requirements. Community/State Colleges initiating this program are strongly encouraged to visit existing Florida Community/State Colleges with active programs.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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:

Commercial Pilot (0649010202) - 24 credit hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Aviation Maintenance Management**
Career Cluster: **Transportation, Distribution and Logistics**

AS	
CIP Number	1649010401
Program Type	College Credit
Program Length	83 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 Federal Aviation Regulations (FAR) Part 65 pertaining to eligibility for a mechanic certificate and rating(s). Instruction is designed to qualify students for Federal Aviation Administration (FAA) examinations for aviation maintenance powerplant and airframe technician certification as prescribed by FAR 147. The program content should also include training in communication, management leadership, human relations, supervisory 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 83 credit hours.

Standards

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

01.0 Perform basic electricity skills.
02.0 Perform basic aircraft drawing skills.
03.0 Demonstrate aircraft weight and balance skills.
04.0 Maintain aircraft fluid lines and fittings.
05.0 Perform aircraft materials and process skills.
06.0 Perform ground operations and servicing duties.
07.0 Perform cleaning and corrosion control operations.
08.0 Demonstrate mathematics skills.
09.0 Maintain forms and records.
10.0 Apply principles of basic physics.
11.0 Demonstrate the use of maintenance publications.
12.0 Interpret mechanic privileges.
13.0 Perform basic reciprocating engine skills.
14.0 Perform basic turbine engine skills.
15.0 Perform engine inspection.
16.0 Maintain engine instrument systems.
17.0 Maintain engine fire protection systems.
18.0 Maintain engine electrical systems.
19.0 Maintain lubrication systems.
20.0 Maintain ignition systems.
21.0 Maintain fuel metering systems.
22.0 Maintain engine fuel systems.
23.0 Maintain induction and engine airflow systems.
24.0 Maintain engine cooling systems.
25.0 Maintain engine exhaust systems.
26.0 Maintain aircraft propellers.
27.0 Maintain unducted fans.
28.0 Maintain auxiliary power units
29.0 Maintain wood structures.
30.0 Perform aircraft covering.
31.0 Apply aircraft finishes.
32.0 Repair sheet metal structures.
33.0 Perform aircraft welding.
34.0 Perform airframe assembly and rigging.
35.0 Perform airframe inspection.
36.0 Maintain aircraft landing gear systems.

37.0 Maintain hydraulic and pneumatic power systems.
38.0 Maintain cabin atmosphere control systems.
39.0 Maintain aircraft instrument systems.
40.0 Maintain communication and navigation systems.
41.0 Inspect and repair aircraft fuel systems.
42.0 Inspect or repair aircraft electrical systems.
43.0 Inspect and repair position and warning systems.
44.0 Maintain ice and rain control systems.
45.0 Inspect and repair aircraft fire protection systems.
46.0 Demonstrate employability skills for an Aviation Maintenance Powerplant Technician (AMT) with an FAA Powerplant rating.
47.0 Demonstrate the human relations skills necessary for success in supervision.
48.0 Demonstrate knowledge of skills and attitudes the supervisor needs for effective performance.
49.0 Demonstrate a practical approach to job management.
50.0 Demonstrate appropriate communication skills.
51.0 Demonstrate employability skills.
52.0 Demonstrate an understanding of computer skills.

Florida Department of Education
Student Performance Standards

Program Title: **Aviation Maintenance Management**
CIP Numbers: **1649010401**
Program Length: **83 credit hours**

At the completion of this program, the student will be able to:	FAA FAR Part 147
01.0 Perform basic electricity skills. The student will be able to:	
01.01 Calculate and measure capacitance and inductance.	App. B, A, 1. Level 2
01.02 Calculate and measure electrical power.	App. B, A, 2. Level 2
01.03 Measure voltage, current, resistance, and continuity.	App. B, A, 3. Level 3
01.04 Determine the relationship of voltage, current, and resistance in electrical circuits.	App. B, A, 4. Level 3
01.05 Read and interpret aircraft electrical-circuit diagrams, including solid-state devices and logic functions.	App. B, A, 5. Level 3
01.06 Inspect and service batteries.	App. B, A, 6. Level 3
01.07 Utilize proper electrical safety procedures.	
01.08 Troubleshoot electrical systems.	
02.0 Perform basic aircraft drawing skills. The student will be able to:	
02.01 Use aircraft drawings, symbols, and system schematics.	App. B, B, 7. Level 2
02.02 Draw sketches of repairs and alterations.	App. B, B, 8. Level 3
02.03 Use blueprint information.	App. B, B, 9. Level 3
02.04 Use graphs and charts.	App. B, B, 10. Level 3
03.0 Demonstrate aircraft weight and balance skills. The student will be able to:	
03.01 Properly configure aircraft for weighing and capable of setting up and using weighing equipment.	
03.02 Weigh aircraft.	App. B, C, 11. Level 2
03.03 Perform complete weight-and-balance check and record data.	App. B, C, 12. Level 3
04.0 Maintain aircraft fluid lines and fittings. The student will be able to:	
04.01 Utilize proper personal safety procedures for fluid lines and fittings.	
04.02 Fabricate and install rigid and flexible fluid lines and fittings.	App. B, D, 13. Level 3

05.0	Perform aircraft materials and processes skills. The student will be able to:	
05.01	Identify and select appropriate nondestructive testing methods.	App. B, E, 14. Level 1
05.02	Perform dye penetrant, eddy current, ultrasonic, and magnetic particle inspections.	App. B, E, 15. Level 2
05.03	Perform basic heat-treating processes.	App. B, E, 16. Level 1
05.04	Identify and select aircraft hardware and materials.	App. B, E, 17. Level 3
05.05	Inspect and check welds.	App. B, E, 18. Level 3
05.06	Perform precision measurements.	App. B, E, 19. Level 3
05.07	Perform safety wiring techniques.	
06.0	Perform ground operations and servicing duties. The student will be able to:	
06.01	Start, ground operate, move, service, and secure aircraft and identify typical ground-operations hazards.	App. B, F, 20. Level 2
06.02	Identify and select fuels.	App. B, F, 21. Level 2
06.03	Comply with prescribed shop and personal safety procedures.	
07.0	Perform cleaning and corrosion control operations. The student will be able to:	
07.01	Identify and select cleaning materials.	App. B, G, 22. Level 3
07.02	Inspect, identify, remove, and treat aircraft corrosion and perform aircraft cleaning.	App. B, G, 23. Level 3
07.03	Identify and utilize appropriate equipment for cleaning and corrosion control.	
07.04	Observe appropriate personal safety procedures for corrosive chemicals.	
08.0	Demonstrate mathematical skills. The student will be able to:	
08.01	Extract roots and raise numbers to a given power.	App. B, H, 24. Level 3
08.02	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
08.03	Solve ratio, proportion, and percentage problems.	App. B, H, 26. Level 3
08.04	Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.	App. B, H, 27. Level 3
08.05	Solve linear inequalities in one variable and applied problems.	
08.06	Factor polynomials.	
08.07	Simplify algebraic fractions, complex fractions and solve rational and literal equations and applied problems.	
08.08	Determine areas and volumes of various geometrical shapes.	

	08.09 Solve ratio, proportion, and percentage problems.	
	08.10 Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.	
	08.11 Graph linear equations and inequalities in two variables and solve graph systems of linear equations and inequalities in two variables.	
	08.12 Solve and graph quadratic equations and inequalities with real solutions and solve related word problems.	
	08.13 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.	
	08.14 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.	
	08.15 Determine the correct purchase price, to include sales tax, for a materials list containing a minimum of six items.	
	08.16 Demonstrate an understanding of federal, state and local taxes and their computation.	
09.0	Maintain forms and records. The student will be able to:	
	09.01 Write descriptions of work performed including aircraft discrepancies and corrective actions using typical aircraft maintenance records.	App. B, I, 28. Level 3
	09.02 Complete required maintenance forms, records, and inspection reports.	App. B, I, 29. Level 3
10.0	Apply principles of basic physics. The student will be able to:	
	10.01 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
	10.02 Understand molecular action as a result of temperature extremes, chemical reactions, and moisture content.	
	10.03 Draw conclusions or make inferences from data.	
	10.04 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.	
	10.05 Understand pressure measurement in terms of P.S.I., inches of mercury and K.P.A.	
11.0	Demonstrate the use of maintenance publications. The student will be able to:	
	11.01 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
	11.02 Identify the information in Federal Aviation Regulations (FAR) Part 65 pertaining to eligibility for Aviation Maintenance Technician (AMT) certification and ratings.	
	11.03 Identify the FAA requirements that must be satisfied in order to display the FAA Airframe and Powerplant license.	

	11.04 Read technical data.	App. B, K, 32. Level 3
12.0	Interpret mechanic privileges. The student will be able to:	
	12.01 Exercise mechanic privileges within the limitations prescribed by Part 65 of this chapter.	App. B, L, 33. Level 3
13.0	Perform basic reciprocating engine skills. The student will be able to:	
	13.01 Inspect and repair a radial engine.	App. D, I, A, 1. Level 1
	13.02 Overhaul reciprocating engine.	App. D, I, A, 2. Level 2
	13.03 Inspect, check, service, and repair reciprocating engines and engine installations.	App. D, I, A, 3. Level 3
	13.04 Install, troubleshoot, and remove reciprocating engines.	App. D, I, A, 4. Level 3
14.0	Perform basic turbine engine skills. The student will be able to:	
	14.01 Overhaul turbine engine.	App. D, I, B, 5. Level 2
	14.02 Inspect, check, service, and repair turbine engines and turbine engine installations.	App. D, I, B, 6. Level 3
	14.03 Install, troubleshoot, and remove turbine engines.	App. D, I, B, 7. Level 3
15.0	Perform engine inspection. The student will be able to:	
	15.01 Perform powerplant conformity and air worthiness inspections.	App. D, I, C, 8. Level 3
16.0	Maintain engine instrument systems. The student will be able to:	
	16.01 Troubleshoot, service, and repair electrical and mechanical fluid rate-of-flow indicating systems.	App. D, II, A, 9. Level 2
	16.02 Inspect, check, service, troubleshoot, and repair electrical and mechanical engine temperature, pressure, and revolutions per minute (rpm) indicating systems.	App. D, II, A, 10. Level 2
17.0	Maintain engine fire protection systems. The student will be able to:	
	17.01 Inspect, check service, troubleshoot, and repair engine fire detection and extinguishing systems.	App. D, II, B, 11. Level 3
18.0	Maintain engine electrical systems. The student will be able to:	
	18.01 Repair engine electrical system components.	App. D, II, C, 12. Level 2
	18.02 Install, check and service engine electrical wiring, controls, indicators, and protective devices.	App. D, II, C, 13. Level 3
19.0	Maintain lubrication systems. The student will be able to:	
	19.01 Identify and select lubricants.	App. D, II, D, 14. Level 2
	19.02 Repair engine lubrication system components.	App. D, II, D, 15. Level 2
	19.03 Inspect, check, service, troubleshoot, and repair engine lubrication system.	App. D, II, D, 16. Level 3
20.0	Maintain ignition systems. The student will be able to:	

	20.01 Overhaul magneto and ignition harness.	App. D, II, E, 17. Level 2
	20.02 Inspect, service, troubleshoot, and repair reciprocating and turbine engine ignition systems and components.	App. D, II, E, 18. Level 2
	20.03 Inspect, service, troubleshoot, and repair turbine engine electrical starting systems.	App. D, II, E, 19a. Level 3
	20.04 Inspect, service, and troubleshoot turbine engine pneumatic starting systems.	
21.0	Maintain fuel metering systems. The student will be able to:	
	21.01 Troubleshoot and adjust turbine engine fuel metering systems and electronic engine fuel controls.	App. D, II, F, 20. Level 1
	21.02 Overhaul carburetor.	App. D, II, F, 21. Level 1
	21.03 Repair engine fuel metering system components.	App. D, II, F, 22. Level 2
	21.04 Inspect, check, troubleshoot, and repair reciprocating and turbine engine fuel metering systems.	App. D, II, F, 23. Level 3
22.0	Maintain engine fuel systems. The student will be able to:	
	22.01 Repair engine fuel system components.	App. D, II, G, 24. Level 2
	22.02 Inspect, check, service, troubleshoot, and repair engine fuel systems.	App. D, II, G, 25. Level 3
23.0	Maintain induction and engine airflow systems. The student will be able to:	
	23.01 Inspect, check, troubleshoot, service and repair engine ice and rain control systems.	App. D, II, H, 26. Level 2
	23.02 Inspect, check, service, troubleshoot and repair heat exchangers, superchargers and turbine engine airflow and temperature control systems.	App. D, II, H, 27. Level 1
	23.03 Inspect, check, service, and repair carburetor air intake and induction manifolds.	App. D, II, H, 28. Level 3
24.0	Maintain engine cooling systems. The student will be able to:	
	24.01 Repair engine cooling system components.	App. D, II, I, 29. Level 2
	24.02 Inspect, check, troubleshoot, service and repair engine cooling systems.	App. D, II, I, 30. Level 3
25.0	Maintain engine exhaust systems. The student will be able to:	
	25.01 Repair engine exhaust system components.	App. D, II, J, 31. Level 2
	25.02 Inspect, check, troubleshoot, service and repair engine exhaust systems.	App. D, II, J, 32a. Level 3
	25.03 Troubleshoot and repair engine thrust reverser systems and related components.	App. D, II, J, 32b. Level 1
26.0	Maintain aircraft propellers. The student will be able to:	
	26.01 Inspect, check, service and repair propeller synchronizing and ice control systems.	App. D, II, K, 33. Level 1
	26.02 Identify and select propeller lubricants.	App. D, II, K, 34. Level 2
	26.03 Balance propellers.	App. D, II, K, 35. Level 1

	26.04 Repair propeller control system components.	App. D, II, K, 36. Level 2
	26.05 Inspect, check, service, and repair fixed-pitch, constant-speed, and feathering propellers, and propeller governing systems.	App. D, II, K, 37. Level 3
	26.06 Install, troubleshoot and remove propellers.	App. D, II, K, 38. Level 3
	26.07 Repair aluminum alloy propeller blades.	App. D, II, K, 39. Level 3
27.0	Maintain unducted fans. The student will be able to:	
	27.01 Inspect and troubleshoot unducted fan systems and components.	App. D, II, L, 40. Level 1
28.0	Maintain auxiliary power units. The student will be able to:	
	28.01 Inspect, check, service, and troubleshoot turbine-driven auxiliary power units.	
29.0	Maintain wood structures. The student will be able to:	
	29.01 Service and repair wood structures.	App. C, I, A, 1. Level 1
	29.02 Identify wood defects.	App. C, I, A, 2. Level 1
	29.03 Inspect wood structures.	App. C, I, A, 3. Level 1
30.0	Perform aircraft covering. The student will be able to:	
	30.01 Select and apply fabric and fiberglass covering materials.	App. C, I, B, 4. Level 1
	30.02 Inspect, test and repair fabric and fiberglass.	App. C, I, B, 5. Level 1
31.0	Apply aircraft finishes. The student will be able to:	
	31.01 Apply trim, letters and touch-up paint.	App. C, I, C, 6. Level 1
	31.02 Identify and select aircraft finishing materials.	App. C, I, C, 7. Level 2
	31.03 Apply finishing materials.	App. C, I, C, 8. Level 2
	31.04 Inspect finishes and identify defects.	App. C, I, C, 9. Level 2
	31.05 Demonstrate an understanding of common safety practices dealing with paints and solvents.	
32.0	Repair sheet metal structures. The student will be able to:	
	32.01 Select, install, and remove special fasteners for metallic, bonded, and composite structures.	App. C, I, D, 10. Level 2
	32.02 Inspect bonded structures.	App. C, I, D, 11. Level 2
	32.03 Inspect, test, and repair fiberglass, plastics, honeycomb, composite, and laminated primary and secondary structures.	App. C, I, D, 12. Level 2
	32.04 Inspect, check, service, and repair windows, doors, and interior furnishings.	App. C, I, D, 13. Level 2
	32.05 Inspect and repair sheet-metal structures.	App. C, I, D, 14. Level 3

	32.06 Install conventional rivets.	App. C, I, D, 15. Level 3
	32.07 Form, lay out, and bend sheet metal.	App. C, I, D, 16. Level 3
33.0	Perform aircraft welding. The student will be able to:	
	33.01 Weld magnesium and titanium.	App. C, I, E, 17. Level 1
	33.02 Solder stainless steel.	App. C, I, E, 18. Level 1
	33.03 Fabricate tubular structures.	App. C, I, E, 19. Level 1
	33.04 Solder, braze, gas-weld and arc-weld steel.	App. C, I, E, 20. Level 2
	33.05 Weld aluminum and stainless steel.	App. C, I, E, 21. Level 1
34.0	Perform airframe assembly and rigging. The student will be able to:	
	34.01 Rig rotary-wing aircraft.	App. C, I, F, 22. Level 1
	34.02 Rig fixed-wing aircraft.	App. C, I, F, 23. Level 2
	34.03 Check alignment of structures.	App. C, I, F, 24. Level 2
	34.04 Assemble aircraft components, including flight control surfaces.	App. C, I, F, 25. Level 3
	34.05 Balance, rig, and inspect movable primary and secondary flight control surfaces.	App. C, I, F, 26. Level 3
	34.06 Jack aircraft.	App. C, I, F, 27. Level 3
35.0	Perform airframe inspection. The student will be able to:	
	35.01 Perform conformity and airworthiness inspections.	App. C, I, G, 28. Level 3
36.0	Maintain aircraft landing gear systems. The student will be able to:	
	36.01 Inspect, check, service, and repair landing gear, retraction systems, shock struts, bakes, wheels, tires, and steering systems.	App. C, II, A, 29. Level 3
	36.02 Utilize proper safety procedures and equipment when working on aircraft with electrical or hydraulic power on.	
	36.03 Utilize proper safety procedures when working on landing gear struts or wheel and tire assemblies.	
37.0	Maintain hydraulic and pneumatic power systems. The student will be able to:	
	37.01 Repair hydraulic and pneumatic power system components.	App. C, II, B, 30. Level 2
	37.02 Identify and select hydraulic fluids.	App. C, II, B, 31. Level 3
	37.03 Inspect, check, service, troubleshoot, and repair hydraulic and pneumatic power systems.	App. C, II, B, 32. Level 3
38.0	Maintain cabin atmosphere control systems. The student will be able to:	
	38.01 Inspect, check, troubleshoot, service, and repair heating, cooling, air-conditioning, pressurization	App. C, II, C 33. Level 1

	systems, and air cycle machines.	
38.02	Inspect, check, troubleshoot, service, and repair heating, cooling, air-conditioning, and pressurization systems.	App. C, II, C 34. Level 1
38.03	Inspect, check, troubleshoot, service and repair oxygen systems.	App. C, II, C 35. Level 2
39.0	Maintain aircraft instrument systems. The student will be able to:	
39.01	Inspect, check, service, troubleshoot and repair electronic flight instrument systems and both mechanical and electrical heading, speed, altitude, temperature, pressure, and position indicating systems to include the use of built-in test equipment.	App. C, II, D, 36. Level 1
39.02	Install instruments and perform a static pressure system leak test	App. C, II, D, 37. Level 2
40.0	Maintain communication and navigation systems. The student will be able to:	
40.01	Inspect, check, and troubleshoot autopilot servos and approach coupling systems.	App. C, II, E, 38. Level 1
40.02	Inspect, check, and service aircraft electronic communications and navigation systems, including VHF, ILS, LORAN, Radar beacon transponders, flight management computers, and GPWS.	App. C, II, E, 39. Level 1
40.03	Inspect and repair antenna and electronic equipment installations.	App. C, II, E, 40. Level 2
41.0	Inspect and repair aircraft fuel systems. The student will be able to:	
41.01	Check and service fuel dump systems.	App. C, II, F, 41. Level 1
41.02	Perform fuel management, transfer and defueling.	App. C, II, F, 42. Level 1
41.03	Inspect, check and repair pressure fueling systems.	App. C, II, F, 43. Level 1
41.04	Repair aircraft fuel system components.	App. C, II, F, 44. Level 2
41.05	Inspect and repair fluid quantity indicating systems.	App. C, II, F, 45. Level 2
41.06	Troubleshoot, service and repair fluid and temperature warning systems.	App. C, II, F, 46. Level 2
41.07	Inspect, check, service, troubleshoot and repair aircraft fuel systems.	App. C, II, F, 47. Level 3
42.0	Inspect and repair aircraft electrical systems. The student will be able to:	
42.01	Repair and inspect aircraft electrical system components; crimp and splice wiring to manufacturers' specifications; and repair pins and sockets of aircraft connectors.	App. C, II, G, 48. Level 2
42.02	Install, check, and service airframe electrical wiring, controls, switches, indicators, and protective devices.	App. C, II, G, 49. Level 2
42.03	Inspect, check, troubleshoot, service and repair alternating and direct current electrical systems.	App. C, II, G, 50a. Level 3
42.04	Inspect, check, and troubleshoot constant speed and integrated speed drive generators.	App. C, II, G, 50b. Level 1
43.0	Inspect and repair position and warning systems. The student will be able to:	
43.01	Inspect, check, and service speed and configuration warning systems, electrical brake controls, and	App. C, II, H, 51. Level 2

	anti-skid systems.	
	43.02 Inspect, check, troubleshoot, and service landing gear position indicating and warning systems.	App. C, II, H, 52. Level 3
44.0	Maintain ice and rain control systems. The student will be able to:	
	44.01 Inspect, check, troubleshoot, service, and repair airframe ice and rain control systems.	App. C, II, I, 53. Level 2
45.0	Inspect and repair aircraft fire protection systems. The student will be able to:	
	45.01 Inspect, check and service smoke and carbon monoxide detection systems.	App. C, II, J, 54. Level 1
	45.02 Inspect, check, service, troubleshoot, and repair aircraft fire detection and extinguishing systems.	App. C, II, J, 55. Level 3
46.0	Demonstrate employability skills for an Aviation Maintenance Powerplant Technician (AMT) with an FAA Powerplant rating. The student will be able to:	
	46.01 Conduct a job search for an AMT position.	
	46.02 Secure information about the requirements for an AMT in a particular firm.	
47.0	Demonstrate the human relations skills necessary for success in supervision. The student will be able to:	
	47.01 Exhibit the ability to get along with others.	
	47.02 Discuss the importance of human relations.	
	47.03 Develop and demonstrate the unique human relations skills needed for successful job attainment and progress in supervising others.	
48.0	Demonstrate knowledge of skills and attitudes the supervisor needs for effective performance. The student will be able to:	
	48.01 Describe leadership theory and its complexity.	
	48.02 Discuss how a new supervisor is introduced to leadership responsibilities.	
	48.03 Identify the legal and social environment for supervision.	
	48.04 Discuss pertinent legislation and the role of government intervention.	
	48.05 Describe problems in union and non-union organizations.	
49.0	Demonstrate a practical approach to job management. The student will be able to:	
	49.01 Assume responsibility in planning and coordinating resources.	
	49.02 Demonstrate effective decision making and problem-solving techniques.	
	49.03 Implement methods of work improvement.	
50.0	Demonstrate appropriate communication skills. The student will be able to:	
	50.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.	

	50.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.	
	50.03 Read and follow written and oral instructions.	
	50.04 Answer and ask questions coherently and concisely.	
	50.05 Read critically by recognizing assumptions and implications and by evaluating ideas.	
	50.06 Demonstrate appropriate telephone/communication skills.	
	50.07 Describe the importance of clear and concise writing.	
	50.08 Demonstrate proficiency in the effective use of speech and vocabulary.	
	50.09 Explain the importance of good listening skills.	
	50.10 Discuss the role communication plays in management.	
	50.11 Demonstrate the components of the communication process.	
	50.12 Demonstrate effective written communication skills.	
	50.13 Demonstrate effective oral communication skills.	
	50.14 Write technical reports.	
51.0	Demonstrate employability skills. The student will be able to:	
	51.01 Conduct a job search.	
	51.02 Secure information about a job.	
	51.03 Identify documents which may be required when applying for a job.	
	51.04 Complete a job application form correctly.	
	51.05 Demonstrate competence in job interview techniques.	
	51.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.	
	51.07 Identify acceptable work habits.	
	51.08 Demonstrate knowledge of how to make appropriate job changes.	
	51.09 Demonstrate acceptable employee health and grooming habits.	
	51.10 Exhibit punctuality, initiative, courtesy, loyalty and honesty.	
	51.11 Demonstrate knowledge of the Federal as recorded in (29 CFR-1910.1200).	
52.0	Demonstrate an understanding of computer skills. The student will be able to:	
	52.01 Demonstrate use of spreadsheets, databases and word processing.	

52.02 Demonstrate use of Internet including locating information, copying and printing web-based information.	
52.03 Demonstrate general knowledge of computer components.	
52.04 Demonstrate the location and use of antivirus capability.	
52.05 Demonstrate the ability to communicate by e-mail.	

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 as aircraft mechanics, aircraft maintenance supervisors, or aviation maintenance managers. Graduates will be eligible to pursue FAA certification as airframe and powerplant mechanics and will be trained to troubleshoot maintenance problems and supervise mechanics in the aviation industry. This program also provides supplemental training for persons previously or currently employed in this occupation.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Aviation industry; planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues. Since 83 credit hours are required in this curriculum, two summer terms will probably be required to complete the program within two years. Consideration should be given to making one or both summer terms a hands-on cooperative work experience for 5 credit hours.

An important note to consider is that each FAR PART 147 school must be approved by the FAA before any students can be placed in the program.

Required FAA exams include GENERAL written, oral, and practical; AIRFRAME written, oral, and practical; and POWERPLANT written, oral and practical. The only way a person can get authorization to take these examinations 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, torsion 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.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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:

Airline Maintenance Procedures and Records Management (0649010411) – 18 credit hours
Aviation Airframe Mechanics (0649010409) – 24 credit hours
Aviation Mechanic (0649010408) – 12 credit hours
Aviation Powerplant Mechanics (0649010410) – 24 credit hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Aviation Administration**
Career Cluster: **Transportation, Distribution and Logistics**

AS	
CIP Number	1649010403
Program Type	College Credit
Program Length	60 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 who are seeking employment in the aviation/airline/airport fields. Some of the students will able to obtain opportunities in the federal, state and local government aviation fields, while others will find opportunities in airline fields, such as initial entry level jobs in customer service and operations and air cargo as well as lower to middle level management positions. Others will find positions in supporting aviation entities, such as suppliers and service providers to airlines, government aviation agencies, air traffic control, and aircraft dispatch.

The aviation-specific content covered by this framework includes, but is no limited to airport facility equipment, ground equipment; aircraft operating requirements/limitations, navigational equipment, aviation weather reports and conditions, air traffic control equipment/procedures; customer service information technology tools, Federal Aviation Administration regulations, and air cargo ground handling equipment and procedures.

The general administrative content covered in this framework includes but is not limited to, communication skills, leadership skills, directing, planning and controlling, human relations and employability skills, safe and efficient work practices, technical skills such as aircraft and ground equipment operations and terminology, records management, security 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 60 credit hours.

Standards

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

01.0 Demonstrate an understanding of basic aviation terminology and history.
02.0 Demonstrate effective communication skills.
03.0 Demonstrate an understanding of aviation operations practices, limitations and procedures.
04.0 Demonstrate an understanding of federal, state and other governmental laws, rules and policies as they relate to aviation.
05.0 Demonstrate an understanding of aviation and airport management practices.
06.0 Demonstrate an understanding of aviation security.
07.0 Demonstrate an understanding of aviation/airline marketing, customer service/sales, and reservations/ticketing.
08.0 Demonstrate an understanding of fundamentals of flight.
09.0 Demonstrate an understanding of meteorology.
10.0 Demonstrate an understanding of aviation safety and human factors, including accident prevention.
11.0 Demonstrate an understanding of air traffic control procedures and policies.
12.0 Demonstrate an understanding of air cargo operations and procedures.
13.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Aviation Administration**
CIP Numbers: **1649010403**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of basic aviation terminology and history. The student will be able to:
01.01	Explain the overall scope and breadth of the aviation industry including its impact on the economy.
01.02	Distinguish the terms and vocabularies that are used in the aerospace and commercial aviation industry.
01.03	Describe the history of technological, governmental, social and economic developments of aviation.
01.04	Explain the different types and categories of aircraft in use in the industry by distinguishing and identifying: Various wide body, narrow body types and general aviation aircraft.
01.05	Demonstrate an understanding of the oversight role of the Federal Government and its effect on the aviation industry.
02.0	Demonstrate effective communication skills. The student will be able to:
02.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
02.02	Read and understand graphs, charts, diagrams and tables commonly used in this industry/occupational area.
02.03	Read and follow written and oral English instructions.
02.04	Answer and ask questions coherently and concisely.
02.05	Read critically by recognizing assumptions and implications and by evaluating ideas.
02.06	Demonstrate appropriate telephone/communications skills.
02.07	Demonstrate knowledge and use of appropriate computer skills.
02.08	Demonstrate effective interpersonal skills.
02.09	List the more common labels found in the Restricted Articles Regulations: as published in bulletins by International Air Transport Association (IATA).
03.0	Demonstrate an understanding of aviation operations practices, limitations and procedures. The student will be able to:
03.01	Demonstrate knowledge of aircraft systems as they apply to flight operations, including engines, fuel, electrical, hydraulics, pneumatics, flight controls and avionics.
03.02	Understand the various factors of aircraft performance, including takeoff, enroute and landing limitations and weight and balance.

03.03	Demonstrate knowledge of the function of flight operations, including pilot hiring, training, standards, safety issues, security issues, FAA and TSA regulations, documentation requirements, operations specifications, operating within the ATC system, and crew scheduling as well as flight attendant and aircraft dispatcher requirements.
03.04	Describe maintenance operations and their role and effect on flight operations.
03.05	Demonstrate an understanding of the role of the flight operations professional in the economic and planning functions.
03.06	Explain FAA requirements such as flight standards, types of certificates, training and record keeping, surveillance, and investigations, as well as the operator's response and its relationship with the FAA.
03.07	Describe the role of the National Transportation Safety Board in accident investigation, NASA's role in aviation safety reporting systems and research, and industry-specific safety reporting programs.
03.08	Demonstrate knowledge of the application of information technology systems in flight operations as they relate to flight planning systems, flight management systems, satellite communication and navigation systems, weight and balance, maintenance monitoring, and management information systems.
04.0	Demonstrate an understanding of federal, state and other governmental laws, rules and policies as they relate to aviation. The student will be able to:
04.01	Demonstrate knowledge of the history and foundations of the legal and court system in the United States as it pertains to development of aviation law and regulations.
04.02	Explain the role and function of the U.S. DOT, FAA, TSA, and the NTSB as it relates to their legal responsibilities and authority.
04.03	Demonstrate knowledge of airmen rights and responsibilities, negligence, FAA enforcement, immunity, and degrees of care.
04.04	Explain state aviation law, relating to airports, fixed based operators, aircraft sales, registration, and taxation issues.
04.05	Demonstrate knowledge of the legal matters relating to the aircraft manufacturing and airline industry, including warranties, products liability, negligence, accident litigation, labor, and consumer issues.
04.06	Demonstrate knowledge of international air law, bilateral and multilateral agreements, international jurisdiction, and limits of liability and damages.
04.07	Demonstrate knowledge of legal issues that relate to aviation security.
05.0	Demonstrate an understanding of aviation and airport management practices. The student will be able to:
05.01	Describe how historical and current changes in competition, social factors, government policies, and technology affect aviation and airport management.
05.02	Demonstrate understanding of organizational design and functional areas of an aviation business.
05.03	Demonstrate understanding of the various functions of an airport, including airside and landside operations and management, financial planning, airport master plans, environmental issues, and land use.
05.04	Describe the factors of effective communication, leadership styles, and motivating employees in an aviation environment with an emphasis on individual performance.
05.05	Demonstrate an understanding of labor relations contract negotiations, and the grievance process in an aviation environment, including issues specific to airline labor relations.
05.06	Explain how strategic planning and control processes are used in the aviation industry.

06.0	Demonstrate an understanding of aviation security. The student will be able to:
06.01	Describe aviation security threats and responses.
06.02	Discuss aspects of aviation security, such the Aviation Safety and Security Act of 2001, and FAR Parts 108 and 109.
06.03	Describe the components of a layered aviation security system, including personnel selection and training, and performance of security personnel.
06.04	Explain the importance of planning for security threats, and having contingency plans and responsive measures.
06.05	Explain the ground security measures and technology, including restricted access, inspections of personnel, baggage and goods, and effective screening techniques.
06.06	Discuss inflight threats and security procedures.
07.0	Demonstrate an understanding of aviation/airline marketing, customer service/sales, and reservations/ticketing. The student will be able to:
07.01	Explain the Marketing Concept and how it differs from the Product and Sales Concepts.
07.02	Analyze the various environmental factors that affect aviation/airline marketing.
07.03	Demonstrate an understanding of market demographics, segmentation, methods of market research and analysis, and pricing strategies.
07.04	Analyze why a customer buys a particular product or service.
07.05	Explain the advantages and disadvantages of the media available for aviation industry advertising and promotion.
07.06	Describe the factors of delivering quality customer service, why companies lose customer, and how to salvage a bad customer experience.
07.07	Explain the principles of reservations, ticketing, internet sales, e-ticketing, and travel agency functions.
08.0	Demonstrate an understanding of fundamentals of flight. The student will be able to:
08.01	Name and compare the four forces of flight.
08.02	Describe an airfoil.
08.03	Explain how lift is produced.
08.04	Discuss how and why an airplane stalls and spins.
08.05	Describe and explain how pitot/static vacuum, pressure and engine instruments work.
08.06	Explain factors affecting aircraft design, performance, and operation.
09.0	Demonstrate understanding of meteorology. The student will be able to:
09.01	Describe the composition, circulation and stability of the atmosphere.
09.02	Demonstrate an understanding of air mass development, the movement of fronts and their effect on aviation.

	09.03 Demonstrate an awareness of weather hazards to aviation and an understanding of how to avoid them.
	09.04 Demonstrate the ability to access weather information prior to and during flights through a variety of media.
	09.05 Interpret printed reports, forecasts and graphic weather products.
10.0	Demonstrate an understanding of aviation safety and human factors, including accident prevention. The student will be able to:
	10.01 Describe the nature of human factors and sources of errors.
	10.02 Discuss the issues of fatigue, body rhythms and sleep.
	10.03 Describe the effects of fitness and health on human performance.
	10.04 Discuss how motivation and leadership affects safety in aviation.
	10.05 Discuss the role of training devices and education in reducing errors and increasing safety.
	10.06 Describe how the physical layout of displays and controls and space relate to human factors errors.
	10.07 Explain how documentation problems such as manuals and checklists, maps and charts can cause safety issues.
	10.08 Describe how an aviation safety program is designed to create an environment of safety awareness and accident prevention.
	10.09 Describe the importance of effective single-pilot and crew resource management skills, as well as dispatcher resource management skills.
11.0	Demonstrate an understanding of air traffic control procedures and policies. The student will be able to:
	11.01 Discuss the basic terminology and communications phraseology that is used in air traffic control.
	11.02 Describe airspace classifications that are used in air traffic control.
	11.03 Discuss separation of aircraft requirements.
	11.04 Demonstrate an understanding of the Federal Aviation Regulations that apply to air traffic control.
	11.05 Explain aircraft characteristics and recognition.
	11.06 Describe instrument procedures, for departure, arrival and for IFR flight plans.
	11.07 Discuss the weather hazards to aircraft, including wake turbulence, downbursts and restrictions to visibility.
	11.08 Review ATC Clearances, including their purpose and the different types of ATC clearances, the appropriate sequence and pilot responsibilities for compliance.
	11.09 Describe the fundamentals of radar, including information about primary and secondary radar systems.
	11.10 Explain strip marking (radar and non-radar), including the basic outline for strip marking and the associated symbologies for Enroute, Terminal, and Flight Service Options.
	11.11 Explain non-radar procedures, including horizontal and vertical separation, timed approaches.
12.0	Demonstrate an understanding of air cargo operations and procedures. The student will be able to:

12.01	Describe the importance of air cargo to the economy.
12.02	Describe air cargo customers, freight forwarders, customs brokers, and how marketing is done in the air cargo industry.
12.03	Explain the different classes of air cargo, and the required documentation of each.
12.04	Describe and discuss cargo packaging and how cargo is loaded on an aircraft.
12.05	Describe HAZMAT classification, labeling, packaging, shipping requirements, and related incident/accident procedures and required reports.
12.06	Describe the security requirements for air cargo personnel, facilities, and aircraft.
13.0	Demonstrate employability skills. The student will be able to:
13.01	Describe positions available and requirements for careers in aviation administration.
13.02	Describe qualification and certification requirements for careers in aviation administration.

Additional Information

Laboratory Activities

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

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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:

Air Cargo Management (0649010404) – 16 credit hours
Airline/Aviation Management (0649010403) – 16 credit hours
Airport Management (0649010405) – 16 credit hours
Passenger Agent (0649010406) – 16 credit hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Aviation Operations**
Career Cluster: **Transportation, Distribution and Logistics**

AS	
CIP Number	1649010404
Program Type	College Credit
Program Length	60 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 initial employment as communication, transportation, utility management, air station managers or provide supplemental training for persons previously or currently employed in these occupations.

The content includes but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, technical writing, records management, security, Federal Aviation Administration regulations, data processing, and air cargo transportation.

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

Program Structure

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

Standards

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

01.0 Demonstrate understanding of safe and efficient work practices.
02.0 Demonstrate understanding of federal and state security procedures.
03.0 Demonstrate appropriate math skills.
04.0 Demonstrate understanding of Federal Aviation Administration, state and other governmental laws, rules and policies.
05.0 Demonstrate understanding of business law and management pertaining to aviation operations.
06.0 Demonstrate understanding of personnel management.
07.0 Demonstrate understanding of aviation safety and accident prevention and investigation.
08.0 Demonstrate appropriate communication skills.
09.0 Prepare, analyze and evaluate technical reports and data.
10.0 Demonstrate appropriate understanding of basic science.
11.0 Demonstrate employability skills.
12.0 Demonstrate an understanding of entrepreneurship.

Florida Department of Education
Student Performance Standards

Program Title: **Aviation Operations**
CIP Numbers: **1649010400**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of safe and efficient work practices. The student will be able to:
01.01	Demonstrate an awareness and understanding of health and safety hazards, prevention and correction of ecological problems and know the solutions unique to the industry.
01.02	Demonstrate an awareness and understanding of fueling hazards.
01.03	Demonstrate an awareness and understanding of physical hazards.
01.04	Demonstrate an awareness and understanding of fire hazards.
01.05	Demonstrate an awareness of the proper techniques to control and extinguish fires.
01.06	Demonstrate an awareness and understanding of the need for safety devices, controls, guards and equipment.
01.07	Demonstrate full awareness and understanding of personal protective equipment (PPE).
02.0	Demonstrate understanding of federal and state security procedures. The student will be able to:
02.01	Describe passenger security systems in use.
02.02	Describe and define federal security laws.
02.03	Identify the role of local law enforcement agencies.
02.04	List known security risk features.
02.05	Describe standard cargo theft precautions used at airports and related facilities.
02.06	Describe the International Air Transport Association.
02.07	List the more common labels found in the Restricted Articles Regulations; as published in bulletins by IATA.
03.0	Demonstrate appropriate math skills. The student will be able to:
03.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
03.02	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
03.03	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.

04.0	Demonstrate understanding of federal aviation administration, state and other governmental laws, rules and policies. The student will be able to:
04.01	Describe the economic, social and political importance of commercial aviation, general aviation and aircraft manufacturing in the United States.
04.02	Describe the function, basic organization and responsibility of the National Transportation Safety Board.
04.03	Explain major portions of relevant Parts of Federal Aviation Regulations and ICAO standards.
04.04	List and describe the federal statutes pertaining to the economic regulation of the airline industry.
04.05	Demonstrate an understanding of federal, state and local taxes.
04.06	List and describe the major federal statutes pertaining to the regulation of aviation safety.
04.07	Describe the historical and current relationship between the U.S. Post Office and the aviation industry.
04.08	List and describe six categories of general aviation.
04.09	Describe the development of aviation laws and their analogy to the Law of the Sea.
04.10	Describe how aviation is affected by state departments of transportation, including aircraft sales, maintenance, and passenger transport.
04.11	Describe and explain Title II (Safety and Pilot training improvement) of the Airline Safety and Federal Aviation Administration Extension Act of 2010.
05.0	Demonstrate understanding of business law and management pertaining to aviation operations. The student will be able to:
05.01	Describe and identify in what manner and under what conditions an airport may be exposed to a lawsuit.
05.02	Identify and discuss fundamental aspects of business law that relate to aviation operations.
05.03	Explain how an employee's action or inaction may subject an aviation organization to a lawsuit.
05.04	Describe the classification of airports and their economic role as well as management issues facing airport systems.
05.05	Discuss the importance of integrating airport planning with federal, state and local interests in developing airport systems.
05.06	Describe the major components that go into the overall operating and capital expenditure programs related to aviation operations including revenue sources.
06.0	Demonstrate understanding of personnel management. The student will be able to:
06.01	Name and describe the basic guides in personnel management.
06.02	Discuss governmental relations in personnel management.
06.03	Explain the general nature of personnel problems, and approaches to problem solving.
06.04	Demonstrate knowledge of the minimum standard for work practices.
06.05	Describe training, education, and professional development available to personnel.

06.06	Calculate the staff necessary to attain goals; and equipment and resources they will require.
06.07	Explain how the requirements to attain stated goals will necessitate the allocation of stated budgets.
06.08	Name and describe the rules/regulations associated with Americans with Disabilities Act.
07.0	Demonstrate understanding of aviation safety, accident prevention and investigation. The student will be able to:
07.01	State and discuss the portion of the Federal Aviation Act of 1958 as amended, which is generally described as Title VI, Safety Regulations of Civil Aeronautics.
07.02	Demonstrate knowledge of the minimum standards governing design, materials workmanship, performance of aircraft, inspection, servicing, overhaul of aircraft, and parts and appliances, equipment and facilities, as required by section 601(a) of Federal Aviation Act of 1958 Section 601(a).
07.03	Discuss the maximum hours of service for airmen and other employees, and other practices, methods, and procedures as required by Section 601(a) of the Federal Aviation Act of 1958.
07.04	Explain the Federal Aviation Regulations (FAR's) promulgated by the Administrator to implement the authority granted by the Federal Aviation Act of 1958, in the area of safety, and to prevent accidents.
07.05	Demonstrate full knowledge of 14 CFR 830 and be able to explain the notification and reporting criteria of aircraft accidents or incidents.
07.06	Identify health-related problems, which may result from exposure to work-related chemicals and hazardous materials, and know the use of Safety Data Sheets (SDS) and the proper precautions required for handling such materials.
08.0	Demonstrate appropriate communication skills. The student will be able to:
08.01	Write logical and understandable statements, or phrases, to complete with accuracy the forms/invoices commonly used in business and industry.
08.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
08.03	Read and follow written and oral instructions.
08.04	Answer and ask questions coherently and concisely.
08.05	Read critically by recognizing assumptions and implications and by evaluating ideas.
08.06	Demonstrate appropriate verbal and electronic communication skills.
09.0	Prepare, analyze and evaluate technical reports and data. The student will be able to:
09.01	State the five basic guidelines for preparation of technical reports.
09.02	Compare the difference between technical and literary description.
09.03	Describe the techniques used in technical report writing.
09.04	Discuss the arrangement of the technical written report – such as: cause and effect, inductive and deductive, enumeration and classification, problems and solution.
09.05	Explain the preparatory work or stages in the process, such as the writing, the drafts, use of the library, and polishing style.

	09.06 List types of reports, and describe use of illustrations.
	09.07 Discuss the steps in developing an oral presentation.
10.0	Demonstrate appropriate understanding of basic science. The student will be able to:
	10.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	10.02 Draw conclusions or make inferences from data.
	10.03 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.
	10.04 Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
11.0	Demonstrate employability skills. The student will be able to:
	11.01 Conduct a job search.
	11.02 Secure information about a job.
	11.03 Identify documents which may be required when applying for a job interview.
	11.04 Complete a job application form correctly.
	11.05 Demonstrate competence in job interview techniques.
	11.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
	11.07 Identify acceptable work habits.
	11.08 Demonstrate knowledge of how to make appropriate job changes.
	11.09 Demonstrate acceptable employee health habits.
	11.10 Demonstrate knowledge of the Federal Law as recorded in (29 CFR-1910.1200).
12.0	Demonstrate an understanding of entrepreneurship. The student will be able to:
	12.01 Define entrepreneurship.
	12.02 Describe the importance of entrepreneurship to the American economy.
	12.03 List the advantages and disadvantages of business ownership.
	12.04 Identify the risks involved in ownership of a business.
	12.05 Identify the necessary personal characteristics of a successful entrepreneur.
	12.06 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

The American Association of Airport Executives, National Air Transportation Association (NATA), National Association of State Aviation Officials (NASAO), and Florida Department of Transportation – Aviation Office (FDOT) are additional organizations for providing leadership training and for reinforcing specific skills. Organizations for students such as those mentioned, when provided shall be an integral part of the vocational instructional program.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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: **Transportation and Logistics**
Career Cluster: **Transportation, Distribution and Logistics**

AS	
CIP Number	1652020301
Program Type	College Credit
Program Length	64 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare students 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, related business, accounting, and financial practices such as standard policies and operating procedures, negotiation techniques, planning, organizing, purchasing and inventory control theory. Emphasis is placed on planning and scheduling skills associated with transportation operations.

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 64 credit hours.

Standards

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

01.0 Demonstrate an understanding of the basic concepts and terms used in transportation and logistics.
02.0 Demonstrate an understanding of the transportation and logistics regulatory environment.
03.0 Identify risks and safety and security measures in transportation and logistics.
04.0 Demonstrate the ability to use technology as it relates to transportation and logistics.
05.0 Demonstrate knowledge of management.
06.0 Demonstrate an understanding of accounting and finance.
07.0 Demonstrate an understanding of economics.
08.0 Demonstrate knowledge of contemporary issues in transportation and logistics.
09.0 Demonstrate knowledge of documentation (domestic, international, and customs) related to transportation and logistics.
10.0 Demonstrate the ability to manipulate quantitative data including international weights and measures, as it relates to the movement of goods.
11.0 Demonstrate an understanding of reverse logistics.
12.0 Demonstrate knowledge of border security.
13.0 Identify characteristics and benefits of intermodal transportation.
14.0 Demonstrate knowledge of procurement, contracts and contract administration as it applies to transportation and logistics.
15.0 Demonstrate knowledge of performance and quality measurements.
16.0 Demonstrate knowledge of human resources and labor relations.
17.0 Demonstrate knowledge and basic skills in project management.
18.0 Demonstrate public speaking skills.
19.0 Demonstrate knowledge of geography, culture, customs, and language in international trade.
20.0 Demonstrate knowledge of professional development and networking.
21.0 Demonstrate knowledge of supply chain management.
22.0 Demonstrate knowledge of pricing as it relates to shipping methods.
23.0 Demonstrate knowledge of market research.
24.0 Demonstrate knowledge of the air, sea, truck, and rail operations in the movement of freight.
25.0 Describe the various control processes in freight movement.
26.0 Distinguish the difference between domestic and international freight movements.
27.0 Demonstrate knowledge of the Port freight operations.
28.0 Demonstrate knowledge of rail freight operations.
29.0 Demonstrate knowledge of trucking operations.
30.0 Demonstrate knowledge of air cargo operations.

Florida Department of Education
Student Performance Standards

Program Title: **Transportation and Logistics**
CIP Numbers: **1652020301**
Program Length: **64 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of the basic concepts and terms used in transportation and logistics. The student will be able to:
01.01	Compare various shipping options.
01.02	Analyze types of goods and products and impact on logistics.
01.03	Identify the characteristics of a full-service transportation organization.
01.04	Demonstrate an understanding of intermodalism.
01.05	Demonstrate knowledge of mode-specific logistics.
01.06	Demonstrate knowledge of Incoterms versus Uniform Commercial Code (UCC).
01.07	Demonstrate knowledge of how goods move through freight forwarder and customs broker.
01.08	Demonstrate knowledge of inventory and warehousing concepts.
01.09	Explain the relevance of Just-in-Time (JIT) logistics.
01.10	Demonstrate knowledge of shipment process for perishables.
01.11	Demonstrate knowledge of packaging and labeling requirements.
01.12	Demonstrate knowledge of the advantages and disadvantages of combining given modes of transportation air/sea/land).
01.13	Identify the various governmental regulatory agencies by their names and initials.
01.14	Demonstrate the ability to read, write, and conduct a conversation using common terms of freight movement by transportation mode.
02.0	Demonstrate an understanding of the transportation and logistics regulatory environment. The student will be able to:
02.01	Demonstrate knowledge of the “alphabet soup” of regulatory agencies.
02.02	Identify which agency(ies) have jurisdiction over a given transportation system.
02.03	Demonstrate knowledge of DOT regulations.
02.04	Identify who has regulatory authority over a given project.
02.05	Identify regulatory requirements.

	02.06 Identify permits needed for a given project.
	02.07 Identify consequences of violations of regulatory requirements.
	02.08 Identify policy issues and political factors in a regulatory environment.
	02.09 Demonstrate skill in regulatory research.
	02.10 Demonstrate knowledge of labor laws.
03.0	Identify risks and safety and security measures in transportation and logistics. The student will be able to:
	03.01 Establish an emergency management plan.
	03.02 Identify the need for security background check requirements.
	03.03 Demonstrate knowledge of OSHA and all agencies involved in the movement of goods including Customs and Border Protection, Transportation and Security Administration, U.S. Department of Agriculture.
	03.04 Demonstrate knowledge of the impact of technology on countering threats to transportation systems and border security.
	03.05 Identify differences in dealing with security threats for passenger versus freight/cargo transportation systems including the impact on supply chain logistics.
	03.06 Outline the primary federal, state, and local agencies in the U.S. that are affiliated with border security and transportation security.
	03.07 Identify the ethical parameters in which border security agencies operate.
	03.08 Identify the difference in safety and security threats as they relate to rail, seaport, trucking, and aviation.
	03.09 Identify the cost/benefit analysis of various safety and security measures.
	03.10 Implement a schedule.
	03.11 Analyze system performance.
	03.12 Develop process maps.
	03.13 Develop knowledge of process analysis.
04.0	Demonstrate the ability to use technology as it relates to transportation and logistics. The student will be able to:
	04.01 Demonstrate the ability to use spreadsheet, word processing, and presentation software.
	04.02 Demonstrate the ability to use scheduling/planning software.
	04.03 Identify the electronic systems used in a modern transportation system.
	04.04 Utilize Internet resources.
	04.05 Demonstrate ability to use logistics software for bookings, shipments, consolidations, and shipment verifications.
05.0	Demonstrate knowledge of management. The student will be able to:
	05.01 Explain management concepts.

	05.02 Assess and manage human resources and integrated teams.
	05.03 Provide leadership to procurement, acquisition, logistic, and supply chain management employees.
	05.04 Apply sound decision-making strategies.
	05.05 Identify ethical and social responsibility issues.
06.0	Demonstrate an understanding of accounting and finance. The student will be able to:
	06.01 Conduct R.O.I. analysis.
	06.02 Develop a departmental budget.
	06.03 Monitor a departmental budget.
	06.04 Demonstrate an understanding of fund accounting.
	06.05 Demonstrate a basic understanding of cost (managerial) accounting.
	06.06 Demonstrate an understanding of resource development in a public transportation system.
	06.07 Conduct cost/benefit analysis.
	06.08 Conduct post cost analysis.
	06.09 Identify various revenue streams.
	06.10 Demonstrate knowledge of financial and credit processes in international shipping.
	06.11 Demonstrate knowledge of currency exchange methods.
	06.12 Demonstrate grant writing ability.
	06.13 Demonstrate grants administration and accounting skills.
	06.14 Demonstrate understanding of fund accounting.
	06.15 Demonstrate knowledge of managerial (cost) accounting.
	06.16 Demonstrate knowledge of an “enterprise fund”.
07.0	Demonstrate an understanding of economics. The student will be able to:
	07.01 Compare basic features of different economic systems.
	07.02 Explain importance of resources to the economy.
	07.03 Explain concept of organized labor and business.
	07.04 Apply business economic concepts.
	07.05 Analyze economic indicators and trends.

	07.06 Explain measures used to analyze economic conditions.
	07.07 Explain the nature of international trade.
	07.08 Explain the impact of cultural and social environments on world trade.
	07.09 Compare/contrast influences on a nation's ability to trade.
08.0	Demonstrate knowledge of contemporary issues in transportation and logistics. The student will be able to:
	08.01 Identify the factors that influence changes in costs among the various modes of transportation.
	08.02 Demonstrate an understanding of current trends in containerized shipping.
	08.03 Identify current security issues among the various modes of transportation.
	08.04 Demonstrate knowledge of the effect of current technology on intermodal transportation systems.
	08.05 Describe the pros and cons of free trade agreements.
	08.06 Describe "push" versus "pull" logistics.
	08.07 Demonstrate knowledge of current trends in currency exchange rates.
	08.08 Demonstrate knowledge of advantages and disadvantages of logistics centers, intermodal container transfer facilities and intermodal rail yards.
09.0	Demonstrate knowledge of documentation (domestic, international, and customs) related to transportation and logistics. The student will be able to:
	09.01 Identify basic documents used in freight forwarding and customs brokering.
	09.02 Prepare an airway bill.
	09.03 Demonstrate knowledge of letters of credit.
	09.04 Identify components of a bill of lading.
10.0	Demonstrate the ability to manipulate quantitative data including international weights and measures, as it relates to the movement of goods. The student will be able to:
	10.01 Convert standard weights and measures to metric and vice versa.
	10.02 Conduct currency exchange calculations.
	10.03 Demonstrate skill in practical math for transportation.
	10.04 Develop quantitative methods for assessing transportation loads.
11.0	Demonstrate an understanding of reverse logistics. The student will be able to:
	11.01 Assess the nature and scope of reverse logistics.
	11.02 Explain the waste management process.

12.0	Demonstrate knowledge of border security. The student will be able to:
12.01	Identify the various agencies affiliated with border security.
12.02	Construct a historical timeline reflecting significant transportation-related terrorist threats and events involving border security.
12.03	Demonstrate an understanding of the social and cultural issues involved in border security.
12.04	Classify the roles, functions, and interdependency between local, federal, and international law enforcement and military agencies to foster border security.
13.0	Identify characteristics and benefits of intermodal transportation. The student will be able to:
13.01	Compare various shipping options.
13.02	Analyze types of goods and products and impact on logistics.
13.03	Identify the characteristics of a full-service transportation organization.
13.04	Demonstrate knowledge of mode-specific logistics.
13.05	Demonstrate knowledge of contemporary issues in intermodal transportation.
13.06	Demonstrate knowledge of Incoterms versus Uniform Commercial Codes (UCC).
13.07	Demonstrate knowledge of how goods move through freight forwarder and customs broker.
13.08	Demonstrate knowledge of warehousing.
13.09	Demonstrate knowledge of packaging and labeling requirements.
13.10	Demonstrate knowledge of the advantages and disadvantages of combining given modes of transportation (air/sea/truck/rail).
14.0	Demonstrate knowledge of procurement, contracts and contract administration as it applies to transportation and logistics. The student will be able to:
14.01	Identify the basic components of a contract.
14.02	Identify the difference between “void” and “voidable” contracts.
14.03	Demonstrate an understanding of the importance of being in compliance with the terms of a contract.
14.04	Determine appropriate methods of procurement.
14.05	Explain competitive bids, quotations, and proposals.
14.06	Evaluate competitive bids to determine the best offer.
14.07	Manage contracts and purchase orders from award to completion.
14.08	Resolve contract and/or purchase order differences with suppliers.
14.09	Explain payment problems with suppliers and user departments.
14.10	Discuss the scope of compliance requirements.

	14.11 Conduct a negotiation.
15.0	Demonstrate knowledge of performance and quality measurements. The student will be able to:
	15.01 Develop/track performance measures.
	15.02 Analyze system performance.
	15.03 Develop contingency plans.
	15.04 Demonstrate knowledge of process analysis.
	15.05 Identify various quality initiatives (ISO, Six Sigma, etc.).
16.0	Demonstrate knowledge of human resources and labor relations. The student will be able to:
	16.01 Demonstrate knowledge of labor contracts.
	16.02 Conduct conflict resolution.
	16.03 Identify training needs.
	16.04 Monitor employee performance.
	16.05 Evaluate employee performance.
	16.06 Ensure necessary training.
	16.07 Identify workload issues.
	16.08 Identify necessary tools and resources.
	16.09 Identify need for security/background checks.
	16.10 Identify impact of union/labor agreements.
	16.11 Demonstrate knowledge of labor laws.
	16.12 Demonstrate effective supervisory techniques.
17.0	Demonstrate knowledge and skill in project management. The student will be able to:
	17.01 Utilize project management software.
	17.02 Identify planning/scheduling techniques such as PERT and Critical Path Method.
	17.03 Develop a project management plan.
	17.04 Coordinate a project.
	17.05 Demonstrate an understanding of the connection between time and money.
18.0	Demonstrate public speaking skills. The student will be able to:

	18.01 Use public speaking skills to conduct media relations.
	18.02 Use public speaking skills to conduct public relations.
	18.03 Use public speaking skills to make a presentation.
	18.04 Use presentation software to deliver a presentation.
19.0	Demonstrate knowledge of geography, culture, customs, and language in international trade. The student will be able to:
	19.01 Demonstrate an understanding of world geography.
	19.02 Demonstrate knowledge of various cultural customs as it relates to conducting business.
	19.03 Abstain from the use of idioms when dealing with foreign customers and colleagues.
	19.04 Demonstrate knowledge of time and date differences in international trade.
	19.05 Identify customer service techniques that account for cultural differences when working with international clients.
20.0	Demonstrate knowledge of professional development and networking. The student will be able to:
	20.01 Create a professional network.
	20.02 Read industry journals.
	20.03 Join appropriate professional organizations.
	20.04 Attend industry/trade shows.
	20.05 Establish global networks.
21.0	Demonstrate knowledge of supply chain management. The student will be able to:
	21.01 Characterize the nature of business.
	21.02 Explain the nature and scope of logistics.
	21.03 Explain the importance of inventory.
	21.04 Explain inventory management methods.
	21.05 Analyze just in time (JIT) inventory process.
	21.06 Analyze the Materials Requirement Planning (MRP) system.
	21.07 Explain the dangers of single-vendor supplier.
22.0	Demonstrate knowledge of pricing as it relates to shipping methods. The student will be able to:
	22.01 Identify the importance of time in a given shipment.
	22.02 Identify issues such as perishability, weight, fragility, and packing method.

	22.03 Identify best combination of shipping methods given knowledge of product and customer's requirements.
	22.04 Describe pricing strategies.
23.0	Demonstrate knowledge of market research. The student will be able to:
	23.01 Describe market research.
	23.02 Differentiate between basic market research tools.
	23.03 Use online market research tools.
	23.04 Use data collection methods.
	23.05 Analyze information from various sources.
	23.06 Analyze and conduct research.
	23.07 Analyze customer feedback surveys.
24.0	Demonstrate knowledge of the air, sea, truck and rail operations for the movement of freight. The student will be able to:
	24.01 Describe the knowledge of the organizational structure for each mode of transportation relative to the movement of freight.
	24.02 Describe the basic function of each mode.
	24.03 Identify the important markets for the each mode.
	24.04 Identify the major companies in each mode.
	24.05 Compare the various key specializations within an intermodal cargo operation.
25.0	Describe the various control processes in freight movement. The student will be able to:
	25.01 Demonstrate knowledge of budgeting and auditing.
	25.02 Demonstrate knowledge of quality measurements such as on-time performance.
	25.03 Demonstrate knowledge of customer complaints and quality issues.
26.0	Distinguish the difference between domestic and international freight movements. The student will be able to:
	26.01 Describe how legal standards vary.
	26.02 Describe how safety rules vary.
	26.03 Distinguish the cultural, political, and geographic effects on the international cargo operations.
	26.04 Describe the use of a foreign (free) trade zone its advantages.
27.0	Demonstrate knowledge of the Port freight operations. The student will be able to:
	27.01 Describe the different types of Ports including seaports, waterway ports and inland ports.

	27.02 Identify the types of water-borne and inland freight and the types of cargo documentation required.
	27.03 Describe Port facilities for processing domestic and international cargo.
	27.04 Describe the types and functions of intermodal facilities at a Port.
	27.05 Describe the typical organizational structure of a Port and its operations.
	27.06 Define the role and impact of government and other regulatory agencies in this industry.
	27.07 Define various terms and abbreviations used in Port freight operations.
	27.08 Identify the types of hazardous materials moved through Ports and the rules governing this type of shipment.
	27.09 Describe process for movement of perishable goods.
28.0	Demonstrate knowledge of rail freight operations. The student will be able to:
	28.01 Demonstrate knowledge of scheduling shipments and documentation procedures required.
	28.02 Identify the railroad companies serving the state and what areas their lines serve.
	28.03 Describe the function of intermodal rail yards, on-Port rail facilities, and intermodal container facilities.
	28.04 Identify the types of cargo moved by rail and the types of documentation required.
	28.05 Identify the types of hazardous materials moved by rail and the rules governing this type of shipment.
	28.06 Describe the role of rail at logistics centers.
	28.07 Describe the typical organizations structure of a railroad company and its operations.
	28.08 Describe the role and impact of government and other regulatory agencies in the rail industry.
	28.09 Define various terms and abbreviations used in the rail industry.
	28.10 Describe process for movement of perishable goods.
29.0	Demonstrate knowledge of trucking operations. The student will be able to:
	29.01 Identify the advantages and disadvantages of trucking company versus owner-operator.
	29.02 Demonstrate knowledge of processing truck shipments and the driver scheduling issues.
	29.03 Identify the types of carriers and equipment.
	29.04 Demonstrate knowledge of weight and load distribution.
	29.05 Identify the types of cargo moved by truck and the types of cargo documentation required.
	29.06 Describe the role of trucking at logistics centers.
	29.07 Identify the types of hazardous materials moved by truck and the rules governing this type of shipment.

	29.08	Demonstrate knowledge of intrastate, interstate and international trucking operations.
	29.09	Define the role and impact of government and other regulatory agencies in the trucking industry.
	29.10	Define various terms and abbreviations used in the trucking industry.
	29.11	Describe process for movement of perishable goods.
30.0	Demonstrate knowledge of air cargo operations. The student will be able to:	
	30.01	Demonstrate knowledge of intrastate, interstate and international air cargo operations.
	30.02	Describe the air industry as it is found today: the different types of cargo, the different types of carriers, the major players, upstarts, and the future of the industry.
	30.03	Identify sales and marketing ideals used in the industry, the various rates, and the various tariffs in the air cargo industry.
	30.04	Differentiate the various types of terminal facilities and equipment, including aircraft, used by the air cargo companies to run an operation.
	30.05	Define the role and impact of the government and other regulatory agencies in the air cargo industry.
	30.06	Define various terms and abbreviations used in the air cargo industry.
	30.07	Categorize the various types of cargo and its major classifications.
	30.08	Identify the types of hazardous materials moved by air and the regulations governing this type shipment.
	30.09	Describe the process for movement of perishable goods.

Additional Information

Laboratory Activities

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

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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:

Intermodal Freight Transportation (0652020303) – 18 credit hours
International Freight Transportation (0652020302) – 15 credit hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Supply Chain Management**
Career Cluster: **Transportation, Distribution and Logistics**

AS	
CIP Number	1652020901
Program Type	College Credit
Program Length	60 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this program is to prepare students for further education and employment in the Transportation, Distribution and Logistics career cluster. The program is designed to develop the student's general employability by improving their work attitudes, communication, critical thinking, technical skills, problem-solving skills and occupation-specific skills relative to supply chain management.

The program content is broad-based to reflect the cross-functional relationships prevalent in supply chain management. Students are exposed to related business practices such as standard operating procedures, negotiation techniques, planning, organizing, and accounting concepts, purchasing, sustainability, warehousing, project management, quality control, import/export, and asset management theory. Emphasis is placed on understanding the planning, acquisition, flow, and distribution of goods and services while managing the complexity of operational linkages in a fast-paced global supply chain. Learning is promoted via team work, case studies, practitioner guest lectures, and visits to work sites.

This program prepares students for employment in roles such as: Integrated Logistics Planner, Purchasing Analyst, Cargo Scheduler, International Logistics Clerk, Quality Associate, Inventory Control Manager, Logistics Analyst, Junior Buyer, Customer Service Associate, Materials Analyst, Material Manager, Supply Manager, Dispatcher, Supply Technician, Operations Supervisor, Order Fulfillment Associate, Transportation Coordinator, Distribution Planning Analyst, Packing Supervisor, Transportation Clerk, Cargo Sales, Receiving/Shipping Supervisor, Transportation Specialist, Procurement Clerk, Product Tracing and Tracking Clerk, Warehouse Shift Supervisor, Import/Export Clerk, and Purchasing Agent.

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

Program Structure

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

Standards

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

01.0 Demonstrate an understanding of personal development and professional networking.
02.0 Demonstrate an understanding of professional effectiveness.
03.0 Demonstrate an understanding of logistics, and supply chain management basics.
04.0 Demonstrate an understanding of transportation systems.
05.0 Demonstrate an understanding of warehousing and materials handling.
06.0 Demonstrate an understanding of packaging.
07.0 Demonstrate an understanding of inventory and supply planning.
08.0 Demonstrate an understanding of reverse logistics.
09.0 Demonstrate an understanding of procurement/contracting.
10.0 Demonstrate an understanding of production.
11.0 Demonstrate an understanding of product management.
12.0 Demonstrate an understanding of pricing.
13.0 Demonstrate an understanding of customer relationship management.
14.0 Demonstrate an understanding of appropriate finance skills.
15.0 Demonstrate an understanding of management practices.
16.0 Demonstrate an understanding of supply chain risk management.
17.0 Demonstrate an understanding of project and quality management.
18.0 Demonstrate an understanding of domestic and global business law, ethics and legal issues.
19.0 Demonstrate an understanding of economics.
20.0 Demonstrate an understanding of supply chain information management.
21.0 Demonstrate an understanding of market research for procurement decisions.
22.0 Demonstrate an understanding of writing and presenting documentation.
23.0 Demonstrate an understanding of demand planning.
24.0 Demonstrate an understanding of the differences between a manufacturing and a services supply chain.

Florida Department of Education
Student Performance Standards

Program Title: **Supply Chain Management**
CIP Numbers: **1652020901**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of personal development and professional networking. The student will be able to:
	01.01 Explore career pathways in supply chain management.
	01.02 Explore professional development opportunities for a supply chain management professional.
	01.03 Prepare for career advancement in supply chain management.
02.0	Demonstrate an understanding of professional effectiveness. The student will be able to:
	02.01 Explain professional responsibilities in supply chain management.
	02.02 Develop self-management skills.
	02.03 Demonstrate appropriate work ethics as they apply to supply chain management.
	02.04 Apply problem-solving techniques.
	02.05 Manage stressful situations.
	02.06 Build professional communication skills.
	02.07 Disseminate information.
	02.08 Develop and achieve goals.
	02.09 Manage change.
	02.10 Identify time-management skills.
03.0	Demonstrate an understanding of logistics, and supply chain management basics. The student will be able to:
	03.01 Define and characterize supply chain management and logistics.
	03.02 Describe the role of other business functional areas in supply chain management.
04.0	Demonstrate an understanding of transportation systems. The student will be able to:
	04.01 Assess the importance of the transportation system.
	04.02 Explain the scope of the domestic and global transportation system.

	04.03 Describe various services in the transportation industry and how these services are coordinated.
	04.04 Explain the infrastructure and equipment used by the various modes of transportation.
	04.05 Determine the costs/benefits of company-owned versus for-hire transportation.
	04.06 Explain the scope and complexities of international transportation.
	04.07 Explain the general costs included in transportation rates.
	04.08 Calculate and analyze rate structures and transportation possibilities using electronic spreadsheets.
	04.09 Determine multimodal rates.
	04.10 Explain common transportation documents.
	04.11 Explain procedures to expedite deliveries and conduct follow-up procedures as needed.
05.0	Demonstrate an understanding of warehousing and materials handling. The student will be able to:
	05.01 Explain the reasons for maintaining warehousing.
	05.02 Explain the functions of warehouses and distribution centers.
	05.03 Compare and contrast public and private warehouses.
	05.04 Explain common warehouse documents.
	05.05 Describe materials handling functions.
	05.06 Explain the elements that influence space layout in warehousing (e.g., productivity, damage, safety, security, etc.)
	05.07 Create a cost-benefit analysis.
	05.08 Explain the product characteristics that impact logistics.
	05.09 Explain order fulfillment procedures.
	05.10 Analyze rate structures.
06.0	Demonstrate an understanding of packaging. The student will be able to:
	06.01 Assess types of packaging including customer requirements, and industry required labels.
	06.02 Explain the functions of packaging.
	06.03 Explain how packaging influences other logistic activities.
07.0	Demonstrate an understanding of inventory and supply planning. The student will be able to:
	07.01 Explain the importance of inventory.
	07.02 Explain how inventory is measured and managed.

	07.03 Analyze just-in time (JIT) inventory process.
	07.04 Understand the use and output of various resource planning systems.
	07.05 Calculate, analyze, and incorporate various inventory management tools, including spreadsheets, in order to understand the impact on logistics.
08.0	Demonstrate an understanding of reverse logistics. The student will be able to:
	08.01 Assess the nature and scope of reverse logistics.
	08.02 Explain the waste management process.
	08.03 Explain the disposition of assets.
09.0	Demonstrate an understanding of procurement/contracting. The student will be able to:
	09.01 Develop a procurement/acquisition plan.
	09.02 Analyze organizational requirements for procurement requisitions.
	09.03 Determine appropriate methods of procurement.
	09.04 Work collaboratively to develop and review specifications, statements of work, performance terms, and/or acceptance criteria.
	09.05 Identify and select potential sources of materials or services.
	09.06 Explain competitive bids, quotations, and proposals.
	09.07 Prepare and solicit competitive bids, quotations, and proposals.
	09.08 Evaluate competitive bids to determine the best offer.
	09.09 Conduct supplier visits and/or evaluations to determine suitability when needed.
	09.10 Analyze elements of contracts.
	09.11 Issue contracts.
	09.12 Review legal implications of contracting, including the difference between a business decision and legal case.
	09.13 Manage contracts and purchase orders from award to completion.
	09.14 Resolve contract and/or purchase order differences with suppliers.
	09.15 Explain payment problems with suppliers and user departments.
	09.16 Discuss the scope of compliance requirements.
	09.17 Conduct a negotiation.
10.0	Demonstrate an understanding of production. The student will be able to:
	10.01 Explain the relationship between manufacturing, purchasing, and logistics.

	10.02 Explain the concept of production.
	10.03 Plan production.
	10.04 Apply best practices for production operations.
	10.05 Explain impact of new production technology for profitability.
	10.06 Analyze job costing using appropriate application software.
11.0	Demonstrate an understanding of product management. The student will be able to:
	11.01 Describe the factors involved in product/service operations.
	11.02 Plan product/service management strategies.
	11.03 Explain types of products and their impact on logistics.
	11.04 Explain the impact of packaging on product/service management.
	11.05 Explain the impact of product promotions within supply chain and logistics.
12.0	Demonstrate an understanding of pricing. The student will be able to:
	12.01 Explain pricing fundamentals.
	12.02 Evaluate pricing fundamentals.
	12.03 Explain how logistics cost can influence pricing decisions.
	12.04 Determine prices for products/services.
13.0	Demonstrate an understanding of customer relationship management. The student will be able to:
	13.01 Explain basic customer relationship management (CRM) concepts.
	13.02 Demonstrate quality customer service focus.
	13.03 Describe the concept of order cycle time.
	13.04 Explain the importance of logistic performance on customer service in generating revenue and managing profit and loss.
	13.05 Explain the role of technology in order processing, tracking, and customer research.
	13.06 Process orders and returns.
14.0	Demonstrate an understanding of appropriate finance skills. The student will be able to:
	14.01 Explain how logistic costs impact net profit.
	14.02 Understand and apply various inventory valuation methods, including COGS and Purchase Price Variance (PPV).
	14.03 Explain how an income statement and a balance sheet are derived.

	14.04 Review and understand the key components of a Profit & Loss statement.
15.0	Demonstrate an understanding of management practices. The student will be able to:
	15.01 Explain basic management concepts.
	15.02 Assess and manage human resources and integrated teams at domestic and international levels.
	15.03 Provide leadership to procurement, acquisition, logistic, and supply chain management employees at domestic and international levels.
	15.04 Apply sound decision-making strategies.
16.0	Demonstrate an understanding of supply chain risk management. The student will be able to:
	16.01 Explain types of risk.
	16.02 Explain risk management.
	16.03 Analyze safety/security risks.
17.0	Demonstrate an understanding of project and quality management. The student will be able to:
	17.01 Plan and coordinate the diverse components of a project.
	17.02 Assess and manage a project.
	17.03 Build interpersonal skills with individuals and teams.
	17.04 Explain quality assurance.
	17.05 Select and employ quality methodologies and tools. (i.e., Lean, Six Sigma, TL9000/ISO9001, etc.)
	17.06 Examine quality cost implications.
18.0	Demonstrate an understanding of domestic and global business law, ethics and legal issues. The student will be able to:
	18.01 Review and discuss current legal and ethical considerations as they relate to supply chain management.
	18.02 Evaluate policies for managing privacy and ethical issues.
19.0	Demonstrate an understanding of economics. The student will be able to:
	19.01 Compare basic features of different economic systems.
	19.02 Explain importance of resources to the economy.
	19.03 Explain concept of organized labor and business.
	19.04 Apply business economic concepts.
	19.05 Analyze economic indicators and trends.
	19.06 Explain measures used to analyze economic conditions.

	19.07 Explain the nature of international trade and global supply networks.
	19.08 Explain the impact of cultural and social environments on world trade.
	19.09 Compare/contrast influences on a nation's ability to trade.
20.0	Demonstrate an understanding of supply chain information management. The student will be able to:
	20.01 Explain supply chain management information management.
	20.02 Explain and demonstrate use of databases and spreadsheets in organizing supply chain data.
	20.03 Examine data using common statistical procedures.
21.0	Demonstrate an understanding of market research for procurement decisions. The student will be able to:
	21.01 Describe market research.
	21.02 Differentiate between basic market research resources.
	21.03 Use online market research portals.
	21.04 Use data collection methods.
	21.05 Analyze information from various sources.
	21.06 Evaluate and conduct research.
22.0	Demonstrate an understanding of writing and presenting documentation. The student will be able to:
	22.01 Assess report writing requirements.
	22.02 Create, write, and present reports using APA format.
23.0	Demonstrate an understanding of demand planning. The student will be able to:
	23.01 Interpret the general concept of demand planning and trend analysis.
	23.02 Explain the seasonal influences on forecasts.
	23.03 Contrast balancing supply and demand.
	23.04 Forecast demand.
24.0	Demonstrate an understanding of the differences between a manufacturing and a services supply chain. The student will be able to:
	24.01 Describe the basic concepts of manufacturing and service operations and their role in meeting customer needs.
	24.02 Define the key elements and processes in manufacturing and service operations.
	24.03 Describe how to assess the performance of manufacturing and service operations.

Additional Information

Laboratory Activities

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

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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:

Logistics and Transportation Specialist (0652020901) – 18 credit hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Manufacturer Specific Automotive Service Technology**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	I470604	
CIP Number	0647060406	
Grade Level	30, 31	
Program Length	2400 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in 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 nine occupational completion points.

NOTE: It is recommended that students complete **OCP-A (Automotive Maintenance Technician)** and/or demonstrate mastery of the outcomes in **OCP-A (Automotive Maintenance Technician)** prior to enrolling in additional Advanced Automotive Service Technology courses. **The sequence of OCP's, after completing and/or demonstrating mastery of OCP-A (Automotive Maintenance Technician), is at the discretion of the instructor.**

Benchmarks identified with a designation of ASE P-1, P-2, or P-3 are ASE tasks. P-4 tasks are additional tasks that may be required by the manufacturer partner. P-4 tasks can be either instructor led or performed by the student as determined by the manufacturer's curriculum.

When offered at the postsecondary adult career and technical level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	AER0011	Automotive Maintenance Technician	AUTO IND @7 %7 %G AUTO MECH @7 7G	200 hours
B	AER0118	Advanced Engine Repair Technician		200 hours
C	AER0258	Advanced Automatic Transmission and Transaxle Technician		200 hours
D	AER0275	Advanced Manual Drivetrain and Axle Technician		200 hours
E	AER0459	Advanced Automotive Suspension and Steering Technician		200 hours
F	AER0419	Advanced Automotive Brake System Technician		200 hours
G	AER0319	Advanced Automotive Electrical/Electronic System Technician		500 hours
H	AER0173	Advanced Automotive Heating and Air Conditioning Technician		200 hours
I	AER0506	Advanced Automotive Engine Performance Technician		500 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Advanced Automotive Service Technology program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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 Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services.
03.0 Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, engine block, lubrication, and cooling systems.
04.0 Explain and apply proficiently the diagnosis, service, repair, and overhaul of automatic transmissions/transaxles.
05.0 Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive.
06.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions 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, traction control, stability control systems and miscellaneous (wheel bearings, parking brake, electrical, etc.) systems.
08.0 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.
09.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling.
10.0 Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems.

Florida Department of Education
Student Performance Standards

Program Title: **Manufacturer Specific Automotive Service Technology**
Career Certificate Program Number: **I470604**

Course Description: The Automotive Maintenance Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study shop and personal safety skills, tools and equipment, pre/post maintenance, and customer service.

Abbreviations:
ASE = Supplemental Tasks

For every task in Automotive Maintenance Technician course, 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.

Course Number: AER0011 **Occupational Completion Point: A** **Automotive Maintenance Technician – 200 Hours**		**Priority Number**
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 general shop safety rules and procedures.	P-4
01.02	Utilize safe procedures for handling of tools and equipment.	P-4
01.03	Identify and use proper placement of floor jacks and jack stands.	P-4
01.04	Identify and use proper procedures for safe lift operation.	P-4
01.05	Utilize proper ventilation procedures for working within the lab/shop area.	P-4
01.06	Identify marked safety areas.	P-4
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.	P-4
01.08	Identify the location and use of eye wash stations.	P-4
01.09	Identify the location of the posted evacuation routes.	P-4
01.10	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.	P-4

01.11	Identify and wear appropriate clothing for lab/shop activities.	P-4
01.12	Secure hair and jewelry for lab/shop activities.	P-4
01.13	Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	P-4
01.14	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).	P-4
01.15	Locate and demonstrate knowledge of safety data sheets (SDS).	P-4
01.16	Identify tools and their usage in automotive applications.	P-4
01.17	Identify standard and metric designation.	P-4
01.18	Demonstrate safe handling and use of appropriate tools.	P-4
01.19	Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	P-4
01.20	Demonstrate proper use of precision measuring tools (i.e., micrometer, dial-indicator, dial caliper).	P-4
01.21	Identify information needed and the service requested on a repair order.	P-4
01.22	Identify purpose and demonstrate proper use of fender covers, mats.	P-4
01.23	Demonstrate use of the three C's (concern, cause, and correction).	P-4
01.24	Review vehicle service history.	P-4
01.25	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P-4
01.26	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).	P-4
01.27	Identify appropriate emergency first aid procedures.	P-4
01.28	Identify proper procedures for safe pit usage.	P-4
01.29	Use proper handling procedures for automotive fluids.	P-4
01.30	Identify and describe typical automotive lubricants and lubricant properties.	P-4
01.31	Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).	P-4
01.32	Identify and describe typical automotive seals and gaskets.	P-4
01.33	Explain the effects of chemical/substance abuse.	P-4
01.34	Identify principles of stress management.	P-4
01.35	Identify and define career opportunities in the automotive service industry.	P-4
01.36	Demonstrate knowledge of appropriate automotive industry certifications.	P-4

	01.37 Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.	P-4
02.0	Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services. The student will be able to:	
	02.01 Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.	P-4
	02.02 Locate and use Vehicle identification Number (VIN) vehicle information placards, decals, tags, as required.	P-4
	02.03 Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.	P-4
	02.04 Demonstrate retrieving stored diagnostic trouble codes.	P-4
	02.05 Reset product specific service indicator.	P-4
	02.06 Identify acceptable customer relations.	P-4
	02.07 Identify and demonstrate proper customer relations skills.	P-4
	02.08 Identify and define payroll deductions (taxes, insurance, and social security) employee benefits and pay systems.	P-4
	02.09 Identify principles of time management.	P-4
	02.10 Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.	P-4
	02.11 Use proper chemicals for cleaning and lubrication.	P-4
	02.12 Determine the presence of a Tire Pressure Monitoring System (TPMS).	P-4
	02.13 Identify service considerations when equipped with a Tire Pressure Monitoring System (TPMS).	P-4
	02.14 Determine the presence of wheel locks.	P-4
	02.15 Determine the presence of an air suspension system.	P-4
	02.16 Check operation and status of instrument panel warning lights and gauges.	P-4
	02.17 Inspect under hood area for leaks, damage, and unusual conditions.	P-4
	02.18 Inspect undercar area for leaks, damage, and unusual conditions.	P-4
	02.19 Inspect engine assembly for fuel, oil, coolant, and other leaks.	P-4
	02.20 Determine fluid type requirements and identify fluid.	P-4
	02.21 Check engine oil level and condition; service as required.	P-4
	02.22 Check engine coolant level and condition; service as required.	P-4
	02.23 Inspect cooling system pipes and hoses for wear, damage, and proper routing.	P-4
	02.24 Check power steering fluid level and condition; service as required.	P-4

02.25	Lubricate driveline, suspension and steering systems as applicable.	P-4
02.26	Inspect and replace power steering hoses and fittings.	P-4
02.27	Inspect struts, springs, and related components; service as required.	P-4
02.28	Inspect stabilizer bar, bushings, brackets, and links; service as required.	P-4
02.29	Inspect springs, torsion bars, and related components; service as required.	P-4
02.30	Inspect shock absorbers and related components.	P-4
02.31	Check windshield washer fluid level and condition; service as required.	P-4
02.32	Check automatic transmission fluid level and condition; service as required.	P-4
02.33	Check differential/transfer case fluid level; note unusual conditions; service as required.	P-4
02.34	Check manual transmission fluid level; note unusual conditions; service as required.	P-4
02.35	Service transmission; perform visual inspection; replace fluids and filters.	P-4
02.36	Check hydraulic clutch fluid and condition; service as required.	P-4
02.37	Check rear axle drive assembly seals and vents; check lube level.	P-4
02.38	Inspect constant velocity (CV) axle shaft boots; service as required.	P-4
02.39	Remove, inspect, and service front and rear wheel bearings on non-drive axles.	P-4
02.40	Check wheel bearings for play and other signs of wear.	P-4
02.41	Inspect, replace and adjust drive belts; inspect tensioners and pulleys.	P-4
02.42	Inspect and replace air filter.	P-4
02.43	Inspect and replace cabin air filter.	P-4
02.44	Inspect tires, diagnose tire wear patterns, inspect spare and mounting system; check and adjust tire pressure; where applicable.	P-4
02.45	Rotate tires according to manufacturer’s recommendations.	P-4
02.46	Balance wheel and tire assembly (static, dynamic and road force balance); where applicable.	P-4
02.47	Dismount, inspect, repair, and remount tire on wheel.	P-4
02.48	Repair tire according to industry standards.	P-4
02.49	Identify nitrogen-filled tires.	P-4
02.50	Reinstall wheel; torque wheel fasteners to specification.	P-4
02.51	Perform a visual inspection of a brake drum system.	P-4

02.52	Perform a visual inspection of a disc brake system.	P-4
02.53	Check parking brake operation; check parking brake components for unusual conditions.	P-4
02.54	Check master cylinder for internal and external leaks and proper operation.	P-4
02.55	Fill master cylinder with recommended fluid and seat pads.	P-4
02.56	Check brake fluid level and condition; service as required.	P-4
02.57	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.	P-4
02.58	Identify and use the proper procedures required for cutting tubing and double and ISO flaring.	P-4
02.59	Inspect flexible brake hoses for leaks, kinks, cracks, bulging or wear; tighten loose fittings and supports.	P-4
02.60	Inspect fuel tank, fuel cap and seal; inspect and replace fuel lines, fittings, and hoses; as applicable.	P-4
02.61	Inspect and replace fuel filters as applicable.	P-4
02.62	Inspect exhaust manifold, exhaust pipes, mufflers, resonators, tail pipes, and heat shields; repair or replace as needed.	P-4
02.63	Inspect, test head lamps, tail lamps and stop lamps. Aim headlights.	P-4
02.64	Inspect and replace exterior and courtesy lamps.	P-4
02.65	Check wiper blades, inserts, and arms; replace wiper blades or inserts.	P-4
02.66	Lubricate door latches and hinges.	P-4
02.67	Perform slow/fast battery charge.	P-4
02.68	Inspect, clean, fill, and replace battery.	P-4
02.69	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.	P-4
02.70	Perform battery, starting, and charging system tests using appropriate tester.	P-4
02.71	Perform battery test; determine needed service.	P-4
02.72	Start a vehicle using jumper cables or a battery auxiliary power supply (jump box).	P-4
02.73	Demonstrate knowledge of abnormal key-off battery drain.	P-4
02.74	Perform starter current draw and circuit voltage drop test; determine necessary action.	P-4
02.75	Remove and replace/reinstall starter.	P-4
02.76	Remove, inspect, and replace/reinstall alternator.	P-4
02.77	Observe dash warning lamps during bulb check.	P-4
02.78	Practice recommended precautions when handling static sensitive devices.	P-4

02.79	Check 12-volt non-computer electrical circuits with a test light; determine necessary action.	P-4
02.80	Check voltage and voltage drop in electrical circuits using a digital multi-meter (DMM).	P-4
02.81	Obtain and interpret digital multi-meter (DMM) readings.	P-4
02.82	Check current flow in electrical/electronic circuits and components using an ammeter.	P-4
02.83	Check electrical circuits using fused jumper wires.	P-4
02.84	Inspect and test fusible links, circuit breakers, and fuses; confirm proper circuit operation; replace as needed.	P-4
02.85	Maintain or restore electronic memory functions if required.	P-4
02.86	Inspect and test positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; service or replace as needed.	P-4
02.87	Remove and replace valve cover gaskets.	P-4
02.88	Return cores for rebuilt and exchange items.	P-4
02.89	Inspect driver and passenger restraint system.	P-4
02.90	Demonstrate knowledge of manufacturer policies and procedures.	P-4
02.91	Perform product specific service procedures.	P-4
02.92	Identify and maintain product specific engine systems.	P-4
02.93	Identify and maintain product specific automatic transmission systems.	P-4
02.94	Identify and maintain product specific manual transmission systems.	P-4
02.95	Identify and maintain product specific electrical and electronic systems.	P-4
02.96	Identify and maintain product specific heating and A/C systems.	P-4
02.97	Identify and maintain product specific steering and suspension systems.	P-4
02.98	Identify and maintain product specific brake systems.	P-4
02.99	Identify and maintain product specific audio systems.	P-4
02.100	Identify and maintain product specific safety systems.	P-4
02.101	Identify and maintain product specific accessories.	P-4
02.102	Identify product specific engine performance and emission related components	P-4
02.103	Use manufacturer specific scan tool to retrieve P, B, C and U type diagnostic trouble codes.	P-4

Course Description: The Advanced Engine Repair Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engine theory and repair, cylinder heads, valve trains, engine blocks, lubrication, and cooling systems.

Abbreviations:
ER = Engine Repair

ER Task List:	
	P-1 = 26
	P-2 = 16
	P-3 = 11
Total	**51**

For every task in Advanced Engine Repair Technician course, 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.

Course Number: AER0018 **Occupational Completion Point: B** **Advanced Engine Repair Technician – 200 Hours**	**Priority Number**
03.0 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)	
03.01 Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
03.02 Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
03.03 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P-1
03.04 Verify operation of the instrument panel engine warning indicators.	P-1
03.05 Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action.	P-1
03.06 Install engine covers using gaskets, seals, and sealers as required.	P-1
03.07 Verify engine mechanical timing.	P-1
03.08 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
03.09 Inspect, remove and/or replace engine mounts.	P-2
03.10 Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.	P-2
03.11 Remove and reinstall engine on a newer vehicle equipped with OBD; reconnect all attaching components and restore the vehicle to running condition.	P-3

Cylinder Head and Valve Train Diagnosis and Repair	
03.12 Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure.	P-1
03.13 Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1
03.14 Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-2
03.15 Adjust valves (mechanical or hydraulic lifters).	P-1
03.16 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
03.17 Establish camshaft position sensor indexing.	P-1
03.18 Inspect valve springs for squareness and free height comparison; determine needed action.	P-3
03.19 Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action.	P-3
03.20 Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action.	P-3
03.21 Inspect valves and valve seats; determine needed action.	P-3
03.22 Check valve spring assembled height and valve stem height; determine needed action.	P-3
03.23 Inspect valve lifters; determine needed action.	P-2
03.24 Inspect and/or measure camshaft for runout, journal wear and lobe wear.	P-3
03.25 Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action.	P-3
Engine Block Assembly Diagnosis and Repair	
03.26 Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-1
03.27 Disassemble engine block; clean and prepare components for inspection and reassembly.	P-1
03.28 Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.	P-2
03.29 Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.	P-2
03.30 Deglaze and clean cylinder walls.	P-2
03.31 Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.	P-3
03.32 Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine needed action.	P-1

03.33 Inspect main and connecting rod bearings for damage and wear; determine needed action.	P-2
03.34 Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.	P-3
03.35 Inspect and measure piston skirts and ring lands; determine needed action.	P-2
03.36 Determine piston-to-bore clearance.	P-2
03.37 Inspect, measure, and install piston rings.	P-2
03.38 Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance and/or silencer); inspect shaft(s) and support bearings for damage and wear; determine needed action; reinstall and time.	P-2
03.39 Assemble engine block.	P-1
Lubrication and Cooling Systems Diagnosis and Repair	
03.40 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 needed action.	P-1
03.41 Identify causes of engine overheating.	P-1
03.42 Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
03.43 Inspect and/or test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.	P-1
03.44 Inspect, remove, and replace water pump.	P-2
03.45 Remove and replace radiator.	P-2
03.46 Remove, inspect, and replace thermostat and gasket/seal.	P-1
03.47 Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.	P-1
03.48 Perform oil pressure tests; determine needed action.	P-1
03.49 Perform engine oil and filter change; use proper fluid type per manufacturer specification.	P-1
03.50 Inspect auxiliary coolers; determine needed action.	P-3
03.51 Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
03.52 Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.	P-2
Manufacturer Specific Engine Repair Tasks	
03.53 Inspect and replace engine cooling and heater system hoses.	P-4
03.54 Service product specific water pumps.	P-4
03.55 Service product specific belt drive and tensioner systems.	P-4

03.56 Service product specific engine systems.	P-4
03.57 Diagnose engine noises and vibrations; determine necessary action.	P-4
03.58 Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.	P-4
03.59 Perform engine vacuum tests; determine necessary action.	P-4
03.60 Service product specific cam drive systems.	P-4
03.61 Perform product specific valve adjustments.	P-4
03.62 Perform cylinder power balance tests; determine necessary action.	P-4
03.63 Perform cylinder cranking and running compression tests; determine necessary action.	P-4
03.64 Perform cylinder leakage tests; determine necessary action.	P-4
03.65 Remove and replace piston pin; where applicable.	P-4
03.66 Service product specific engines	P-4
03.67 Perform product specific relearn procedure	P-4

Course Description: The Advanced Automatic Transmission and Transaxle Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study automatic transmission/transaxle diagnosis, service, and repair.

Abbreviations:
AT = Automatic Transmission/Transaxle

For every task in Advanced Automatic Transmission and Transaxle Technician course, 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.

AT Task List:	
P-1 =	**19**
P-2 =	**19**
P-3 =	**3**
Total	**39**

Course Number: AER0258 **Occupational Completion Point: C** **Advanced Automatic Transmission and Transaxle Technician – 200 Hours**	**Priority Number**
04.0 Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles. The student will be able to:	
General: Transmission and Transaxle Diagnosis	

04.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
04.02	Identify automatic transmission and transaxle components and configurations.	P-1
04.03	Identify and interpret transmission/transaxle concerns, differentiate between engine performance and transmission/transaxle concerns; determine needed action.	P-1
04.04	Diagnose fluid loss and condition concerns; determine needed action.	P-1
04.05	Check fluid level in a transmission or a transaxle equipped with a dipstick.	P-1
04.06	Check fluid level in a transmission or a transaxle not equipped with a dipstick.	P-1
04.07	Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine needed action.	P-1
04.08	Diagnose noise and vibration concerns; determine needed action.	P-2
04.09	Perform stall test; determine needed action.	P-2
04.10	Perform lock-up converter system tests; determine needed action.	P-3
04.11	Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.	P-1
04.12	Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.	P-1
04.13	Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).	P-2
In-Vehicle Transmission/Transaxle Maintenance Repair		
04.14	Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.	P-1
04.15	Inspect for leakage; replace external seals, gaskets, and bushings.	P-2
04.16	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 the relearn procedure.	P-1
04.17	Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.	P-1
04.18	Inspect, replace and align powertrain mounts.	P-2
Off-Vehicle Transmission and Transaxle Repair		
04.19	Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mounting surfaces.	P-2
04.20	Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings.	P-1
04.21	Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.	P-2

04.22	Describe the operational characteristics of a continuously variable transmission (CVT).	P-3
04.23	Describe the operational characteristics of a hybrid vehicle drive train.	P-3
04.24	Disassemble, clean, and inspect transmission/transaxle.	P-1
04.25	Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, switches, solenoids, sleeves, retainers, brackets, check valves/balls, screens, spacers, and gaskets).	P-2
04.26	Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine needed action.	P-2
04.27	Assemble transmission/transaxle.	P-1
04.28	Inspect, measure, and reseal oil pump assembly and components.	P-2
04.29	Measure transmission/transaxle end play and/or preload; determine needed action.	P-1
04.30	Inspect, measure, and/or replace thrust washers and bearings.	P-2
04.31	Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.	P-2
04.32	Inspect bushings; determine needed action.	P-2
04.33	Inspect and measure planetary gear assembly components; determine needed action.	P-2
04.34	Inspect case bores, passages, bushings, vents, and mating surfaces; determine needed action.	P-2
04.35	Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform needed action.	P-2
04.36	Inspect measure, repair, adjust or replace transaxle final drive components.	P-2
04.37	Inspect clutch drum, piston, check-balls, springs, retainers, seals, friction plates, pressure plates, and bands; determine needed action.	P-2
04.38	Measure clutch pack clearance; determine needed action.	P-1
04.39	Air test operation of clutch and servo assemblies.	P-1
04.40	Inspect one-way clutches, races, rollers, sprags, springs, cages, retainers; determine needed action.	P-2
Manufacturer Specific Automatic Transmission Tasks		
04.41	Install and seat torque converter to engage drive/splines.	P-4
04.42	Inspect bands and drums; determine necessary action.	P-4
04.43	Service product specific automatic transmissions/transaxles.	P-4
04.44	Perform product specific relearn procedure.	P-4
04.45	Diagnose electronic transmission control systems using appropriate test equipment, service information, technical service bulletins, and schematics; diagnose shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.	P-4

04.46 Differentiate between engine performance, or other vehicle systems, and transmission/transaxle related problems; determine necessary action.	P-4
04.47 Diagnose shift quality concerns resulting from problems in the electronic transmission control system; determine necessary action.	P-4

Course Description: The Advanced Manual Drivetrain and Axle Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study manual drivetrain, clutch, transmission/transaxle, drive and half-shaft universals, constant velocity joints, rear axle differential, limited slip, four-wheel drive, all-wheel drive operation, assembly, diagnosis, service and repair.

Abbreviations:
MD = Manual Drivetrain and Axles

For every task in Advanced Manual Drivetrain and Axle Technician course, 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.

MD Task List:	
	P-1 = 20
	P-2 = 16
	P-3 = 16
Total	**50**

Course Number: AER0275 Occupational Completion Point: D Advanced Manual Drivetrain and Axle Technician – 200 Hours	**Priority Number**
05.0 Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive. The student will be able to:	
General: Drive Train Diagnosis	
05.01 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
05.02 Identify manual drive train and axles components and configurations.	P-1
05.03 Identify and interpret drive train concerns; determine needed action.	P-1
05.04 Check fluid condition; check for leaks; determine needed action.	P-1
05.05 Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification.	P-1
Clutch Diagnosis and Repair	
05.06 Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action.	P-1

05.07 Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform needed action.	P-1
05.08 Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable).	P-1
05.09 Bleed clutch hydraulic system.	P-1
05.10 Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.	P-1
05.11 Inspect flywheel and ring gear for wear, cracks, and discoloration; determine needed action.	P-1
05.12 Measure flywheel runout and crankshaft end play; determine needed action.	P-2
05.13 Describe the operation and service of a system that uses a dual mass flywheel.	P-3
Transmission/Transaxle Diagnosis and Repair	
05.14 Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers.	P-2
05.15 Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.	P-2
05.16 Diagnose noise concerns through the application of transmission/transaxle power-flow principles.	P-2
05.17 Diagnose hard shifting and jumping out of gear concerns; determine needed action.	P-2
05.18 Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action.	P-3
05.19 Disassemble, inspect clean, and reassemble internal transmission/transaxle components.	P-2
Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair (Front, Rear, All-Wheel, and Four-Wheel drive)	
05.20 Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action.	P-1
05.21 Diagnose universal joint noise and vibration concerns; perform needed action.	P-2
05.22 Inspect, remove, and/or replace bearings, hubs, and seals.	P-1
05.23 Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.	P-1
05.24 Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.	P-2
Drive Axle Diagnosis and Repair – Ring and Pinion Gears and Differential Case Assembly	
05.25 Clean and inspect differential case; check for leaks; inspect housing vent.	P-1
05.26 Check and adjust differential case fluid level; use proper fluid type per manufacturer specification.	P-1
05.27 Drain and refill differential case; use proper fluid type per manufacturer specifications.	P-1
05.28 Diagnose noise and vibration concerns; determine needed action.	P-2
05.29 Inspect and replace companion flange and/or pinion seal; measure companion flange runout.	P-2

05.30 Inspect ring gear and measure runout; determine needed action.	P-3
05.31 Remove, inspect, reinstall and/or drive pinion and ring gear, spacers, sleeves, and bearings.	P-3
05.32 Measure and adjust drive pinion depth.	P-3
05.33 Measure and adjust drive pinion bearing preload.	P-3
05.34 Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types).	P-3
05.35 Check ring and pinion tooth contact patterns; perform needed action.	P-3
05.36 Disassemble, inspect, measure, adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.	P-3
05.37 Reassemble and reinstall differential case assembly; measure runout; determine needed action.	P-3
Drive Axle Diagnosis and Repair – Limited Slip Differential	
05.38 Diagnose noise, slippage, and chatter concerns; determine needed action.	P-3
05.39 Measure rotating torque; determine needed action.	P-3
Drive Axle Diagnosis and Repair – Drive Axles	
05.40 Inspect and replace drive axle wheel studs.	P-1
05.41 Remove and replace drive axle shafts.	P-1
05.42 Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2
05.43 Measure drive axle flange runout and shaft end play; determine needed action.	P-2
05.44 Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine needed action.	P-2
Four-Wheel Drive/All-Wheel Drive Component Diagnosis and Repair	
05.45 Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-3
05.46 Inspect locking hubs; determine needed action.	P-3
05.47 Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P-3
05.48 Identify concerns related to variations in tire circumference and/or final drive ratios.	P-2
05.49 Diagnose noise, vibration, and unusual steering concerns; determine needed action.	P-3
05.50 Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive/all-wheel drive systems.	P-2
05.51 Disassemble, service, and reassemble transfer case and components.	P-2

Manufacturer Specific Manual Drivetrain and Axle Tasks		
05.52	Locate and interpret vehicle major drivetrain components and identification numbers.	P-4
05.53	Diagnose fluid loss, level, and condition concerns; determine necessary action.	P-4
05.54	Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.	P-4
05.55	Inspect engine block, core plugs, rear main engine oil seal, clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action.	P-4
05.56	Remove and reinstall manual transmission/transaxle.	P-4
05.57	Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action.	P-4
05.58	Inspect, replace, and align powertrain mounts.	P-4
05.59	Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.	P-4
05.60	Remove and replace transaxle final drive.	P-4
05.61	Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.	P-4
05.62	Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action.	P-4
05.63	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.	P-4
05.64	Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly.	P-4
05.65	Inspect lubrication devices (oil pump or slingers); perform necessary action.	P-4
05.66	Inspect, test, and replace transmission/transaxle sensors and switches.	P-4
05.67	Inspect, service, and replace shaft center support bearings.	P-4
05.68	Diagnose noise and vibration concerns; determine necessary action.	P-4
05.69	Inspect and reinstall limited slip differential components.	P-4
05.70	Remove and reinstall transfer case.	P-4
05.71	Service product specific clutch assembly	P-4
05.72	Service product specific manual transmission/transaxles	P-4
05.73	Service product specific driveaxles/driveshafts	P-4
05.74	Service product specific transfer cases	P-4

Course Description: The Advanced Automotive Suspension and Steering Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study front and rear suspension systems, wheel alignment, wheels and tire, diagnosis, service, and repair.

Abbreviations:
SS = Suspension and Steering

For every task in Advanced Automotive Suspension and Steering Technician course, 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.

SS Task List:	
P-1	29
P-2	20
P-3	10
Total	57

Course Number: AER0459 Occupational Completion Point: E Advanced Automotive Suspension and Steering Technician – 200 Hours	Priority Number
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: Suspension and Steering Systems	
06.01 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
06.02 Identify suspension and steering system components and configurations.	P-1
06.03 Identify and interpret suspension and steering system concerns; determine needed action.	P-1
Steering Systems Diagnosis and Repair	
06.04 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1
06.05 Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).	P-1
06.06 Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action.	P-2
06.07 Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2
06.08 Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2
06.09 Inspect steering shaft universal joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.	P-2
06.10 Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.	P-2

06.11	Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.	P-1
06.12	Inspect power steering fluid level and condition.	P-1
06.13	Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.	P-2
06.14	Inspect for power steering fluid leakage; determine needed action.	P-1
06.15	Remove, inspect, replace, and/or adjust power steering pump drive belt.	P-1
06.16	Remove and reinstall power steering pump.	P-2
06.17	Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.	P-2
06.18	Inspect, remove and/or replace power steering hoses and fittings.	P-2
06.19	Inspect, remove and/or replace pitman arm, relay (center-link/intermediate) rod, idler arm, mountings, and steering linkage damper.	P-2
06.20	Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps.	P-1
06.21	Inspect, test and diagnose electrically- assisted power steering systems (including using a scan tool); determine needed action.	P-2
06.22	Identify hybrid vehicle power steering system electrical circuits and safety precautions.	P-2
06.23	Test power steering system pressure; determine needed action.	P-2
Suspension Systems Diagnosis and Repair		
06.24	Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
06.25	Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
06.26	Inspect, remove, and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.	P-3
06.27	Inspect, remove, and/or replace strut rods and bushings.	P-3
06.28	Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators).	P-2
06.29	Inspect, remove, and/or replace steering knuckle assemblies.	P-3
06.30	Inspect, remove and/or replace short and long arm suspension system coil springs and spring insulators.	P-3
06.31	Inspect, remove, and/or replace torsion bars and mounts	P-3
06.32	Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.	P-3
06.33	Inspect, remove, and/or replace strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.	P-3
06.34	Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings.	P-3

06.35 Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.	P-1
Related Suspension and Steering Service	
06.36 Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.	P-1
06.37 Remove, inspect, service and/or replace front and rear wheel bearings.	P-1
06.38 Describe the function of suspension and steering control systems and components, (i.e., active suspension and stability control).	P-3
Wheel Alignment Diagnosis, Adjustment, and Repair	
06.39 Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action.	P-1
06.40 Perform pre-alignment inspection; measure vehicle ride height; determine needed action.	P-1
06.41 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
06.42 Check toe-out-on-turns (turning radius); determine needed action.	P-2
06.43 Check steering axis inclination (SAI) and included angle; determine needed action.	P-2
06.44 Check rear wheel thrust angle; determine needed action.	P-1
06.45 Check for front wheel setback; determine needed action.	P-2
06.46 Check front and/or rear cradle (sub-frame) alignment; determine needed action.	P-3
06.47 Reset steering angle sensor.	P-2
Wheels and Tires Diagnosis and Repair	
06.48 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
06.49 Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.	P-2
06.50 Rotate tires according to manufacturer’s recommendation including vehicles equipped with tire pressure monitoring systems (TPMS)	P-1
06.51 Measure wheel, tire, axle flange, and hub runout; determine needed action.	P-2
06.52 Diagnose tire pull problems; determine needed action.	P-1
06.53 Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.	P-1
06.54 Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-1
06.55 Inspect tire and wheel assembly for air loss; perform needed action.	P-1
06.56 Repair tire following vehicle manufacturer approved procedure.	P-1
06.57 Identify indirect and direct tire pressure monitoring system (TPMS); calibrate system; verify operation of	P-1

	instrument panel lamps.	
06.58	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure	P-1
Manufacturer Specific Steering and Suspension Tasks		
06.59	Service product specific suspension systems.	P-4
06.60	Service product specific ride height control systems.	P-4
06.61	Locate and interpret vehicle major suspension components and identification numbers.	P-4
06.62	Adjust non-rack and pinion worm bearing preload and sector lash.	P-4
06.63	Reinstall wheel; torque lug nuts.	P-4
06.64	Service product specific tire pressure monitoring systems	P-4
06.65	Service product specific electric power steering systems	P-4
06.66	Reset product specific steering wheel sensors	P-4
06.67	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the steering and suspension control systems; determine necessary action.	P-4
06.68	Perform multiplex check to determine that all steering and suspension components are communicating and are performing within specifications.	P-4

Course Description: The Advanced Automotive Brake System Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study drum/disc brakes, hydraulics, power assist units, electronic brakes, traction control, stability control, and miscellaneous diagnostics, service, and repair.

Abbreviations:
BR = Brakes

For every task in Advanced Automotive Brake System Technician course, 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.

BR Task List:	
P-1 =	**42**
P-2 =	**11**
P-3 =	**5**
Total	**56**

Course Number: AER0419 **Occupational Completion Point: F** **Advanced Automotive Brake System Technician – 200 Hours**		**Priority Number**
07.0	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	
07.01 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
07.02 Identify brake system components and configurations.	P-1
07.03 Identify and interpret brake system concerns; determine needed action.	P-1
07.04 Describe procedure for performing a road test to check brake system operation including an anti-lock brake system (ABS).	P-1
07.05 Install wheel and torque lug nuts.	P-1
Hydraulic System Diagnosis and Repair	
07.06 Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).	P-1
07.07 Measure brake pedal height, travel, and free play (as applicable); determine needed action.	P-1
07.08 Check master cylinder for internal/external leaks and proper operation; determine needed action.	P-1
07.09 Remove, bench bleed, and reinstall master cylinder.	P-1
07.10 Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.	P-1
07.11 Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear; and loose fittings/supports; determine needed action.	P-1
07.12 Replace brake lines, hoses, fittings, and supports.	P-2
07.13 Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).	P-2
07.14 Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P-1
07.15 Inspect, test, and/or replace components of brake warning light system.	P-3
07.16 Identify components of hydraulic brake warning light system.	P-2
07.17 Bleed and/or flush brake system.	P-1
07.18 Test brake fluid for contamination.	P-1
Drum Brake Diagnosis and Repair	
07.19 Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.	P-1
07.20 Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P-1
07.21 Refinish brake drum and measure final drum diameter; compare with specification.	P-1

07.22	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
07.23	Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2
07.24	Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	P-1
Disc Brake Diagnosis and Repair		
07.25	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.	P-1
07.26	Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action.	P-1
07.27	Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action.	P-1
07.28	Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action.	P-1
07.29	Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks.	P-1
07.30	Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.	P-1
07.31	Remove and reinstall/replace rotor.	P-1
07.32	Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P-1
07.33	Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-1
07.34	Retract and re-adjust caliper piston on an integrated parking brake system.	P-2
07.35	Check brake pad wear indicator; determine needed action.	P-1
07.36	Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer’s recommendations.	P-1
Power-Assist Units Diagnosis and Repair		
07.37	Check brake pedal travel with and without engine running to verify proper power booster operation.	P-2
07.38	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
07.39	Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine needed action.	P-1
07.40	Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine needed action.	P-3
07.41	Measure and adjust master cylinder pushrod length.	P-3
Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair		
07.42	Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action.	P-1
07.43	Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.	P-2

07.44 Check parking brake system and components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.	P-1
07.45 Check parking brake operation and parking brake indicator light system operation; determine needed action.	P-1
07.46 Check operation of brake stop light system.	P-1
07.47 Replace wheel bearing and race.	P-3
07.48 Remove, reinstall, and/or replace sealed wheel bearing assembly.	P-1
07.49 Inspect and replace wheel studs.	P-1
Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) Systems Diagnosis and Repair	
07.50 Identify and inspect electronic brake control system components (ABS, TCS, and ESC); determine needed action.	P-1
07.51 Describe the operation of a regenerative braking system.	P-3
07.52 Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action.	P-2
07.53 Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action.	P-2
07.54 Depressurize high-pressure components of an electronic brake control system.	P-2
07.55 Bleed the electronic brake control system hydraulic circuits.	P-1
07.56 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).	P-2
07.57 8. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).	P-1
Manufacturer Specific Brake, Traction Control and Vehicle Stability Control Tasks	
07.58 Service product specific anti-lock brake systems	P-4
07.59 Service product specific traction control systems.	P-4
07.60 Locate and interpret vehicle major brake component and identification numbers (VIN, vehicle certification labels, calibration decals).	P-4
07.61 Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.	P-4
07.62 Install wheel, torque lug nuts, and make final checks and adjustments associated with drum brakes.	P-4
07.63 Install wheel, torque lug nuts, and make final checks and adjustments associated with disc brakes.	P-4
07.64 Remove and install electronic brake control system electrical/electronic and hydraulic components.	P-4

07.65	Service product specific braking systems.	P-4
07.66	Perform product specific brakes relearn procedures	P-4
07.67	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the brake, traction control and vehicle stability control systems; determine necessary action.	P-4
07.68	Perform multiplex check to determine that all brake, traction control and vehicle stability control components are communicating and are performing within specifications.	P-4

Course Description: The Advanced Automotive Electrical/Electronic System Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems diagnostics, service, and repair.

Abbreviations:
EE = Electrical/Electronic Systems

For every task in Advanced Automotive Electrical/Electronic System Technician course, 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.

EE Task List:
P-1 = 29
P-2 = 16
P-3 = 1
Total 46

Course Number: AER0319 Occupational Completion Point: G Advanced Automotive Electrical/Electronic System Technician – 500 Hours		**Priority Number**
08.0	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		
08.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
08.02	Identify electrical/electronic system components and configurations.	P-1
08.03	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1
08.04	Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.	P-1

08.05	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1
08.06	Demonstrate proper use of a test light on an electrical circuit.	P-1
08.07	Use fused jumper wires to check operation of electrical circuits.	P-1
08.08	Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.	P-1
08.09	Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.	P-1
08.10	Inspect and test fusible links, circuit breakers, and fuses; determine needed action.	P-1
08.11	Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.	P-1
08.12	Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.	P-2
08.13	Repair data bus wiring harness.	P-1
Battery Diagnosis and Service		
08.14	Perform battery state-of-charge test; determine needed action.	P-1
08.15	Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action.	P-1
08.16	Maintain or restore electronic memory functions.	P-1
08.17	Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1
08.18	Perform slow/fast battery charge according to manufacturer’s recommendations.	P-1
08.19	Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1
08.20	Identify safety precautions for high voltage systems on electric, hybrid, hybrid-electric, and diesel vehicles.	P-2
08.21	Identify electrical/electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.	P-1
08.22	Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.	P-2
Starting System Diagnosis and Repair		
08.23	Perform starter current draw tests; determine needed action.	P-1
08.24	Perform starter circuit voltage drop tests; determine needed action.	P-1
08.25	Inspect and test starter relays and solenoids; determine needed action.	P-2
08.26	Remove and install starter in a vehicle.	P-1
08.27	Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.	P-2
08.28	Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank	P-2

condition.	
08.29 Demonstrate knowledge of an automatic idle-stop/start-stop system.	P-2
Charging System Diagnosis and Repair	
08.30 Perform charging system output test; determine needed action.	P-1
08.31 Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.	P-1
08.32 Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P-1
08.33 Remove, inspect, and/or replace generator (alternator).	P-1
08.34 Perform charging circuit voltage drop tests; determine needed action.	P-1
Lighting Systems Diagnosis and Repair	
08.35 Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action.	P-1
08.36 Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.	P-1
08.37 Aim headlights.	P-2
08.38 Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2
Instrument Cluster and Driver Information Systems Diagnosis and Repair	
08.39 Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action.	P-2
08.40 Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine needed action.	P-2
08.41 Reset maintenance indicators as required.	P-2
Body Electrical Systems Diagnosis and Repair	
08.42 Diagnose 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 shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, cruise control, and auto dimming headlamps); determine needed repairs.	P-2
08.43 Diagnose 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-2
08.44 Diagnose 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
08.45 Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back-up camera); determine needed repairs.	P-1

08.46	Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action.	P-2
08.47	Describe the process for software transfer, software updates, or reprogramming of electronic modules.	P-2
Manufacturer Specific Electrical and Electronic Related Tasks		
08.48	Service and repair product specific electrical/electronic systems.	P-4
08.49	Perform product specific diagnostic procedures.	P-4
08.50	Locate and interpret vehicle major electrical/electronic components and identification numbers.	P-4
08.51	Identify location of hybrid vehicle high voltage circuits disconnect (service plug) location and safety procedures.	P-4
08.52	Manufacturer specific battery test; determine necessary action.	P-4
08.53	Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.	P-4
08.54	Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action.	P-4
08.55	Perform product specific electrical/electronic relearning procedures	P-4
08.56	Diagnose 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-4
08.57	Diagnose operation of heated and cooled accessories and related circuits (such as: heated/cooled seats, heated steering wheel, heated mirror, heated glass, and heated/cooled cup holders); determine needed repairs.	P-4
08.58	Diagnose operation of safety systems and related circuits (such as: airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back up camera); determine needed repairs.	P-4
08.59	Diagnose operation of comfort and convenience accessories and related circuits (such as: power windows, power seats, pedal height, power locks, truck locks, remote start, moon roof, sun roof, sun shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, and auto dimming headlamps); determine needed repairs.	P-4

Course Description: The Advanced Automotive Heating and Air Conditioning Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, recycling and handling, diagnostics, service, and repair.

Abbreviations:
HA = Heating and Air Conditioning

For every task in Advanced Automotive Heating and Air Conditioning Technician course, 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.

HA Task List:	
P-1 =	17
P-2 =	16
P-3 =	4
Total	36

Course Number: AER0173 Occupational Completion Point: H Advanced Automotive Heating and Air Conditioning Technician – 200 Hours	**Priority Number**
09.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling. The student will be able to:	
General: A/C System Diagnosis and Repair	
09.01 Research vehicle service information, including refrigerant/oil/fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
09.02 Identify heating, ventilation, and air conditioning (HVAC) components and configurations.	P-1
09.03 Identify and interpret heating and air conditioning problems; determine needed action.	P-1
09.04 Performance test A/C system; identify problems.	P-1
09.05 Identify abnormal operating noises in the A/C system; determine needed action.	P-2
09.06 Identify refrigerant type; select and connect proper gauge set/test equipment; record temperature and pressure readings.	P-1
09.07 Leak test A/C system; determine needed action.	P-1
09.08 Inspect condition of refrigerant oil removed from A/C system; determine needed action.	P-2
09.09 Determine recommended oil and oil capacity for system application.	P-1
09.10 Using a scan tool, observe and record related HVAC data and trouble codes.	P-3
Refrigeration System Component Diagnosis and Repair	
09.11 Inspect, remove, and/or replace A/C compressor drive belts, pulleys, tensioners and visually inspect A/C components for signs of leaks; determine needed action.	P-1
09.12 Inspect, test, service and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.	P-2
09.13 Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity.	P-2
09.14 Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	P-2

09.15 Determine need for an additional A/C system filter; perform needed action.	P-3
09.16 Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform needed action.	P-2
09.17 Inspect for proper A/C condenser airflow; determine needed action.	P-1
09.18 Remove, inspect, and replace receiver/drier or accumulator/drier; determine recommended oil type and quantity.	P-2
09.19 Remove, inspect, and install expansion valve or orifice (expansion) tube.	P-1
09.20 Inspect evaporator housing water drain; perform needed action.	P-1
09.21 Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action.	P-2
09.22 Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.	P-2
Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair	
09.23 Inspect engine cooling and heater systems hoses and pipes; perform needed action.	P-1
09.24 Inspect and test heater control valve(s); perform needed action.	P-2
09.25 Diagnose temperature control problems in the HVAC system; determine needed action.	P-2
09.26 Determine procedure to remove, inspect, reinstall, and/or replace heater core.	P-2
Operating Systems and Related Controls Diagnosis and Repair	
09.27 Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.	P-1
09.28 Diagnose A/C compressor clutch control systems; determine needed action.	P-2
09.29 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
09.30 Inspect and test HVAC system control panel assembly; determine needed action.	P-3
09.31 Inspect and test HVAC system control cables, motors, and linkages; perform needed action.	P-3
09.32 Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; perform needed action.	P-1
09.33 Identify the source of HVAC system odors.	P-2
09.34 Check operation of automatic or semi-automatic HVAC control systems; determine needed action.	P-2
Refrigerant Recovery, Recycling, and Handling	
09.35 Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer’s standards.	P-1
09.36 Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.	P-1

09.37	Recycle, label, and store refrigerant.	P-1
Manufacturer Specific Heating and Air Conditioning Related Tasks		
09.38	Service product specific climate control systems.	P-4
09.39	Locate and interpret vehicle heating and air conditioning major components and identification numbers.	P-4
09.40	Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action.	P-4
09.41	Inspect, test, and replace thermostat and gasket/seal.	P-4
09.42	Determine coolant condition and coolant type for vehicle application; drain and recover coolant.	P-4
09.43	Flush system; refill system with recommended coolant; bleed system.	P-4
09.44	Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.	P-4
09.45	Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.	P-4
09.46	Service product specific hybrid heating and A/C systems.	P-4
09.47	Perform product specific heating and A/C relearn procedure	P-4
09.48	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the Heating and Air Conditioning systems; determine necessary action.	P-4
09.49	Perform multiplex check to determine that Heating and Air Conditioning components are communicating and are performing within specifications.	P-4
09.50	Identify proper service precautions and procedures for R1234yf systems.	P-4

Course Description: The Advanced Automotive Engine Performance Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engines, ignition, fuel, air induction, exhaust, computer, engine and emission control systems diagnostics, service, and repair.

Abbreviations:
EP = Engine Performance

For every task in Advanced Automotive Engine Performance Technician course, 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.

EP Task List:	
P-1 =	**22**
P-2 =	**20**
P-3 =	**2**
Total	**43**

Course Number: AER0506	**Priority Number**

Occupational Completion Point: I Advanced Automotive Engine Performance Technician – 500 Hours	
10.0 Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems. The student will be able to:	
General: Engine Diagnosis	
10.01 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
10.02 Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
10.03 Identify and interpret engine performance concerns; determine needed action.	P-1
10.04 Diagnose abnormal engine noises or vibration concerns; determine needed action.	P-3
10.05 Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.	P-2
10.06 Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action.	P-1
10.07 Perform cylinder power balance test; determine needed action.	P-2
10.08 Perform cylinder cranking and running compression tests; determine needed action.	P-1
10.09 Perform cylinder leakage test; determine needed action.	P-1
10.10 Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.	P-2
10.11 Verify engine operating temperature; determine needed action.	P-1
10.12 Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT).	P-1
Computerized Controls Diagnosis and Repair	
10.13 Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable.	P-1
10.14 Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1
10.15 Perform active tests of actuators using a scan tool; determine needed action.	P-1
10.16 Describe the use of OBD monitors for repair verification.	P-1
10.17 Diagnose the causes of emissions or drive-ability concerns with stored or active diagnostic trouble codes (DTC); obtain, graph, and interpret scan tool data.	P-1
10.18 Diagnose emissions or drive-ability concerns without stored or active diagnostic trouble codes; determine needed action.	P-1
10.19 Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO); perform needed action.	P-2

10.20 Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, HVAC, automatic transmissions, non-OEM installed accessories, or similar systems); determine needed action.	P-2
Ignition System Diagnosis and Repair	
10.21 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
10.22 Inspect and test crankshaft and camshaft position sensor(s); determine needed action.	P-1
10.23 Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as needed.	P-3
10.24 Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair	
10.25 Diagnose (troubleshoot) hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine needed action.	P-2
10.26 Check fuel for contaminants; determine needed action.	P-2
10.27 Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; perform needed action.	P-1
10.28 Replace fuel filter(s) where applicable.	P-2
10.29 Inspect, service, or replace air filters, filter housings, and intake duct work.	P-1
10.30 Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2
10.31 Inspect, test, and/or replace fuel injectors.	P-2
10.32 Verify idle control operation.	P-1
10.33 Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform needed action.	P-1
10.34 Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.	P-1
10.35 Perform exhaust system back-pressure test; determine needed action.	P-2
10.36 Check and refill diesel exhaust fluid (DEF).	P-2
10.37 Test the operation of turbocharger/supercharger systems; determine needed action.	P-2
Emissions Control Systems Diagnosis and Repair	
10.38 Diagnose oil leaks, emissions, and drive-ability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.	P-3
10.39 Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes,	P-2

	orifices, and hoses; perform needed action.	
10.40	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) systems; determine needed action.	P-2
10.41	Diagnose emissions and drive-ability concerns caused by the secondary air injection system; inspect, test, repair, and/or replace electrical/electronically operated components and circuits of secondary air injection systems; determine needed action.	P-2
10.42	Diagnose emissions and drive-ability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.	P-1
10.43	Diagnose emission and drive-ability concerns caused by catalytic converter system; determine needed action.	P-2
10.44	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.	P-2
Manufacturer Specific Engine Performance Related Tasks		
10.45	Adjust valves on engines with mechanical or hydraulic lifters.	P-4
10.46	Remove and replace timing belt; verify correct camshaft timing.	P-4
10.47	Remove and replace thermostat and gasket/seal.	P-4
10.48	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	P-4
10.49	Perform common fastener and thread repairs, to include: remove broken bolt, restore internal and external threads, and repair internal threads with a threaded insert.	P-4
10.50	Inspect engine oil and/or filter for condition and determine necessary action.	P-4
10.51	Identify hybrid vehicle internal combustion engine service precautions.	P-4
10.52	Demonstrate proficiency in use of computer-based information systems.	P-4
10.53	Perform product specific OBD II drive cycle diagnostic tests.	P-4
10.54	Service product specific ignition systems.	P-4
10.55	Inspect and test distributor; service as needed.	P-4
10.56	Perform exhaust system back-pressure test; determine needed action.	P-4
10.57	Service product specific fuel injection systems.	P-4
10.58	Locate and interpret vehicle engine performance major components and identification numbers.	P-4
10.59	Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.	P-4

10.60	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.	P-4
10.61	Check for module communication (including CAN/BUS systems) errors using a scan tool.	P-4
10.62	Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.	P-4
10.63	Inspect and test mechanical components of secondary air injection systems; perform necessary action.	P-4
10.64	Demonstrate knowledge of direct injection systems.	P-4
10.65	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the engine control systems; determine necessary action.	P-4
10.66	Perform multiplex check to determine that engine control components are communicating and are performing within specifications.	P-4
10.67	Perform universal drive cycle to run monitors and erase permanent DTCs.	P-4
Electrification Tasks are optional and can be instructor demonstrated and/or performed by the student. The manufacturer sponsor of the program will determine the integration plan for electrification based on the roll out of vehicles in their product lines. Electrification tasks can be spread throughout the program and other courses in a manner that best fits the manufacturer's curriculum.		
10.68	Perform high voltage disconnect procedure; reconnect/enable high voltage system.	
10.69	Select, test and use proper safety gloves.	
10.70	Select, qualify, and use proper electrical testing equipment and leads.	
10.71	Diagnose problems caused by damaged or failed harnesses, connectors, terminals and fuses.	
10.72	Diagnose high voltage (HV) battery pack malfunctions.	
10.73	Remove and install high voltage battery pack.	
10.74	Test, diagnose and repair high voltage leaks/loss of isolation.	
10.75	Test, diagnose and repair high voltage battery pack heating and cooling systems.	
10.76	Test, diagnose, repair or replace high voltage battery pack internal components.	
10.77	Test and diagnose charging problems when using electric vehicle supply equipment (EVSE).	
Internal Combustion Engine (ICE)		
10.78	Retrieve and diagnose DTCs; determine needed repairs	
10.79	Determine if the internal combustion engine (ICE) is in CRANK mode or RUN mode.	
10.80	Differentiate between driveability problems caused by the internal combustion engine and/or hybrid drive system.	
10.81	Perform internal combustion engine cranking compression test.	

10.82 Keep the internal combustion engine running during service.	
10.83 Diagnose internal combustion engine no-crank condition.	
10.84 Diagnose internal combustion engine cranks/no-start condition.	
10.85 Interpret vacuum and compression readings on Atkinson cycle engines.	
10.86 Identify engine start/stop strategy; diagnose malfunctions.	
10.87 Service engine cooling system.	
Drive Systems	
10.88 Perform high voltage disconnect procedure; reconnect/enable high voltage system.	
10.89 Select, test, and use proper safety gloves.	
10.90 Select, qualify, and use proper electrical testing equipment and leads.	
10.91 Retrieve and diagnose driveline DTCs; determine needed repairs.	
10.92 Diagnose problems caused by damaged or failed harnesses, connectors, and terminals.	
10.93 Test, diagnose and repair high voltage leaks/loss of isolation.	
10.94 Remove and install rotor from stator.	
10.95 Diagnose motor-rotor position sensor (Resolver or Encoder type).	
10.96 Diagnose drive/traction motor-generator assembly for proper operation (such as an inoperative condition, noise, shudder, overheating, etc.).	
10.97 Diagnose improper electrically actuated parking pawl operation; determine needed repair.	
10.98 Identify transmission fluid and coolant fluid requirements; verify fluid levels.	
Power Electronics	
10.99 Perform high voltage disconnect procedure; reconnect/enable high voltage system.	
10.100 Select, test, and use proper safety gloves.	
10.101 Select, qualify, and use proper electrical testing equipment and leads.	
10.102 Retrieve and diagnose DTCs; determine needed repairs.	
10.103 Diagnose problems caused by damaged or failed harnesses, connectors, and terminals.	
10.104 Identify procedures necessary to establish the proper vehicle operational power mode during service (OFF, ACCESSORY, POWER ON, READY TO DRIVE).	
10.105 Diagnose the cause of a hybrid system warning displayed on the instrument panel and/or driveability complaint.	

10.106 Diagnose impact sensor problems; determine needed repair.	
10.107 Diagnose AC/DC inverter overheating; determine needed repair.	
10.108 Diagnose AC/DC inverter failure; determine needed repair.	
10.109 Replace AC/DC inverter cooling pump.	
10.110 Remove and install AC/DC inverter.	
10.111 Diagnose failures in the data communications bus network; determine needed repair.	
10.112 Locate and test the voltage level of capacitors.	
10.113 Diagnose, locate and safely disable/enable safety interlocks.	
10.114 Diagnose failed DC/DC converter; determine needed repair.	
10.115 Remove and install DC/DC converter.	
10.116 Test high voltage cable integrity and loss of isolation.	
10.117 Perform 12-volt battery testing.	
10.118 Diagnose system main relay (SMR)/contactor malfunctions; determine needed repairs.	
Hybrid Supporting Systems	
10.119 Perform high voltage disconnect procedure; reconnect/enable high voltage system.	
10.120 Select, test, and use proper safety gloves.	
10.121 Select, qualify, and use proper electrical testing equipment and leads.	
10.122 Diagnose problems caused by damaged or failed harnesses, connectors, and terminals.	
10.123 Retrieve and diagnose DTCs; determine needed repairs.	
10.124 Inspect, test, and diagnose EVAP emission system components; determine needed repairs.	
10.125 Observe and interpret driver indicators, power flow display and energy monitor; determine necessary action.	
10.126 Test and diagnose high voltage air compressor malfunctions; determine necessary action.	
10.127 Remove and install high voltage air conditioning compressor; identify and select proper system oil.	
10.128 Diagnose cabin heating system performance problems; determine needed repairs.	
10.129 Diagnose and repair electric/electronic steering systems.	
10.130 Diagnose brake system performance problems; differentiate between braking problems caused by the hydraulic system and the regenerative system; determine needed repairs.	
10.131 Deactivate brake system self-test prior to service.	

10.132 Service liquid cooling system(s).	

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 P-1, P-2, or P-3 are ASE tasks. P-4 tasks are additional tasks that may be required by the manufacturer partner. P-4 tasks can be either instructor led or performed by the student as determined by the manufacturer's curriculum.

It is highly recommended that the program be Automotive Service Excellence Education Foundation (ASE) Master Certified and be approved by the appropriate industry manufacturer to provide manufacturer certification. Instructors must meet the specific manufacturer certification and be A1-A8 ASE Master certified, Advanced Engine Performance (L1) ASE Certification is also recommended. Program must meet the equipment and specialty tool requirement as specified by the manufacturer sponsor. The program must offer EPA section 609 recognized refrigerant-recycling certification training.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting

the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program		
Program Number	I470605	
CIP Number	0647060501	
Grade Level	30, 31	
Program Length	1800 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 bus, truck and diesel engine mechanics, diesel mechanics helpers, mobile heavy equipment mechanics, construction equipment mechanics, industrial truck mechanics. The content includes but is not limited to maintaining and repairing diesel engines and electrical systems; reconditioning diesel fuel injection systems; overhauling diesel engines; and performing diesel engine preventive maintenance.

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 nine occupational completion points.

The courses after the core (OCP-A) may be taken in any sequence. However, an individual must take the Diesel Engine Preventive Maintenance course (DIM0103).

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

When offered at the postsecondary level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	DIM0101	Diesel Engine Mechanic/Technician Helper	DIESEL MECH @7 7G	150 hours
B	DIM0102	Diesel Electrical and Electronics Technician		300 hours
C	DIM0103	Diesel Engine Preventative Maintenance Technician		150 hours
D	DIM0104	Diesel Engine Technician		300 hours
E	DIM0105	Diesel Brakes Technician		300 hours
F	DIM0106	Diesel Heating and Air Conditioning Technician		150 hours
G	DIM0107	Diesel Steering and Suspension Technician		150 hours
H	DIM0108	Diesel Drivetrain Technician		150 hours
I	DIM0109	Diesel Hydraulics Technician		150 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Diesel Systems Technician program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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 general electrical systems.
08.0 Diagnose and repair battery systems.
09.0 Diagnose and repair starting systems.
10.0 Diagnose and repair charging systems.
11.0 Diagnose and repair lighting systems.
12.0 Diagnose and repair gauges and warning devices.
13.0 Diagnose and repair related electrical systems.
14.0 Inspect and service engine systems record findings as needed.
15.0 Diagnose and repair fuel system.
16.0 Diagnose and repair air induction and exhaust system.
17.0 Diagnose and repair cooling system.
18.0 Diagnose and repair lubrication system.
19.0 Diagnose and repair instruments and controls.
20.0 Diagnose and repair safety equipment.
21.0 Diagnose and repair hardware.
22.0 Diagnose and repair heating, ventilation, and air conditioning (HVAC)
23.0 Diagnose and repair electrical/electronic battery and starting systems.
24.0 Diagnose and repair electrical/electronic charging systems.
25.0 Diagnose and repair electrical/electronic lighting systems.
26.0 Diagnose and repair air brake systems.
27.0 Diagnose and repair hydraulic brake systems.
28.0 Inspect, service and record drive train systems.
29.0 Diagnose and repair suspension and steering systems.
30.0 Diagnose and repair tires and wheels.
31.0 Diagnose and repair frame and fifth wheel.
32.0 General engine diagnosis and repair.
33.0 Cylinder head and valve train diagnosis and repair.
34.0 Engine block diagnosis and repair.
35.0 Lubrication systems diagnosis and repair.
36.0 Cooling system diagnosis and repair.

37.0 Air induction and exhaust systems diagnosis and repair.
38.0 Fuel system diagnosis and repair.
39.0 Diagnose and repair engine brakes.
40.0 Diagnose and repair air supply and service systems.
41.0 Diagnose and repair mechanical/foundation air brake systems.
42.0 Diagnose and repair parking brakes.
43.0 Diagnose and repair hydraulic systems.
44.0 Diagnose and repair mechanical/foundation hydraulic brake systems.
45.0 Diagnose and repair power assist units.
46.0 Diagnose and repair air and hydraulic antilock brake systems (ABS) and automatic traction control (ATC).
47.0 Diagnose and repair wheel bearings.
48.0 HVAC systems diagnosis, service, and repair.
49.0 A/C system and component diagnosis, service, and repair.
50.0 Diagnose and repair compressor and clutch.
51.0 Diagnose and repair evaporator, condenser, and related components.
52.0 Heating and engine cooling systems diagnosis, service, and repair.
53.0 Electrical system diagnosis, service, and repair.
54.0 Air/vacuum/mechanical diagnosis, service, and repair.
55.0 Refrigerant recovery, recycling, and handling.
56.0 Steering column diagnosis, service, and repair.
57.0 Steering units diagnosis, service, and repair.
58.0 Steering linkage diagnosis, service, and repair.
59.0 Suspension systems diagnosis and repair.
60.0 Wheel alignment diagnosis, adjustment, and repair.
61.0 Wheels and tires diagnosis, service, and repair.
62.0 Frame and coupling diagnosis, service, and repair.
63.0 Clutch diagnosis and repair.
64.0 Transmission diagnosis and repair.
65.0 Driveshaft and universal joint diagnosis and repair.
66.0 Drive axle diagnosis and repair.
67.0 General hydraulic system diagnosis and repair.
68.0 Diagnose and repair hydraulic pumps.
69.0 Diagnose and repair hydraulic filtration/reservoirs (tanks).
70.0 Diagnose and repair hydraulic hoses, fittings, and connections.
71.0 Diagnose and repair hydraulic control valves.
72.0 Diagnose and repair hydraulic actuators.

Florida Department of Education
Student Performance Standards

Program Title: **Diesel Systems Technician**
Career Certificate Program Number: **I470605**

Course Description: The Diesel Engine Mechanic/Technician Helper 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 Mechanic/Technician Helper, 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.

ASE = Required Supplemental Tasks

Course Number: DIM0101 **Occupational Completion Point: A** **Diesel Engine Mechanic/Technician Helper – 150 Hours**		**Priority Number**
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
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
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	ASE

	cover, etc.)	
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
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

Course Description: The Diesel Electrical and Electronics Technician course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study general electrical systems, batteries, starting, charging, lighting, gauges, warning devices, and related electrical system diagnostics, service, and repair.

For every task in Diesel Electrical and Electronics Technician, 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.

EE Task List:
P-1 = 38
P-2 = 15
P-3 = 12
Total 65

The first task in Diesel Electrical and Electronics Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

Course Number: DIM0102 Occupational Completion Point: B Diesel Electrical and Electronics Technician – 300 Hours		Priority Number
07.0	Diagnose and repair general electrical systems. The student will be able to:	
07.01	Read and interpret electrical/electronic circuits using wiring diagrams.	P-1
07.02	Check continuity in electrical/electronic circuits using appropriate test equipment.	P-1
07.03	Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment.	P-1
07.04	Check current flow in electrical/electronic circuits and components using appropriate test equipment.	P-1
07.05	Check resistance in electrical/electronic circuits and components using appropriate test equipment.	P-1
07.06	Locate shorts, grounds, and opens in electrical/electronic circuits.	P-1
07.07	Diagnose parasitic (key-off) battery drain problems; perform tests; determine needed action.	P-1
07.08	Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed.	P-1
07.09	Inspect and test spike suppression devices; replace as needed.	P-3
07.10	Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment.	P-3
08.0	Diagnose and repair battery systems. The student will be able to:	
08.01	Identify battery type; perform appropriate battery load test; determine needed action.	P-1
08.02	Determine battery state of charge using an open circuit voltage test.	P-1
08.03	Inspect, clean, and service battery; replace as needed.	P-1
08.04	Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed.	P-1
08.05	Charge battery using appropriate method for battery type.	P-1
08.06	Inspect, test, and clean battery cables and connectors; repair or replace as needed.	P-1
08.07	Jump start a vehicle using jumper cables and a booster battery or auxiliary power supply using proper safety procedures.	P-1
08.08	Perform battery capacitance test; determine needed action.	P-2
08.09	Identify and test low voltage disconnect (LVD) systems; determine needed repair.	P-2
09.0	Diagnose and repair starting systems. The student will be able to:	

	09.01 Perform starter circuit cranking voltage and voltage drop tests; determine needed action.	P-1
	09.02 Inspect and test components (key switch, push button and/or magnetic switch) and wires and harnesses in the starter control circuit; replace as needed	P-2
	09.03 Inspect and test starter relays and solenoids/switches; replace as needed.	P-1
	09.04 Remove and replace starter; inspect flywheel ring gear or flex plate.	P-1
10.0	Diagnose and repair charging systems. The student will be able to:	
	10.01 Test instrument panel mounted volt meters and/or indicator lamps; determine needed action.	P-1
	10.02 Identify causes of a no charge, low charge, or overcharge problems; determine needed action.	P-1
	10.03 Inspect and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets; adjust drive belts and check alignment.	P-1
	10.04 Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action.	P-1
	10.05 Perform charging circuit voltage drop tests; determine needed action.	P-1
	10.06 Remove and replace alternator.	P-1
	10.07 Inspect, repair, or replace cables, wires, and connectors in the charging circuit.	P-1
11.0	Diagnose and repair lighting systems. The student will be able to:	
	11.01 Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-1
	11.02 Identify causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation.	P-1
	11.03 Test, aim, and replace headlights.	P-1
	11.04 Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components/modules; repair or replace as needed.	P-1
	11.05 Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays, and control components/modules of parking, clearance, and taillight circuits; repair or replace as needed.	P-1
	11.06 Inspect and test instrument panel light circuit switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires, and printed circuits/control modules; repair or replace as needed.	P-2
	11.07 Inspect and test interior cab light circuit switches, bulbs/LEDs, sockets, low voltage disconnect (LVD), connectors, terminals, wires, and control components/modules; repair or replace as needed.	P-2
	11.08 Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed.	P-1
	11.09 Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.	P-1
	11.10 Inspect and test turn signal and hazard circuit flasher(s), switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.	P-1

11.11	Inspect and test reverse lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, wires and control components/modules; repair or replace as needed.	P-1
12.0	Diagnose and repair gauges and warning devices. The student will be able to:	
12.01	Interface with vehicle's on-board computer; perform diagnostic procedure, verify instrument cluster operations using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-1
12.02	Identify causes of intermittent, high, low, or no gauge readings; determine needed action.	P-2
12.03	Identify causes of data bus-driven gauge malfunctions; determine needed action.	P-3
12.04	Inspect and test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires; repair or replace as needed.	P-2
12.05	Inspect and test warning devices (lights and audible) circuit sensor/sending units, bulbs/LEDs, sockets, connectors, wires, and control components/modules; repair or replace as needed.	P-1
12.06	Inspect, test, replace, and calibrate (if applicable) electronic speedometer, odometer, and tachometer systems.	P-2
13.0	Diagnose and repair related electrical systems. The student will be able to:	
13.01	Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-1
13.02	Identify causes of constant, intermittent, or no horn operation; determine needed action.	P-1
13.03	Inspect and test horn circuit relays, horns, switches, connectors, wires, clock springs, and control components/modules; repair or replace as needed.	P-2
13.04	Identify causes of constant, intermittent, or no wiper operation; diagnose the cause of wiper speed control and/or park problems; determine needed action.	P-2
13.05	Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, wires and control components/modules; repair or replace as needed.	P-2
13.06	Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed.	P-2
13.07	Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.	P-3
13.08	Inspect and test side view mirror motors, heater circuit grids, relays, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.	P-3
13.09	Inspect and test heater and A/C electrical components including: A/C clutches, motors, resistors, relays, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.	P-3
13.10	Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repair or replace as needed.	P-3
13.11	Identify causes of slow, intermittent, or no power window operation; determine needed action.	P-3
13.12	Inspect and test motors, switches, relays, connectors, terminals, wires, and control components/modules of power window circuits; repair or replace as needed.	P-3

13.13	Inspect and test block heaters; determine needed repairs.	P-2
13.14	Inspect and test cruise control electrical components; repair or replace as needed.	P-3
13.15	Inspect and test switches, relays, controllers, actuator/solenoids, connectors, terminals, and wires of electric door lock circuits.	P-3
13.16	Inspect and test engine cooling fan electrical control components/modules, wiring; repair or replace as needed.	P-2
13.17	Identify causes of data bus communication problems; determine needed action.	P-2

Course Description: The Diesel Engine Preventative Maintenance Technician course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engine system, cab and hood systems, electrical/electronic systems, frame and chassis systems diagnostics, service, and repair.

For every task in Diesel Engine Preventative Maintenance Technician, 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 Engine Preventative Maintenance Technician 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.

The first task in Diesel Engine Preventative Maintenance Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

PM Task List:
P-1 = 132
P-2 = 11
P-3 = 0
Total 143

Course Number: DIM0103 Occupational Completion Point: C Diesel Engine Preventative Maintenance Technician – 150 Hours		**Priority Number**
14.0	Inspect and service engine systems record findings as needed. The student will be able to:	
14.01	Check engine starting/operation (including unusual noises, vibrations, exhaust smoke, etc.); record idle and governed rpm.	P-1
14.02	Inspect vibration damper.	P-1
14.03	Inspect belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment.	P-1
14.04	Check engine oil level and condition; check dipstick seal.	P-1
14.05	Inspect engine mounts for looseness and deterioration.	P-1

	14.06 Check engine for oil, coolant, air, fuel and exhaust leaks (Engine Off and Running).	P-1
	14.07 Check engine compartment wiring harnesses, connectors, and seals for damage and proper routing.	P-1
	14.08 Check electrical wiring, routing, and hold-down clamps, including Engine Control Module/Powertrain Control Module (ECM/PCM).	
15.0	Diagnose and repair fuel system. The student will be able to:	
	15.01 Check fuel tanks, mountings, lines, caps, and vents.	P-1
	15.02 Drain water from fuel system.	P-1
	15.03 Service water separator/fuel heater; replace fuel filter(s); prime and bleed fuel system.	P-1
16.0	Diagnose and repair air induction and exhaust system. The student will be able to:	
	16.01 Check exhaust system mountings for looseness and damage.	P-1
	16.02 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
	16.03 Check air induction system: piping, charge air cooler, hoses, clamps, and mountings; check for air restrictions and leaks.	P-1
	16.04 Inspect turbocharger for leaks; check mountings and connections.	P-1
	16.05 Check operation of engine compression/exhaust brake.	P-2
	16.06 Service or replace air filter as needed; check and reset air filter restriction indicator.	P-1
	16.07 Inspect and service crankcase ventilation system.	P-1
	16.08 Inspect diesel exhaust fluid (DEF) system, to include tanks, lines, gauge pump, and filter (if equipped).	P-1
	16.09 Inspect selective catalyst reduction (SCR) system; including diesel exhaust fluid (DEF) for proper levels, leaks, mounting and connections (if equipped).	P-2
17.0	Diagnose and repair cooling system. The student will be able to:	
	17.01 Check operation of fan clutch.	P-1
	17.02 Inspect radiator (including air flow restriction, leaks, and damage) and mountings.	P-1
	17.03 Inspect fan assembly and shroud.	P-1
	17.04 Pressure test cooling system and radiator cap.	P-1
	17.05 Inspect coolant hoses and clamps.	P-1
	17.06 Inspect coolant recovery system.	P-1
	17.07 Check coolant for contamination, additive package concentration, aeration, and protection level (freeze point).	P-1

	17.08 Service coolant filter (if equipped).	P-1
	17.09 Inspect water pump.	P-1
18.0	Diagnose and repair lubrication system. The student will be able to:	
	18.01 Change engine oil and filters; visually check oil for coolant or fuel contamination; inspect and clean magnetic drain plugs.	P-1
	18.02 Take an engine oil sample for analysis.	P-1
19.0	Diagnose and repair instruments and control systems. The student will be able to:	
	19.01 Inspect key condition and operation of ignition switch.	P-1
	19.02 Check warning indicators.	P-1
	19.03 Check instruments; record oil pressure and system voltage.	P-1
	19.04 Check operation of electronic power take off (PTO) and engine idle speed controls (if applicable)	P-2
	19.05 Check HVAC controls.	P-1
	19.06 Check operation of all accessories.	P-1
	19.07 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
	19.08 Check mechanical and electronic engine speed controls (if equipped).	
20.0	Diagnose and repair safety equipment. The student will be able to:	
	20.01 Check operation of electric/air horns and back-up warning devices.	P-1
	20.02 Check condition of spare fuses, safety triangles, fire extinguisher, and all required decals.	P-1
	20.03 Inspect seat belts and sleeper restraints.	P-1
	20.04 Inspect wiper blades and arms.	P-1
21.0	Diagnose and repair hardware. The student will be able to:	
	21.01 Check operation of wiper and washer.	P-1
	21.02 Inspect windshield glass for cracks or discoloration; check sun visor.	P-1
	21.03 Check seat condition, operation, and mounting.	P-1
	21.04 Check door glass and window operation.	P-1
	21.05 Inspect steps, catwalks, and grab handles (if applicable).	P-1
	21.06 Inspect mirrors, mountings, brackets, and glass.	P-1

	21.07 Record all observed physical damage.	P-2
	21.08 Lubricate all cab and hood grease fittings.	P-2
	21.09 Inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.	P-1
	21.10 Inspect cab mountings, hinges, latches, linkages and ride height; service as needed.	P-1
	21.11 Inspect tilt cab hydraulic pump, lines, and cylinders for leakage; inspect safety devices; service as needed.	
22.0	Diagnose and repair heating, ventilation, and air conditioning (HVAC). The student will be able to:	
	22.01 Inspect A/C condenser and lines for condition and visible leaks; check mountings.	P-2
	22.02 Inspect A/C compressor and lines for condition and visible leaks; check mountings.	P-2
	22.03 Check A/C system condition and operation; check A/C monitoring system, if applicable.	P-1
	22.04 Check HVAC air inlet filters and ducts; service as needed.	P-1
23.0	Diagnose and repair electrical/electronic battery and starting systems. The student will be able to:	
	23.01 Inspect battery box(es), cover(s), and mountings.	P-1
	23.02 Inspect battery hold-downs, connections, cables, and cable routing; service as needed.	P-1
	23.03 Check/record battery state-of-charge (open circuit voltage) and condition.	P-1
	23.04 Perform battery test (capacitance).	P-1
	23.05 Inspect starter, mounting, and connections.	P-1
	23.06 Engage starter; check for unusual noises, starter drag, and starting difficulty.	P-1
24.0	Diagnose and repair electrical/electronic charging systems. The student will be able to:	
	24.01 Inspect alternator, mountings, cable, wiring, and wiring routing; determine needed action.	P-1
	24.02 Perform alternator output tests.	P-1
25.0	Diagnose and repair electrical/electronic lighting systems. The student will be able to:	
	25.01 Check operation of interior lights; determine needed action.	P-1
	25.02 Check all exterior lights, lenses, reflectors, and conspicuity tape; check headlight alignment; determine needed action.	P-1
	25.03 Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s); determine needed action.	P-1
26.0	Diagnose and repair air brake systems. The student will be able to:	
	26.01 Check operation of parking brake.	P-1
	26.02 Record air governor cut-in and cut-out setting (psi).	P-1

	26.03 Check operation of air reservoir/tank drain valves.	P-1
	26.04 Check air system for leaks (brakes released).	P-1
	26.05 Check air system for leaks (brakes applied).	P-1
	26.06 Test one-way and double-check valves.	P-1
	26.07 Check low air pressure warning devices.	P-1
	26.08 Check emergency (spring) brake control/modulator valve, if applicable.	P-1
	26.09 Check tractor protection valve.	P-1
	26.10 Test air pressure build-up time.	P-1
	26.11 Inspect coupling air lines, holders, and gladhands.	P-1
	26.12 Check brake chambers and air lines for secure mounting and damage.	P-1
	26.13 Check operation of air drier.	P-1
	26.14 Inspect and record brake shoe/pad condition, thickness, and contamination.	P-1
	26.15 Inspect and record condition of brake drums/rotors.	P-1
	26.16 Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing	P-1
	26.17 Check operation and adjustment of brake automatic slack adjusters (ASA); check and record push rod stroke.	P-1
	26.18 Lubricate all brake component grease fittings.	P-1
	26.19 Check condition and operation of hand brake (trailer) control valve, if applicable.	P-2
	26.20 Perform antilock brake system (ABS) operational system self-test.	P-1
	26.21 Drain air tanks and check for contamination.	P-1
	26.22 Check condition of pressure relief (safety) valves.	P-1
27.0	Diagnose and repair hydraulic brake systems. The student will be able to:	
	27.01 Check master cylinder fluid level and condition.	P-1
	27.02 Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage.	P-1
	27.03 Check parking brake operation; inspect parking brake application and holding devices; adjust as needed.	P-1
	27.04 Check operation of hydraulic system: pedal travel, pedal effort, pedal feel.	P-1
	27.05 Inspect calipers for leakage, binding and damage.	P-1
	27.06 Inspect brake assist system (booster), hoses and control valves; check for leaks.	P-1

	27.07 Inspect and record brake lining/pad condition, thickness, and contamination.	P-1
	27.08 Inspect and record condition of brake rotors.	P-1
	27.09 Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing.	P-1
	27.10 Check drum brakes for proper adjustment.	
28.0	Inspect, service and record drive train systems. The student will be able to:	
	28.01 Check operation of clutch, clutch brake, and gearshift.	P-1
	28.02 Check clutch linkage/cable for looseness or binding, if applicable.	P-1
	28.03 Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable.	P-1
	28.04 Check clutch adjustment; adjust as needed.	P-1
	28.05 Check transmission case, seals, filter, hoses, lines and cooler for cracks and leaks.	P-1
	28.06 Inspect transmission breather.	P-1
	28.07 Inspect transmission mounts.	P-1
	28.08 Check transmission oil level, condition, determine proper type and service as needed.	P-1
	28.09 Inspect U-joints, yokes, driveshafts, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing.	P-1
	28.10 Inspect axle housing(s) for cracks and leaks.	P-1
	28.11 Inspect axle breather(s).	P-1
	28.12 Lubricate all drivetrain grease fittings.	P-1
	28.13 Check drive axle(s) oil level, condition, determine proper type, and service as needed.	P-1
	28.14 Change drive axle(s) oil and filter/screen, if applicable; check and clean magnetic plugs.	P-2
	28.15 Check transmission wiring, connectors, seals, and harnesses for damage and proper routing.	P-1
	28.16 Change transmission oil and filter, if applicable; check and clean magnetic plugs.	P-2
	28.17 Check interaxle differential lock operation.	P-1
	28.18 Check transmission range shift operation.	P-1
29.0	Diagnose and repair suspension and steering systems. The student will be able to:	
	29.01 Check steering wheel operation for free play and binding.	P-1
	29.02 Check power steering pump, mounting, and hoses for leaks, condition, and routing; check fluid level.	P-1
	29.03 Change power steering fluid and filter.	P-1

	29.04 Inspect steering gear for leaks and secure mounting.	P-1
	29.05 Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages.	P-1
	29.06 Check kingpins for wear.	P-1
	29.07 Check wheel bearings for looseness and noise; adjust as necessary.	P-1
	29.08 Check oil level and condition in all non-drive hubs; check for leaks.	P-1
	29.09 Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators.	P-1
	29.10 Inspect shock absorbers for leaks and secure mounting.	P-1
	29.11 Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage.	P-1
	29.12 Check and record suspension ride height.	P-1
	29.13 Lubricate all suspension and steering grease fittings.	P-1
	29.14 Check axle locating components (radius, torque, and/or track rods).	P-1
30.0	Diagnose and repair tires and wheels. The student will be able to:	
	30.01 Inspect tires for wear patterns and proper mounting.	P-1
	30.02 Inspect tires for cuts, cracks, bulges, and sidewall damage.	P-1
	30.03 Inspect valve caps and stems; determine needed action.	P-1
	30.04 Measure and record tread depth; probe for imbedded debris.	P-1
	30.05 Check and record air pressure; adjust air pressure in accordance with manufacturers' specifications.	P-1
	30.06 Check wheel mounting hardware condition; determine needed action.	P-1
	30.07 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
	30.08 Check tire matching (diameter and tread) on single and dual tire applications.	P-1
	30.09 Retorque lugs in accordance with manufacturer's specifications.	
31.0	Diagnose and repair frame and fifth wheel. The student will be able to:	
	31.01 Inspect fifth wheel mounting, bolts, air lines, and locks.	P-1
	31.02 Test operation of fifth wheel locking device; adjust if necessary.	P-1
	31.03 Check quarter fenders, mud flaps, and brackets.	P-1
	31.04 Check pintle hook assembly and mounting; if applicable.	P-2
	31.05 Lubricate all fifth wheel grease fittings and plate; if applicable	P-1

31.06 Inspect frame and frame members for cracks and damage.	P-1

Course Description: The Diesel Engine Technician course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engine, cylinder head, valve train, engine block, lubrication, cooling, air induction, exhaust, fuel, and engine brakes diagnostics, service, and repair.

For every task in Diesel Engine Technician, 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 first task in Diesel Engine Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

DE Task List:
P-1 = 35
P-2 = 32
P-3 = 21
Total 88

Course Number: DIM0104 Occupational Completion Point: D Diesel Engine Technician – 300 Hours	**Priority Number**
32.0 General engine diagnosis and repair. The student will be able to:	
32.01 Inspect fuel, oil, Diesel Exhaust Fluid (DEF), coolant levels, and condition; determine needed action.	P-1
32.02 Identify and diagnose the causes of engine fuel, oil, coolant, air, and other leaks; determine needed action.	P-1
32.03 Listen and interpret engine noises; determine needed action.	P-3
32.04 Observe engine exhaust smoke color and quantity; determine needed action.	P-2
32.05 Check and diagnose no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action.	P-1
32.06 Identify and diagnose causes of engine surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action.	P-1
32.07 Identify and diagnose engine vibration problems; determine needed action.	P-2
32.08 Check, record, and clear electronic diagnostic (fault) codes; monitor electronic data; determine needed action.	P-1
32.09 Perform air intake system restriction and leakage tests; determine needed action.	
32.10 Perform intake manifold pressure (boost) test; determine needed action.	
32.11 Perform exhaust pressure test; determine needed action for DPF.	
32.12 Perform cylinder contribution test; determine needed action.	

33.0	Cylinder head and valve train diagnosis and repair. The student will be able to:	
33.01	Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.	P-2
33.02	Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action.	P-3
33.03	Measure valve head height relative to deck, valve face-to-seat contact; determine needed action.	P-3
33.04	Inspect valve train components; determine needed action.	P-1
33.05	Reassemble cylinder head.	P-3
33.06	Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash.	P-3
33.07	Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness; determine needed action.	P-1
33.08	Inspect and adjust valve bridges (crossheads); adjust valve clearances and injector settings.	P-2
33.09	Remove, clean, inspect for visible damage, and replace cylinder head(s) assembly.	
33.10	Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action.	
33.11	Inspect pushrods, rocker arms, rocker arm shafts, and blocked oil passages; perform needed action.	
33.12	Inspect cam followers; perform needed action.	
34.0	Engine block diagnosis and repair. The student will be able to:	
34.01	Perform crankcase pressure test; determine needed action	P-1
34.02	Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.	P-2
34.03	Disassemble, clean, and inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action.	P-2
34.04	Inspect cylinder sleeve counter bore and lower bore; check bore distortion; determine needed action.	P-2
34.05	Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.	P-2
34.06	Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion).	P-2
34.07	Inspect in-block camshaft bearings for wear and damage; determine needed action.	P-3
34.08	Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action.	P-2
34.09	Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play.	P-2
34.10	Inspect, install, and time gear train; measure gear backlash; determine needed action.	P-2

	34.11 Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action.	P-3
	34.12 Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons.	P-3
	34.13 Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.	P-2
	34.14 Check condition of piston cooling jets (nozzles); determine needed action.	P-2
	34.15 Inspect and measure crankshaft vibration damper; determine needed action.	P-3
	34.16 Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.	P-3
	34.17 Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.	P-2
35.0	Lubrication systems diagnosis and repair. The student will be able to:	
	35.01 Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit, test engine oil temperature and check operation of temperature sensor; determine needed action.	P-1
	35.02 Check engine oil level, condition, and consumption; determine needed action.	P-1
	35.03 Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action.	P-3
	35.04 Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.	P-3
	35.05 Inspect, clean, and test oil cooler and components; determine needed action.	P-3
	35.06 Inspect turbocharger lubrication system; determine needed action.	P-2
	35.07 Determine proper lubricant and perform oil and filter change.	P-1
36.0	Cooling system diagnosis and repair. The student will be able to:	
	36.01 Check engine coolant type, level, condition, and consumption; test coolant for freeze protection and additive package concentration; determine needed action.	P-1
	36.02 Test coolant temperature and check operation of temperature and level sensors, gauge, and/or sending unit; determine needed action.	P-1
	36.03 Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.	P-2
	36.04 Recover coolant, flush, and refill with recommended coolant/additive package; bleed cooling system.	P-1
	36.05 Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed (if equipped).	P-1
	36.06 Inspect water pump and hoses; replace as needed.	P-1
	36.07 Inspect, clean, and pressure test radiator. Pressure test cap, tank(s), and recovery systems; determine needed action.	P-1

	36.08 Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.	P-1
	36.09 Inspect turbo charger cooling systems; determine needed action.	P-2
37.0	Air induction and exhaust systems diagnosis and repair. The student will be able to:	
	37.01 Perform air intake system restriction and leakage test; determine needed action.	P-1
	37.02 Perform intake manifold pressure (boost) test; determine needed action.	P-3
	37.03 Check exhaust back pressure; determine needed action.	P-3
	37.04 Inspect turbocharger(s), wastegate, and piping systems; determine needed action.	P-2
	37.05 Inspect turbocharger(s) (variable ratio/geometry VGT), pneumatic, hydraulic, electronic controls, and actuators.	P-2
	37.06 Check air induction system: piping, hoses, clamps, and mounting; service or replace air filter as needed.	P-1
	37.07 Inspect intake manifold, gaskets, and connections; replace as needed.	P-3
	37.08 Inspect, clean, and test charge air cooler assemblies; replace as needed.	P-2
	37.09 Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed.	P-2
	37.10 Inspect exhaust after treatment devices; determine necessary action.	P-2
	37.11 Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed action.	P-2
	37.12 Inspect exhaust gas recirculation (EGR) system including EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action.	P-2
38.0	Fuel system diagnosis and repair. The student will be able to:	
	38.01 Fuel supply system	
	• Check fuel level, and condition; determine needed action.	P-1
	• Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action.	P-1
	• Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine needed action.	P-1
	• Inspect and test pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action.	P-1
	• Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump.	P-1
	38.02 Electronic fuel management system	
	• Interface with vehicle's on-board computer; perform diagnostic procedures using electronic service tool(s) (to include PC based software and/or data scan tools); determine needed action.	P-1

• Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; clear codes; determine further diagnosis.	P-1
• Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).	P-1
• Inspect and replace electrical connector terminals, seals, and locks.	P-1
• Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed.	P-1
• Using electronic service tool(s) access and interpret customer programmable parameters.	P-1
• Perform on-engine inspections, test and adjustments on electronic unit injectors (EUI); determine needed action	P-2
• Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable).	P-2
• Perform cylinder contribution test utilizing electronic service tool(s).	P-1
• Perform on-engine inspections and tests on hydraulic electronic unit injectors (HEUI) and system electronic controls; determine needed action.	P-2
• Perform on-engine inspections and tests on hydraulic electronic unit injector (HEUI) high pressure oil supply and control systems; determine needed action.	P-2
• Perform on-engine inspections and tests on high pressure common rail (HPCR) type injection systems; determine needed action.	P-2
• Inspect high pressure injection lines, hold downs, fittings and seals; determine needed action.	P-2
39.0 Diagnose and repair engine brakes. The student will be able to:	
39.01 Inspect and adjust engine compression/exhaust brakes; determine needed action.	P-2
39.02 Inspect, test, and adjust engine compression/exhaust brake control circuits, switches, and solenoids; determine needed action.	P-3
39.03 Inspect engine compression/exhaust brake housing, valves, seals, lines, and fittings; repair or replace as needed.	P-3

Course Description: The Diesel Brakes Technician 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, and hydraulic brakes.

For every task in Diesel Brakes Technician, 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.

BR Task List:
P-1 = 39
P-2 = 9
P-3 = 7
Total 55

The first task in Diesel Brakes Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

Course Number: DIM0105 Occupational Completion Point: E Diesel Brakes Technician – 300 Hours		Priority Number
40.0	Diagnose and repair air supply and service systems. The student will be able to:	
40.01	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
40.02	Check air system build-up time; determine needed action.	P-1
40.03	Drain air reservoir/tanks; check for oil, water, and foreign material; determine needed action.	P-1
40.04	Inspect air compressor inlet; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed.	P-1
40.05	Inspect and test air system pressure controls: governor, unloader assembly valves, filters, lines, hoses, and fittings; replace as needed.	P-1
40.06	Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed.	P-1
40.07	Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check-valves, manual and automatic drain valves; replace as needed.	P-1
40.08	Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; repair or replace as needed.	P-1
40.09	Inspect and test brake application (foot/treadle) valve, fittings, and mounts; check pedal operation; replace as needed.	P-1
40.10	Inspect and test stop light circuit switches, wiring, and connectors; repair or replace as needed.	P-1
40.11	Inspect and test hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed.	P-1
40.12	Inspect and test brake relay valve; replace as needed.	P-1
40.13	Inspect and test quick release valves; replace as needed.	P-1
40.14	Inspect and test tractor protection valve; replace as needed.	P-1
40.15	Inspect and test emergency (spring) brake control/modulator valve(s); replace as needed. (as applicable)	P-1
40.16	Inspect and test low pressure warning devices, wiring, and connectors; repair or replace as needed.	P-1
40.17	Inspect and test air pressure gauges, lines, and fittings; replace as needed.	P-2
41.0	Diagnose and repair mechanical/foundation air brake systems. The student will be able to:	
41.01	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

	41.02 Inspect and test service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed.	P-1
	41.03 Identify type, inspect and service slack adjusters; perform needed action.	P-1
	41.04 Inspect camshafts, tubes, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; replace as needed.	P-1
	41.05 Inspect, clean, and adjust air disc brake caliper assemblies; determine needed repairs.	P-2
	41.06 Inspect and measure brake shoes or pads; perform needed action.	P-1
	41.07 Inspect and measure brake drums or rotors; perform needed action.	P-1
42.0	Diagnose and repair parking brakes. The student will be able to**:**	
	42.01 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
	42.02 Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed.	P-1
	42.03 Inspect and test parking (spring) brake application and release valve; replace as needed.	P-1
	42.04 Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers' recommendations.	P-1
	42.05 Identify and test anti compounding brake function.	P-1
43.0	Diagnose and repair hydraulic systems. The student will be able to:	
	43.01 Identify and diagnose poor stopping, premature wear, pulling, dragging, balance, or pedal feel problems caused by the hydraulic system; determine needed action.	P-2
	43.02 Inspect and test master cylinder for internal/external leaks and damage; replace as needed.	P-1
	43.03 Inspect hydraulic system brake lines for leaks and damage, flexible hoses, and fittings for leaks and damage; replace as needed.	P-1
	43.04 Inspect and test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; replace as needed.	P-3
	43.05 Inspect and test brake pressure differential valve and warning light circuit switch, bulbs/LEDs, wiring, and connectors; repair or replace as needed.	P-2
	43.06 Inspect disc brake caliper assemblies; replace as needed.	P-1
	43.07 Inspect/test brake fluid; bleed and/or flush system; determine proper fluid type.	P-1
	43.08 Inspect and clean wheel cylinders; replace as needed.	
	43.09 Test and adjust brake stop light switch, bulbs, wiring, and connectors; repair or replace as needed.	
44.0	Diagnose and repair mechanical/foundation hydraulic brake systems. The student will be able to:	
	44.01 Identify and diagnose poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems caused by mechanical components; determine needed action.	P-2

	44.02 Inspect and measure rotors; perform needed action.	P-1
	44.03 Inspect and measure disc brake pads; inspect mounting hardware; perform needed action.	P-1
	44.04 Check parking brake operation; inspect parking brake application and holding devices; adjust and replace as needed.	P-2
	44.05 Inspect and measure drum brake shoes and linings; inspect mounting hardware, adjuster mechanisms, and backing plates; perform needed action.	
45.0	Diagnose and repair power assist units. The student will be able to:	
	45.01 Identify and diagnose stopping problems caused by the brake assist (booster) system; determine needed action.	P-3
	45.02 Inspect, test, repair, or replace hydraulic brake assist (booster), hoses, and control valves; determine proper fluid type.	P-3
	45.03 Check emergency (back-up, reserve) brake assist system.	P-3
46.0	Diagnose and repair air and hydraulic antilock brake systems (ABS) and automatic traction control (ATC). The student will be able to:	
	46.01 Observe antilock brake system (ABS) warning light operation (includes trailer and dash mounted ABS warning light); determine needed action.	P-1
	46.02 Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or electronic service tool(s); determine needed action.	P-1
	46.03 Identify poor stopping and wheel lock-up caused by failure of the antilock brake system (ABS); determine needed action.	P-1
	46.04 Test and check operation of antilock brake system (ABS) air, hydraulic, electrical, and mechanical components; perform needed action.	P-1
	46.05 Test antilock brake system (ABS) wheel speed sensors and circuits; adjust or replace as needed.	P-1
	46.06 Bleed the ABS hydraulic circuits according to manufacturers' procedures.	P-2
	46.07 Observe automatic traction control (ATC) warning light operation; determine needed action.	P-3
	46.08 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
	46.09 Verify power line carrier (PLC) operations.	P-2
	46.10 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).	
47.0	Diagnose and repair wheel bearings. The student will be able to:	
	47.01 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

47.02 Identify, inspect or replace unitized/preset hub bearing assemblies.	P-2

Course Description: The Diesel Heating and Air Conditioning Technician 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 HVAC, and A/C systems.

For every task in Diesel Heating and Air Conditioning Technician, 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 first task in Diesel Heating and Air Conditioning Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

HV Task List:
P-1 = 31
P-2 = 17
P-3 = 10
Total 58

Course Number: DIM0106 Occupational Completion Point: F Diesel Heating and Air Conditioning Technician – 150 Hours	**Priority Number**
48.0 HVAC systems diagnosis, service, and repair. The student will be able to:	
48.01 Verify the need for service or repair of HVAC systems based on unusual operating noises; determine needed action.	P-1
48.02 Verify the need for service or repair of HVAC systems based on unusual visual, smell, and touch conditions; determine needed action.	P-1
48.03 Identify system type and components (cycling clutch orifice tube - CCOT, expansion valve) and conduct performance test(s) on HVAC systems; determine needed action.	P-1
48.04 Retrieve diagnostic codes; determine needed action.	P-3
49.0 A/C system and component diagnosis, service, and repair. The student will be able to:	
49.01 Identify causes of temperature control problems in the A/C system; determine needed action.	P-1
49.02 Identify refrigerant and lubricant types; check for contamination; determine needed action.	P-1
49.03 Identify A/C system problems indicated by pressure gauge and temperature readings; determine needed action.	P-1
49.04 Identify A/C system problems indicated by visual, audible, smell, and touch procedures; determine needed action.	P-1
49.05 Perform A/C system leak test; determine needed action.	P-1
49.06 Recover, evacuate, and recharge A/C system using appropriate equipment.	P-1
49.07 Identify contamination in the A/C system components; determine needed action.	P-3

	49.08 Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-2
50.0	Diagnose and repair compressor and clutch. The student will be able to:	
	50.01 Identify and diagnose A/C system problems that cause protection devices (pressure, thermal, and electronic) to interrupt system operation; determine needed action.	P-1
	50.02 Inspect, test, and replace A/C system pressure, thermal, and electronic protection devices.	P-2
	50.03 Inspect, and replace A/C compressor drive belts, pulleys, and tensioners; adjust belt tension and check alignment.	P-1
	50.04 Inspect, test, adjust, service, or replace A/C compressor clutch components or assembly.	P-2
	50.05 Inspect and correct A/C compressor lubricant level (if applicable).	P-2
	50.06 Inspect, test, or replace A/C compressor.	P-1
	50.07 Inspect, repair, or replace A/C compressor mountings and hardware.	P-2
51.0	Diagnose and repair evaporator, condenser, and related components. The student will be able to:	
	51.01 Correct system lubricant level when replacing the evaporator, condenser, receiver/drier or accumulator/drier, and hoses.	P-1
	51.02 Inspect A/C system hoses, lines, filters, fittings, and seals; determine needed action.	P-1
	51.03 Inspect and test A/C system condenser. Check for proper airflow and mountings; determine needed action.	P-1
	51.04 Inspect and replace receiver/drier or accumulator/drier.	P-1
	51.05 Inspect and test cab/sleeper refrigerant solenoid, expansion valve(s); check placement of thermal bulb (capillary tube); determine needed action.	P-3
	51.06 Remove and replace orifice tube.	P-1
	51.07 Inspect and test cab/sleeper evaporator core; determine needed action.	P-3
	51.08 Inspect, clean, and repair evaporator housing and water drain; inspect and service/replace evaporator air filter.	P-1
	51.09 Identify and inspect A/C system service ports (gauge connections); determine needed action.	P-1
	51.10 Identify the cause of system failures resulting in refrigerant loss from the A/C system high pressure relief device; determine needed action.	P-2
52.0	Heating and engine cooling systems diagnosis, service, and repair. The student will be able to:	
	52.01 Identify causes of outlet air temperature control problems in the HVAC system; determine needed action.	P-1
	52.02 Diagnose window fogging problems; determine needed action.	P-2
	52.03 Perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration; determine needed action.	P-1

	52.04 Inspect engine cooling and heating system hoses, lines, and clamps; determine needed action.	P-1
	52.05 Inspect and test radiator, pressure cap, and coolant recovery system (surge tank); determine needed action.	P-1
	52.06 Inspect water pump; determine needed action.	P-1
	52.07 Inspect and test thermostats, by-passes, housings, and seals; determine needed repairs.	P-2
	52.08 Recover, flush and refill with recommended coolant/additive package; bleed cooling system.	P-1
	52.09 Inspect thermostatic cooling fan system (pneumatic and electronic) and fan shroud; replace as needed.	P-2
	52.10 Inspect and test heating system coolant control valve(s) and manual shut-off valves; determine needed action.	P-2
	52.11 Inspect and flush heater core; determine needed action.	P-3
53.0	Electrical system diagnosis, service, and repair. The student will be able to:	
	53.01 Identify causes of HVAC electrical control system problems; determine needed action.	P-1
	53.02 Inspect and test A/C heater blower motors, resistors, switches, relays, modules, wiring, and protection devices; determine needed action.	P-2
	53.03 Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action.	P-2
	53.04 Inspect and test A/C related electronic engine control systems; determine needed action.	P-2
	53.05 Inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices; determine needed action.	P-2
	53.06 Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action.	P-2
	53.07 Inspect and test HVAC system electrical/electronic control panel assemblies; determine needed action.	P-2
	53.08 Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-2
54.0	Air/vacuum/mechanical diagnostics, service, and repair. The student will be able to:	
	54.01 Identify causes of HVAC air and mechanical control problems; determine needed action.	P-3
	54.02 Inspect and test HVAC system air and mechanical control panel assemblies; determine needed action.	P-3
	54.03 Inspect, test, and adjust HVAC system air and mechanical control cables and linkages; determine needed action.	P-3
	54.04 Inspect and test HVAC system actuators and hoses; determine needed action.	P-3
	54.05 Inspect, test, and adjust HVAC system ducts, doors, and outlets; determine needed action.	P-3
NOTE: Tasks 1 through 5 should be accomplished in accordance with appropriate EPA regulations and SAE "J" standards.		

55.0	Refrigerant recovery, recycling, and handling. The student will be able to:	
55.01	Maintain and verify correct operation of certified equipment.	P-1
55.02	Identify and recover A/C system refrigerant.	P-1
55.03	Recycle or properly dispose of refrigerant.	P-1
55.04	Handle, label, and store refrigerant.	P-1
55.05	Test recycled refrigerant for non-condensable gases.	P-1
55.06	Demonstrate knowledge of federal requirements for the handling of refrigerants.	

Course Description: The Diesel Steering and Suspension Technician 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 steering, suspension, wheel alignment, wheels, tires, and frame systems.

For every task in Diesel Steering and Suspension Technician, 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 first task in Diesel Steering and Suspension Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

SS Task List:
P-1 = 23
P-2 = 14
P-3 = 8
Total 45

Course Number: DIM0107 Occupational Completion Point: G Diesel Steering and Suspension Technician – 150 Hours		**Priority Number**
56.0	Steering column diagnosis, service, and repair. The student will be able to:	
56.01	Identify and diagnose fixed and driver adjustable steering column and shaft noise, looseness, and binding problems; determine needed action.	P-1
56.02	Inspect and service steering shaft U-joint(s), slip joints, bearings, bushings, and seals; phase shaft.	P-1
56.03	Check cab mounting and adjust ride height.	P-2
56.04	Remove the steering wheel (includes steering wheels equipped with electrical/electronic controls and components); install and center the steering wheel. Inspect, test, replace and calibrate steering angle sensor.	P-1
56.05	Disable and enable supplemental restraint system (SRS) in accordance with manufacturers' procedures.	P-1
57.0	Steering units diagnosis, service, and repair. The student will be able to:	

	57.01 Identify and diagnose power steering system noise, steering binding, darting/oversteer, reduced wheel cut, steering wheel kick, pulling, non-recovery, turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems; determine needed action.	P-1
	57.02 Determine recommended type of power steering fluid; check level and condition; determine needed action.	P-1
	57.03 Flush and refill power steering system; purge air from system.	P-2
	57.04 Perform power steering system pressure, temperature, and flow tests; determine needed action.	P-3
	57.05 Inspect, service, or replace power steering reservoir including filter, seals, and gaskets.	P-2
	57.06 Inspect power steering pump drive gear and coupling; replace as needed.	P-3
	57.07 Inspect, adjust, or replace power steering pump, mountings, and brackets.	P-3
	57.08 Inspect and replace power steering system cooler, lines, hoses, clamps/mountings, hose routings, and fittings.	P-2
	57.09 Inspect, adjust, repair, or replace integral type power steering gear(s) (single and/or dual) and mountings.	P-2
58.0	Steering linkage diagnosis, service, and repair. The student will be able to:	
	58.01 Inspect and align pitman arm; replace as needed.	P-1
	58.02 Check and adjust steering (wheel) stops; verify relief pressures.	P-1
	58.03 Inspect and lubricate steering components.	P-1
	58.04 Inspect drag link (relay rod) and tie rod ends; adjust or replace as needed.	
	58.05 Inspect steering arm and levers, and linkage pivot joints; replace as needed.	
	58.06 Inspect clamps and retainers on cross tube/relay rod/centerline/tie rod; position or replace as needed.	
59.0	Suspension systems diagnosis, service, and repair. The student will be able to:	
	59.01 Inspect front axles and attaching hardware; determine needed action.	P-1
	59.02 Inspect and service kingpins, steering knuckle bushings, locks, bearings, seals, and covers; determine needed action.	P-1
	59.03 Inspect shock absorbers, bushings, brackets, and mounts; replace as needed.	P-1
	59.04 Inspect leaf springs, center bolts, clips, pins and bushings, shackles, U-bolts, insulators, brackets, and mounts; determine needed action.	P-1
	59.05 Inspect axle aligning devices such as radius rods, track bars, stabilizer bars, torque arms, related bushings, mounts, shims, and cams; determine needed action.	P-1
	59.06 Inspect tandem suspension equalizer components; determine needed action.	P-3
	59.07 Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; adjust, repair or replace as needed.	P-1

	59.08 Inspect air springs, mounting plates, springs, suspension arms, and bushings; replace as needed.	P-1
	59.09 Measure and adjust vehicle ride height; determine needed action.	P-1
	59.10 Identify rough ride problems; determine needed action.	P-3
	59.11 Inspect walking beams, center (cross) tube, bushings, mounts, load pads, and saddles/caps; replace as needed.	
60.0	Wheel alignment diagnosis, adjustment, and repair. The student will be able to:	
	60.01 Identify and diagnose vehicle wandering, pulling, shimmy, hard steering and off-center steering wheel problems; adjust or repair as needed.	P-1
	60.02 Check camber; determine needed action.	P-2
	60.03 Check caster; adjust as needed.	P-2
	60.04 Check and adjust toe settings.	P-1
	60.05 Check rear axle(s) alignment (thrust line/centerline) and tracking; adjust or repair as needed.	P-2
	60.06 Diagnose turning/Ackerman angle (toe-out-on-turns) problems; determine needed action.	P-3
	60.07 Check front axle alignment (centerline); adjust or repair as needed.	P-2
61.0	Wheels and tires diagnosis, service, and repair. The student will be able to:	
	61.01 Identify and diagnose tire wear patterns; check tread depth and pressure; determine needed action.	P-1
	61.02 Identify and diagnose wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action.	P-2
	61.03 Remove and install steering and drive axle wheel/tire assemblies; torque mounting hardware to specifications with a torque wrench.	P-1
	61.04 Inspect tire for proper application, (size, load range, position, and tread design); determine needed action.	P-2
	61.05 Inspect wheel/rims for flaws, proper application, load range and design; ensure dual rims are properly clocked to access valve stems; determine needed action.	P-2
	61.06 Check operation of tire pressure monitoring system (TPMS); determine needed action if applicable.	P-3
62.0	Frame and coupling diagnosis, service, and repair. The student will be able to:	
	62.01 Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, and mounting hardware.	P-1
	62.02 Inspect and service sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls.	P-2
	62.03 Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed repairs.	P-1
	62.04 Inspect, install, or repair frame hangers, brackets, and cross members in accordance with manufacturers' recommended procedures.	P-3

62.05 Inspect, repair or replace pintle hooks and draw bars, if applicable.	P-2

Course Description: The Diesel Drivetrain Technician 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 clutch, transmission, driveshaft, universal joint, and drive axle systems.

For every task in Diesel Drivetrain Technician, 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 first task in Diesel Drivetrain Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

DT Task List:
P-1 = 27
P-2 = 18
P-3 = 12
Total 57

Course Number: DIM0108 Occupational Completion Point: H Diesel Drivetrain Technician – 150 Hours	**Priority Number**
63.0 Clutch diagnosis and repair. The student will be able to:	
63.01 Identify causes of clutch noise, binding, slippage, pulsation, vibration, grabbing, dragging, and chatter problems; determine needed action.	P-1
63.02 Inspect and adjust clutch linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push and pull-type assemblies); check pedal height and travel; perform needed action.	P-1
63.03 Inspect, adjust, repair, and replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system.	P-2
63.04 Inspect, adjust, lubricate or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals.	P-1
63.05 Inspect, adjust, and replace single-disc clutch pressure plate and clutch disc.	P-1
63.06 Inspect, adjust, and replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs.	P-1
63.07 Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; perform needed action.	P-1
63.08 Inspect, adjust, and replace self-adjusting/continuous-adjusting clutch mechanisms.	P-1
63.09 Inspect and replace pilot bearing.	P-1
63.10 Remove and reinstall flywheel, inspect mounting area on crankshaft, rear main oil seal, and measure crankshaft end play; determine needed action.	P-1
63.11 Inspect flywheel, starter ring gear and measure flywheel face and pilot bore runout; determine needed	P-1

	action.	
63.12	Inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.	P-2
64.0	Transmission diagnosis and repair. The student will be able to:	
64.01	Identify causes of transmission noise, shifting concerns, lockup, jumping-out-of-gear, overheating, and vibration problems; determine needed action.	P-1
64.02	Inspect, test, repair, or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies.	P-2
64.03	Inspect and replace transmission mounts, insulators, and mounting bolts.	P-1
64.04	Inspect for leakage and replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; repair as needed.	P-1
64.05	Check transmission fluid level and condition; determine needed service; add proper type of lubricant.	P-1
64.06	Inspect, adjust, and replace transmission shift lever, cover, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires.	P-2
64.07	Remove and reinstall transmission.	P-1
64.08	Inspect input shaft, gear, spacers, bearings, retainers, and slingers; determine needed action.	P-3
64.09	Inspect transmission oil filters and coolers and related components; replace as needed.	P-2
64.10	Inspect speedometer components; determine needed action.	P-2
64.11	Inspect and adjust power take-off (P.T.O.) assemblies, controls, and shafts; determine needed action.	P-3
64.12	Inspect and test function of reverse light, neutral start, and warning device circuits; determine needed action.	P-1
64.13	Inspect and test transmission temperature gauge, wiring harnesses and sensor/sending unit; determine needed action.	P-2
64.14	Inspect and test operation of automated mechanical transmission and manual electronic shift controls, shift, range and splitter solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU) neutral/in gear and reverse switches, and wiring harnesses; determine needed action.	P-2
64.15	Inspect and test operation of automated mechanical transmission electronic shift selectors, air and electrical switches, displays and indicators, wiring harnesses, and air lines; determine needed action.	P-2
64.16	Use appropriate electronic service tool(s) and procedures to diagnose automated mechanical transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed action.	P-1
64.17	Inspect and test operation of automatic transmission electronic shift controls, shift solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, and wiring harnesses.	P-2
64.18	Inspect and test operation of automatic transmission electronic shift selectors, switches, displays and	P-2

	indicators, wiring harnesses.	
64.19	Use appropriate electronic service tool(s) and procedures to diagnose automatic transmission problems; check and record diagnostic codes, clear codes, and interpret digital multi-meter (DMM) readings; determine needed repairs.	P-3
64.20	Diagnose transmission component failure cause, both before and during disassembly procedures; determine needed action.	
64.21	Inspect, adjust, service, repair, or replace transmission remote shift linkages, brackets, bushings, pivots, and levers.	
64.22	Inspect and adjust main shaft, gears, sliding clutches, washers, spacers, bushings, bearings, auxiliary drive assemblies, retainers, and keys; replace as needed.	
64.23	Inspect countershafts, gears, bearings, retainers, and keys; adjust bearing preload and time multiple countershaft gears; replace as needed.	
64.24	Inspect output shafts, gears, washers, spacers, bearings, retainers, and keys; replace as needed.	
64.25	Inspect and/or replace reverse idler shafts, gears, bushings, bearings, thrust washers, and retainers; check reverse idler gear end play (where applicable).	
64.26	Inspect synchronizer hub, sleeve, keys (inserts), springs, blocking rings, synchronizer plates, blocker pins, and sliding clutches; replace as needed.	
64.27	Inspect transmission cases including surfaces, bores, bushings, pins, studs, and magnets; replace as needed.	
64.28	Inspect transmission lubrication system pumps, troughs, collectors, and slingers; service or replace as needed.	
65.0	Driveshaft and universal joint diagnosis and repair. The student will be able to:	
65.01	Identify causes of driveshaft and universal joint noise and vibration problems; determine needed action.	P-1
65.02	Inspect, service, or replace driveshaft, slip joints, yokes, drive flanges, and universal joints; driveshaft boots and seals, and retaining hardware; check phasing of all shafts.	P-1
65.03	Inspect driveshaft center support bearings and mounts; determine needed action.	P-1
65.04	Measure drive line angles; determine needed action.	P-1
66.0	Drive axle diagnosis and repair. The student will be able to:	
66.01	Identify causes of drive axle(s) drive unit noise and overheating problems; determine needed action.	P-2
66.02	Check and repair fluid leaks; inspect and replace drive axle housing cover plates, gaskets, sealants, vents, magnetic plugs, and seals.	P-1
66.03	Check drive axle fluid level and condition; determine needed service; add proper type of lubricant.	P-1
66.04	Remove and replace differential carrier assembly.	P-2
66.05	Inspect and replace differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearings.	P-3

66.06	Inspect and replace components of locking differential case assembly.	P-3
66.07	Inspect differential carrier housing and caps, side bearing bores, and pilot (spigot, pocket) bearing bore; determine needed action.	P-3
66.08	Measure ring gear runout; determine needed action.	P-2
66.09	Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cages, and bearings.	P-3
66.10	Measure and adjust drive pinion bearing preload.	P-3
66.11	Measure and adjust drive pinion depth.	P-3
66.12	Measure and adjust side bearing preload and ring gear backlash.	P-2
66.13	Check and interpret ring gear and pinion tooth contact pattern; determine needed action.	P-2
66.14	Inspect, adjust, or replace ring gear thrust block/bolt.	P-3
66.15	Inspect power divider (inter-axle differential) assembly; determine needed action.	P-3
66.16	Inspect, adjust, repair, or replace air operated power divider (inter-axle differential) lockout assembly including diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls.	P-2
66.17	Inspect, repair, or replace drive axle lubrication system: pump, troughs, collectors, slingers, tubes, and filters.	P-3
66.18	Inspect and replace drive axle shafts.	P-1
66.19	Remove and replace wheel assembly; check rear wheel seal and axle flange gasket for leaks; perform needed action.	P-1
66.20	Identify causes of drive axle wheel bearing noise and check for damage; perform needed action.	P-1
66.21	Inspect and test drive axle temperature gauge, wiring harnesses, and sending unit/sensor; determine needed action.	P-2
66.22	Clean, inspect, lubricate and replace wheel bearings; replace seals and wear rings; inspect and replace retaining hardware; adjust drive axle wheel bearings. Verify end play with dial indicator method	P-1

Course Description: The Diesel Hydraulics Technician 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 hydraulic, pumps, filtration/reservoir, hoses, fittings, connectors, control valves, and actuator systems.

HY Task List:
P-1 = 27
P-2 = 5
P-3 = 0
Total 32

For every task in Diesel Hydraulics Technician, 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 first task in Diesel Hydraulics Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

Course Number: DIM0109 Occupational Completion Point: I Diesel Hydraulics Technician – 150 Hours		Priority Number
67.0	General hydraulic system diagnosis and repair. The student will be able to:	
67.01	Identify system type (closed and open) and verify proper operation.	P-1
67.02	Read and interpret system diagrams and schematics.	P-1
67.03	Perform system temperature, pressure, flow, and cycle time tests; determine needed action.	P-1
67.04	Verify placement of equipment /component safety labels and placards; determine needed action.	P-1
68.0	Diagnose and repair hydraulic pumps. The student will be able to:	
68.01	Identify system fluid type.	P-1
68.02	Identify causes of pump failure, unusual pump noises, temperature flow, and leakage problems; determine needed action.	P-1
68.03	Determine pump type, rotation, and drive system.	P-1
68.04	Remove and install pump; prime and/or bleed system.	P-2
68.05	Inspect pump inlet for restrictions and leaks; determine needed action.	P-2
68.06	Inspect pump outlet for restrictions and leaks; determine needed action.	P-2
69.0	Diagnose and repair hydraulic filtration/reservoirs (tanks). The student will be able to:	
69.01	Identify type of filtration system; verify filter application and flow direction.	P-1
69.02	Service filters and breathers.	P-1
69.03	Identify causes of system contamination; determine needed action.	P-2
69.04	Take a hydraulic oil sample for analysis.	P-1
69.05	Check reservoir fluid level and condition; determine needed action.	P-1
69.06	Inspect and repair or replace reservoir, sight glass, vents, caps, mounts, valves, screens, supply and return lines.	P-1
70.0	Diagnose and repair hydraulic hoses, fittings, and connections. The student will be able to:	
70.01	Diagnose causes of component leakage, damage, and restriction; determine needed action.	P-2
70.02	Inspect hoses and connections (length, size, routing, bend radii, and protection); repair or replace as needed.	P-1

	70.03 Assemble hoses, tubes, connectors, and fittings in accordance with manufacturers' specifications; use proper procedures to avoid contamination.	P-1
	70.04 Inspect and replace fitting seals and sealants.	P-1
71.0	Diagnose and repair hydraulic control valves. The student will be able to:	
	71.01 Pressure test system safety relief valve; determine needed action.	P-1
	71.02 Perform control valve operating pressure and flow tests; determine needed action.	P-1
	71.03 Inspect, test, and adjust valve controls (electrical/electronic, mechanical, and pneumatic).	P-1
	71.04 Identify causes of control valve leakage problems (internal/external); determine needed action.	P-1
	71.05 Inspect pilot control valve linkages, cables, and PTO controls; adjust, repair, or replace as needed.	P-1
72.0	Diagnose and repair hydraulic actuators. The student will be able to:	
Comply with manufacturers' and industry accepted safety practices associated with equipment lock out/tag out; pressure line release; implement/support (blocked or resting on ground); and articulated cylinder devices/machinery safety locks.		
	72.01 Identify actuator type (single/double acting, multi-stage/telescopic, and motors).	P-1
	72.02 Identify the cause of seal failure; determine needed repairs.	P-1
	72.03 Identify the cause of incorrect actuator movement and leakage (internal and external); determine needed repairs.	P-1
	72.04 Inspect actuator mounting, frame components, and hardware for looseness, cracks, and damage; determine needed action.	P-1
	72.05 Remove, repair, and/or replace actuators in accordance with manufacturers' recommended procedures.	P-1
	72.06 Inspect actuators for dents, cracks, damage, and leakage; determine needed action.	P-1
	72.07 Purge and/or bleed system in accordance with manufacturers' recommended procedures.	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

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

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 Automotive Service Excellence (ASE) Education Foundation.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program		
Program Number	l470608	
CIP Number	0647060405	
Grade Level	30, 31	
Program Length	1800 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 10	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 nine occupational completion points.

NOTE: It is recommended that students complete **OCP-A (Automobile Services Assistor)** and/or demonstrate mastery of the outcomes in **OCP-A (Automobile Services Assistor)** prior to enrolling in additional Automotive Service Technology courses. **The sequence of OCP's, after completing and/or demonstrating mastery of OCP-A (Automobile Services Assistor), is at the discretion of the instructor.**

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

When offered at the postsecondary level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	AER0014	Automobile Services Assistor	AUTO IND @7 %7 %G AUTO MECH @7 7G	300 hours
B	AER0110	Engine Repair Technician		150 hours
C	AER0257	Automatic Transmission and Transaxle Technician		150 hours
D	AER0274	Manual Drivetrain and Axle Technician		150 hours
E	AER0453	Automobile Suspension and Steering Technician		150 hours
F	AER0418	Automotive Brake System Technician		150 hours
G	AER0360	Automotive Electrical/Electronic System Technician		300 hours
H	AER0172	Automotive Heating and Air Conditioning Technician		150 hours
I	AER0503	Automotive Engine Performance Technician		300 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Automotive Service Technology program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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, engine block, lubrication and cooling systems.
05.0 Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles.
06.0 Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive.
07.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions systems, wheel alignment, and wheels and tires.
08.0 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.
09.0 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.
10.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling.
11.0 Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems.

Florida Department of Education
Student Performance Standards

Program Title: **Master Automotive Service Technology**
Career Certificate Program Number: **I470608**

Course Description: The Automotive Service Assistor course prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study equipment skills, safety regulations, routine maintenance, and customer service.

Abbreviations:
ASE = Supplemental Tasks

ER Task List	
	P-1 = 12
	P-2 = 6
	P-3 = 0
Total	**18**

For every task in Automotive Services Assistor course, 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.

Course Number: AER0014 **Occupational Completion Point: A** **Automotive Services Assistor – 300 Hours**	**Priority Number**
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
01.02 Demonstrate knowledge of appropriate automotive industry certifications.	
01.03 Identify and define career opportunities in the automotive service industry.	
01.04 Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).	
01.05 Identify appropriate emergency first aid procedures.	
01.06 Utilize and demonstrate safe procedures for handling of tools and equipment.	ASE
01.07 Identify and use proper placement of floor jacks and jack stands.	ASE
01.08 Identify and use proper procedures for safe lift operation.	ASE
01.09 Utilize proper ventilation procedures for working within the lab/shop area.	ASE

	01.10 Identify proper procedures for safe pit usage.	
	01.11 Identify marked safety areas.	ASE
	01.12 Identify the location and the types of fire extinguishers and other fire safety equipment.	ASE
	01.13 Demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.	ASE
	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 personal protection equipment (PPE) to include safety glasses, ear protection, gloves, shoes, and other devices as required 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.	
	01.20 Identify and describe typical automotive lubricants and lubricant properties.	
	01.21 Identify and describe typical automotive seals and gaskets.	
	01.22 Identify the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, battery electric vehicles, and hybrid electric vehicle high voltage circuits.	ASE
	01.23 Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.	
	01.24 Identify the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)	ASE
	01.25 Locate and demonstrate knowledge of Safety Data Sheets (SDS).	ASE
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
	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
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
	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	ASE

	equipment.	
03.04	Demonstrate use of the three C's (Concern, Cause, and Correction).	ASE
03.05	Review vehicle service history.	ASE
03.06	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	ASE
03.07	Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.	
03.08	Determine the presence of a Tire Pressure Monitoring System (TPMS).	
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.	
03.13	Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.	
03.14	Use proper chemicals for cleaning and lubrication.	P-1
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.	P-1
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.	P-1
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.	P-2
03.28	Check manual transmission fluid level; note unusual conditions; service as required.	P-1

03.29	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.	
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	Change engine oil and filter.	P-1
03.33	Inspect, service, or replace air filters, filter housings, and intake duct work.	P-1
03.34	Inspect and replace fuel filters; as applicable.	P-2
03.35	Inspect and replace air filter.	
03.36	Inspect and replace cabin air filter.	
03.37	Inspect, replace and adjust drive belts; inspect tensioners and pulleys.	P-2
03.38	Document observed damage, unusual conditions, and concerns.	
03.39	Inspect struts, springs, and related components; service as required.	
03.40	Inspect stabilizer bar(s), bushings, brackets, and links; service as required.	
03.41	Inspect springs, torsion bars, and related components; service as required.	
03.42	Inspect shock absorbers and related components.	
03.43	Inspect constant velocity (CV) axle shaft boots; service as required.	
03.44	Identify service considerations when equipped with a Tire Pressure Monitoring System (TPMS).	
03.45	Identify nitrogen-filled tires.	
03.46	Inspect tires, diagnose tire wear patterns, inspect spare and mounting system; check and adjust tire pressure; where applicable.	
03.47	Dismount, inspect, and remount tire on wheel (with/without TPMS); balance wheel and tire assembly.	P-1
03.48	Identify indirect and direct tire pressure monitoring system (TPMS); calibrate system; verify operation of instrument panel lamps.	P-1
03.49	Perform Road Force balance /match mounting.	P-2
03.50	Reinstall wheel; torque wheel fasteners to specification.	
03.51	Check wheel bearings for play and other signs of wear.	
03.52	Perform a visual inspection of a drum brake system.	
03.53	Perform a visual inspection of a disc brake system.	
03.54	Check operation of brake stop light system.	P-1
03.55	Check parking brake operation (manual/electric); check parking brake components for unusual conditions.	

03.56	Check wiper blades, inserts, and arms; replace wiper blades or inserts.	
03.57	Lubricate door latches and hinges.	
03.58	Inspect fuel tank, fuel cap and seal; inspect and replace fuel lines, fittings, and hoses; as applicable.	
03.59	Perform battery state-of-charge test; determine needed action.	P-1
03.60	Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action.	P-1
03.61	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.	
03.62	Perform battery, starting, and charging system tests using appropriate tester.	
03.63	Start a vehicle using jumper cables or a battery auxiliary power supply (jump box).	
03.64	Maintain or restore electronic memory functions if required.	P-2
03.65	Inspect and test fusible links, circuit breakers, and fuses; confirm proper circuit operation; replace as needed.	
03.66	Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.	P-1
03.67	Aim headlights.	P-2

Course Description: The Engine Repair Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of general engine, cylinder heads, valve trains, engine block, lubrication, and cooling systems.

Abbreviations:
ER = Engine Repair

For every task in Engine Repair Technician course, 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.

ER Task List:	
P-1	**= 22**
P-2	**= 19**
P-3	**= 9**
Total	**50**

Course Number: AER0110 Occupational Completion Point: B Engine Repair Technician – 150 Hours		**Priority Number**
04.0	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)		

04.01	Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advance driver assistance systems (ADAS).	P-1
04.02	Retrieve and record DTCs, OBD monitor status, and freezeframe data; clear codes and date when directed.	
04.03	Verify operation of the instrument panel engine warning indicators.	P-1
04.04	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action.	P-1
04.05	Install engine covers using gaskets, seals, and sealers as required.	P-1
04.06	Verify engine mechanical timing and identify variable timing procedures.	P-1
04.07	Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.	
04.08	Inspect, remove and/or replace engine mounts.	P-2
04.09	Identify service precautions related to service of the internal combustion engine of a hybrid electric vehicle.	P-2
04.10	Remove and reinstall engine on a newer vehicle equipped with OBD; reconnect all attaching components and restore the vehicle to running condition.	P-3
04.11	Identify and interpret engine concern; determine necessary action.	
04.12	Locate and interpret vehicle and major component identification numbers.	
04.13	Diagnose engine noises and vibrations; determine necessary action.	
04.14	Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.	
04.15	Perform engine vacuum tests; determine necessary action.	
04.16	Identify cylinder head and valve train components and configurations.	P-1
04.17	Perform cylinder power balance tests; determine necessary action.	
04.18	Perform cylinder cranking and running compression tests; determine necessary action.	
04.19	Perform cylinder leakage tests; determine necessary action.	
Cylinder Head and Valve Train Diagnosis and Repair		
04.20	Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer’s specification and procedure.	P-1
04.21	Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1
04.22	Inspect valve actuating mechanisms for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-2
04.23	Adjust valves (mechanical or hydraulic lifters).	P-1

04.24	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
04.25	Inspect valve springs for squareness and free height comparison; determine needed action.	P-3
04.26	Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action.	P-3
04.27	Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action.	P-3
04.28	Inspect valves and valve seats; determine needed action.	P-3
04.29	Check valve spring assembled height and valve stem height; determine needed action.	P-3
04.30	Inspect valve lifters and hydraulic lash adjusters; determine needed action.	P-2
04.31	Inspect and/or measure camshaft for runout, journal wear and lobe wear.	P-3
04.32	Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action.	P-3
Engine Block Assembly Diagnosis and Repair		
04.33	Identify engine block assembly components and configurations.	P-1
04.34	Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-1
04.35	Disassemble engine block; clean and prepare components for inspection and reassembly.	P-1
04.36	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.	P-2
04.37	Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.	P-2
04.38	Deglaze and clean cylinder walls.	P-2
04.39	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.	P-2
04.40	Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine needed action.	P-2
04.41	Inspect main and connecting rod bearings for damage and wear; determine needed action.	P-2
04.42	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.	P-3
04.43	Inspect and measure piston skirts and ring lands; determine needed action.	P-2
04.44	Determine piston-to-bore clearance.	P-2
04.45	Inspect, measure, and install piston rings.	P-2
04.46	Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance and/or silencer); inspect shaft(s) and	P-2

	support bearings for damage and wear; determine needed action; reinstall and time.	
04.47	Remove and replace piston pin; where applicable.	
04.48	Assemble engine block.	P-1
Lubrication and Cooling Systems Diagnosis and Repair		
04.49	Identify lubrication and cooling system components and configurations.	
04.50	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 needed action.	P-1
04.51	Identify causes of engine overheating.	P-1
04.52	Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
04.53	Inspect and/or test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.	P-1
04.54	Inspect, remove, and replace water pump.	P-2
04.55	Remove and replace radiator.	P-2
04.56	Remove, inspect, and replace thermostat and gasket/seal.	P-1
04.57	Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.	P-1
04.58	Perform oil pressure tests; determine needed action.	P-1
04.59	Perform engine oil and filter change; use proper fluid type per manufacturer specification.	P-1
04.60	Inspect auxiliary coolers; determine needed action.	P-2
04.61	Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
04.62	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.	P-2
04.63	Inspect and replace engine cooling and heater system hoses.	

Course Description: The Automatic Transmission and Transaxle Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics, repair, service, and operation of automatic transmission/transaxles.

Abbreviations:
AT = Automatic Transmission/Transaxle

For every task in Automatic Transmission and Transaxle Technician course, the following safety requirement

AT Task List:
P-1 = 13
P-2 = 27
P-3 = 0
Total 40

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.

Course Number: AER0257 Occupational Completion Point: C Automatic Transmission and Transaxle Technician – 150 Hours	**Priority Number**
05.0 Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles. The student will be able to:	
General: Transmission and Transaxle Diagnosis	
05.01 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
05.02 Identify automatic transmission and transaxle components and configurations.	P-1
05.03 Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
05.04 Inspect transmission fluid condition; check level; inspect for leaks on transmission or transaxle equipped with a dipstick.	P-1
05.05 Inspect transmission fluid condition; check level; inspect for leaks on transmission or transaxle not equipped with a dipstick.	P-1
05.06 Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine needed action.	P-1
05.07 Diagnose noise and vibration concerns; determine needed action.	P-2
05.08 Perform stall test; determine needed action.	P-2
05.09 Perform lock-up converter system tests; determine needed action.	P-2
05.10 Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.	P-1
05.11 Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.	P-1
05.12 Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).	P-1
In-Vehicle Transmission/Transaxle Maintenance and Repair	
05.13 Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.	P-1
05.14 Inspect for leakage; replace external seals, gaskets, and bushings.	P-2

05.15 Perform relearn procedures.	P-2
05.16 Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits.	P-1
05.17 Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.	P-1
05.18 Inspect, replace and align powertrain mounts.	P-2
05.19 Diagnose electronic transmission control systems using a scan tool; determine necessary action.	
Off-Vehicle Transmission and Transaxle Repair	
05.20 Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mounting surfaces.	P-2
05.21 Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings.	P-1
05.22 Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.	P-2
05.23 Describe the operational characteristics of a continuously variable transmission (CVT).	P-2
05.24 Describe the operational characteristics of a hybrid electric vehicle drive train.	P-2
05.25 Disassemble, clean, and inspect transmission/transaxle.	P-2
05.26 Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, switches, solenoids, sleeves, retainers, brackets, check valves/balls, screens, spacers, and gaskets).	P-2
05.27 Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine needed action.	P-2
05.28 Assemble transmission/transaxle.	P-2
05.29 Inspect, measure, and reseal oil pump assembly and components.	P-2
05.30 Measure transmission/transaxle end play and/or preload; determine needed action.	P-2
05.31 Inspect, measure, and/or replace thrust washers and bearings.	P-2
05.32 Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.	P-2
05.33 Inspect bushings; determine needed action.	P-2
05.34 Inspect and measure planetary gear assembly components; determine needed action.	P-2
05.35 Inspect case bores, passages, bushings, vents, and mating surfaces; determine needed action.	P-2
05.36 Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform needed action.	P-2
05.37 Inspect measure, repair, adjust or replace transaxle final drive components.	P-2
05.38 Inspect clutch drum, piston, check-balls, springs, retainers, seals, friction plates, pressure plates, and bands; determine needed action.	P-2

05.39 Measure clutch pack clearance; determine needed action.	P-2
05.40 Air test operation of clutch and servo assemblies.	P-2
05.41 Inspect one-way clutches, races, rollers, sprags, springs, cages, retainers; determine needed action.	P-2
05.42 Install and seat torque converter to engage drive/splines.	
05.43 Inspect bands and drums; determine necessary action.	

Course Description: The Manual Drivetrain and Axle Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of drive train, clutch, transmission, transaxle, half shaft universal, constant-velocity joint, rear axle, ring and pinion gears, differential case assemble, limited slip differential, drive shaft, and four wheel drive/all-wheel drive.

Abbreviations:
MD = Manual Drivetrain and Axles

For every task in Manual Drivetrain and Axle Technician course, 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.

MD Task List:
P-1 = 16
P-2 = 30
P-3 = 6
Total 52

Course Number: AER0274 Occupational Completion Point: D Manual Drivetrain and Axle Technician – 150 Hours	**Priority Number**
06.0 Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive. The student will be able to:	
General: Drive Train Diagnosis	
06.01 Identify and interpret drive train concerns; determine needed action.	P-1
06.02 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
06.03 Check fluid condition; check for leaks; determine needed action.	P-1
06.04 Identify manual drive train and axle components and configurations.	P-1

06.05	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
06.06	Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification.	P-1
06.07	Diagnose fluid loss, level, and condition concerns; determine necessary action.	
Clutch Diagnosis and Repair		
06.08	Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action.	P-2
06.09	Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform needed action.	P-2
06.10	Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable).	P-2
06.11	Bleed clutch hydraulic system.	P-2
06.12	Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.	P-2
06.13	Inspect flywheel and ring gear for wear, cracks, and discoloration; determine needed action.	P-2
06.14	Measure flywheel runout and crankshaft end play; determine needed action.	P-2
06.15	Describe the operation and service of a system that uses a dual mass flywheel.	P-3
06.16	Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.	
06.17	Describe the operation and service of an electronically controlled dual clutch system.	
06.18	Inspect engine block, core plugs, rear main engine oil seal, clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action.	
Transmission/Transaxle Diagnosis and Repair		
06.19	Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers.	P-2
06.20	Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.	P-2
06.21	Diagnose noise concerns through the application of transmission/transaxle powerflow principles.	P-2
06.22	Diagnose hard shifting and jumping out of gear concerns; determine needed action.	P-2
06.23	Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action.	P-2
06.24	Disassemble, inspect clean, and reassemble internal transmission/transaxle components.	P-3
06.25	Remove and reinstall manual transmission/transaxle.	
06.26	Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action.	
06.27	Inspect, replace, and align powertrain mounts.	

06.28	Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.	
06.29	Remove and replace transaxle final drive.	
06.30	Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.	
06.31	Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action.	
06.32	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.	
06.33	Inspect lubrication devices (oil pump or slingers); perform necessary action.	
06.34	Inspect, test, and replace transmission/transaxle sensors and switches.	
Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair (Front, Rear, All-Wheel, and Four-Wheel drive)		
06.35	Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action.	P-1
06.36	Diagnose universal joint noise and vibration concerns; perform needed action.	P-1
06.37	Inspect, remove, and/or replace bearings, hubs, and seals.	P-1
06.38	Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.	P-1
06.39	Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles; determine needed action.	P-2
06.40	Inspect, service, and replace shaft center support bearings.	
Drive Axle Diagnosis and Repair – Ring and Pinion Gears and Differential Case Assembly		
06.41	Clean and inspect differential housing; check for leaks; inspect housing vent.	P-1
06.42	Check and adjust differential housing fluid level; use proper fluid type per manufacturer specification.	P-1
06.43	Drain and refill differential housing; use proper fluid type per manufacturer specifications.	P-1
06.44	Diagnose noise and vibration concerns; determine needed action.	P-2
06.45	Inspect and replace companion flange and/or pinion seal; measure companion flange runout.	P-2
06.46	Inspect ring gear and measure runout; determine needed action.	P-2
06.47	Remove, inspect, reinstall and/or drive pinion and ring gear, spacers, sleeves, and bearings.	P-2
06.48	Measure and adjust drive pinion depth.	P-2
06.49	Measure and adjust drive pinion bearing preload.	P-2
06.50	Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types).	P-2

06.51 Check ring and pinion tooth contact patterns; perform needed action.	P-2
06.52 Disassemble, inspect, measure, adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.	P-2
06.53 Reassemble and reinstall differential case assembly; measure runout; determine needed action.	P-2
06.54 Diagnose noise and vibration concerns; determine necessary action.	
Drive Axle Diagnosis and Repair – Limited Slip Differential	
06.55 Diagnose noise, slippage, and chatter concerns; determine needed action.	P-3
06.56 Measure rotating torque; determine needed action.	P-3
06.57 Inspect and reinstall limited slip differential components.	
06.58 Identify operational characteristics of electronic control differentials.	
Drive Axle Diagnosis and Repair – Drive Axles	
06.59 Inspect and replace drive axle wheel studs.	P-1
06.60 Remove and replace drive axle shafts.	P-1
06.61 Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2
06.62 Measure drive axle flange runout and shaft end play; determine needed action.	P-2
06.63 Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine needed action.	P-2
Four-Wheel Drive/All-Wheel Drive Component Diagnosis and Repair	
06.64 Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-2
06.65 Inspect locking mechanisms; determine needed action.	P-3
06.66 Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P-2
06.67 Identify concerns related to variations in tire circumference and/or final drive ratios.	P-1
06.68 Diagnose noise, vibration, and unusual steering concerns; determine needed action.	P-2
06.69 Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive/all-wheel drive systems.	P-2
06.70 Disassemble, service, and reassemble transfer case and components.	P-3
06.71 Remove and reinstall transfer case.	

Course Description: The Automotive Suspension and Steering Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of general suspension, steering systems, front suspensions, rear suspensions, wheel alignment, and tires.

Abbreviations:
SS = Suspension and Steering

For every task in Automotive Suspension and Steering Technician course, 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.

SS Task List:	
P-1	**27**
P-2	**22**
P-3	**6**
Total	**55**

Course Number: AER0453 **Occupational Completion Point: E** **Automotive Suspension and Steering Technician – 150 Hours**	**Priority Number**
07.0 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: Suspension and Steering Systems	
07.01 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
07.02 Identify suspension and steering system components and configurations.	
07.03 Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
07.04 Identify and interpret suspension and steering system concerns; determine needed action.	P-1
Steering Systems Diagnosis and Repair	
07.05 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1
07.06 Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).	P-1
07.07 Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action.	P-2
07.08 Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-3
07.09 Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-1
07.10 Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.	P-2

07.11 Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.	P-2
07.12 Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.	P-1
07.13 Drain and replace power steering system fluid; use proper fluid type per manufacturer specification.	P-2
07.14 Inspect for power steering fluid leakage; determine needed action.	P-1
07.15 Remove and reinstall power steering pump.	P-2
07.16 Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.	P-2
07.17 Inspect, remove and/or replace power steering hoses and fittings.	P-2
07.18 Inspect, remove and/or replace pitman arm, relay (center-link/intermediate) rod, idler arm, mountings, and steering linkage damper.	P-2
07.19 Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps.	P-1
07.20 Inspect and test electric power steering system; determine needed action.	P-1
07.21 Identify hybrid electric vehicle power steering system electrical circuits and safety precautions.	P-2
07.22 Test power steering system pressure; determine needed action.	P-3
Suspension Systems Diagnosis and Repair	
07.23 Diagnose suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
07.24 Inspect, remove, and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.	P-2
07.25 Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators).	P-2
07.26 Inspect, remove, and/or replace steering knuckle assemblies.	P-2
07.27 Inspect, remove and/or replace suspension system coil springs and spring insulators.	P-2
07.28 Inspect, remove, and/or replace torsion bars and mounts	P-2
07.29 Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.	P-3
07.30 Inspect, remove, and/or replace strut assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.	P-3
07.31 Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings.	P-3
07.32 Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.	P-1
07.33 Inspect, remove, and /or replace components of suspension systems (coil, leaf, and torsion).	P-1
07.34 Inspect, remove, and /or replace components of electronically controlled suspension systems.	P-1
Related Suspension and Steering Service	

07.35	Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.	P-2
07.36	Remove, inspect, service and/or replace front and rear wheel bearings.	P-1
07.37	Describe the function of suspension and steering control systems and components, (i.e., active suspension and stability control).	P-2
Wheel Alignment Diagnosis, Adjustment, and Repair		
07.38	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action.	P-1
07.39	Perform pre-alignment inspection; measure vehicle ride height; determine needed action.	P-1
07.40	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
07.41	Check toe-out-on-turns (turning radius); determine needed action.	P-2
07.42	Check steering axis inclination (SAI) and included angle; determine needed action.	P-2
07.43	Check rear wheel thrust angle; determine needed action.	P-1
07.44	Check for front wheel setback; determine needed action.	P-2
07.45	Check front and/or rear cradle (sub-frame) alignment; determine needed action.	P-3
07.46	Reset steering angle sensor and related equipment.	P-2
07.47	Identify operational characteristics of an ADAS system (brakes, lane departure, etc.).	
Wheels and Tires Diagnosis and Repair		
07.48	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
07.49	Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.	P-2
07.50	Rotate tires according to manufacturer’s recommendation including vehicles equipped with tire pressure monitoring systems (TPMS)	P-1
07.51	Measure wheel, tire, axle flange, and hub runout; determine needed action.	P-2
07.52	Diagnose tire pull problems; determine needed action.	P-1
07.53	Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.	P-1
07.54	Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-1
07.55	Inspect tire and wheel assembly for air loss; perform needed action.	P-1
07.56	Repair tire following vehicle manufacturer approved procedure.	P-1
07.57	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure	P-1
07.58	Reinstall wheel; torque lug nuts.	

Course Description: The Automotive Brake System Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of brake systems, drum brakes, disc brakes, power assist units, electronic brakes, traction, and stability control.

Abbreviations:
BR = Brakes

BR Task List:	
	P-1 = 30
	P-2 = 23
	P-3 = 3
Total	**56**

For every task in Automotive Brake System Technician course, 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.

Course Number: AER0418 **Occupational Completion Point: F** **Automotive Brake System Technician – 150 Hours**		**Priority Number**
08.0	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		
08.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
08.02	Identify and interpret brake system concerns; determine needed action.	P-1
08.03	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
08.04	Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).	P-1
08.05	Install wheel and torque lug nuts.	P-1
08.06	Identify and interpret brake system concerns; determine needed action.	P-1
Hydraulic System Diagnosis and Repair		
08.07	Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).	P-1
08.08	Measure brake pedal height, travel, and free play (as applicable); determine needed action.	P-1
08.09	Check master cylinder for internal/external leaks and proper operation; determine needed action.	P-1

08.10	Remove, bench bleed, and reinstall master cylinder.	P-1
08.11	Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.	P-1
08.12	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear; and loose fittings/supports; determine needed action.	P-1
08.13	Replace brake lines, hoses, fittings, and supports.	P-2
08.14	Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).	P-2
08.15	Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P-1
08.16	Inspect, test, and/or replace components of brake warning light system.	P-3
08.17	Identify components of hydraulic brake warning light system.	P-2
08.18	Bleed and/or replace brake fluid.	P-1
08.19	Test brake fluid for contamination.	P-1
08.20	Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.	
Drum Brake Diagnosis and Repair		
08.21	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.	P-2
08.22	Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P-2
08.23	Refinish brake drum and measure final drum diameter; compare with specification.	P-2
08.24	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-2
08.25	Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2
08.26	Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	P-2
Disc Brake Diagnosis and Repair		
08.27	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.	P-1
08.28	Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action.	P-1
08.29	Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action.	P-1
08.30	Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action.	P-1
08.31	Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks.	P-1
08.32	Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.	P-1

08.33 Remove and reinstall/replace rotor.	P-1
08.34 Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P-1
08.35 Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-2
08.36 Retract and re-adjust caliper piston on an integrated parking brake system.	P-1
08.37 Check brake pad wear indicator; determine needed action.	
08.38 Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.	P-1
08.39 Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts.	
Power-Assist Units Diagnosis and Repair	
08.40 Check brake pedal travel with and without engine running to verify proper power booster operation.	P-2
08.41 Identify components of the brake power assist system (vacuum, hydraulic, and electric).	P-2
08.42 Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster; determine needed action.	P-2
08.43 Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine needed action.	P-2
08.44 Inspect electric power booster unit; determine needed action.	P-3
Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair	
08.45 Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action.	P-1
08.46 Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.	P-2
08.47 Check parking brake operation (including electric parking brakes); check parking brake indicator light system operation; determine needed action.	P-2
08.48 Check parking brake operation and parking brake indicator light system operation; determine needed action.	P-1
08.49 Replace wheel bearing and race.	P-3
08.50 Remove, reinstall, and/or replace sealed wheel bearing assembly.	P-1
08.51 Inspect and replace wheel studs.	P-2
Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) Systems Diagnosis and Repair	
08.52 Identify and inspect electronic brake control system components (ABS, TCS, & ESC); determine needed action.	P-1
08.53 Describe the operation of a regenerative braking system.	P-2
08.54 Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action.	P-2

08.55	Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action.	P-2
08.56	Depressurize high-pressure components of an electronic brake control system.	P-2
08.57	Bleed the electronic brake control system hydraulic circuits.	P-1
08.58	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).	P-2
08.59	Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).	P-2
08.60	Remove and install electronic brake control system electrical/electronic and hydraulic components.	

Course Description: The Automotive Electrical/Electronic System Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of electrical/electronics, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems.

Abbreviations:
EE = Electrical/Electronic Systems

For every task in Automotive Electrical/Electronic System Technician course, the following safety requirement MUST be strictly enforced:

EE Task List:
P-1 = 40
P-2 = 6
P-3 = 0
Total 46

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.

Course Number: AER0360 Occupational Completion Point: G Automotive Electrical/Electronic System Technician – 300 Hours		**Priority Number**
09.0	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		
09.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
09.02	Identify electrical/electronic system components and configurations.	P-1
09.03	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1

09.04	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1
09.05	Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.	P-1
09.06	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1
09.07	Describe types of test lights; use appropriate test light to check operation of electrical circuits per service information.	P-1
09.08	Use fused jumper wires to check operation of electrical circuits.	P-1
09.09	Use wiring diagrams during the diagnosis of electrical/electronic circuit problems (e.g., symbols).	P-1
09.10	Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.	P-1
09.11	Inspect and test fusible links, circuit breakers, and fuses; determine needed action.	P-1
09.12	Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.	P-1
09.13	Test and measure circuit using an oscilloscope and/or graphing multimeter (GMM); interpret results; determine needed action.	P-1
09.14	Identify repair procedures for network connected systems.	P-1
09.15	Identify and interpret electrical/electronic system concern; determine necessary action.	
Battery Diagnosis and Service		
09.16	Maintain or restore electronic memory functions.	P-1
09.17	Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1
09.18	Perform slow/fast battery charge according to manufacturer's recommendations.	P-1
09.19	Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1
09.20	Identify safety precautions for high voltage systems on electric, hybrid, hybrid-electric, and diesel vehicles.	
09.21	Identify electrical/electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.	P-2
09.22	Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.	
09.23	Perform battery conductance test; determine necessary action.	
Starting System Diagnosis and Repair		
09.24	Perform starter current draw tests; determine needed action.	P-1
09.25	Perform starter circuit voltage drop tests; determine needed action.	P-1
09.26	Inspect and test starter relays and solenoids; determine needed action.	P-2

09.27	Remove and install starter in a vehicle.	P-1
09.28	Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.	P-1
09.29	Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.	P-1
09.30	Demonstrate knowledge of an automatic idle-stop/start-stop system.	P-1
09.31	Diagnose a no-crank condition using a wiring diagram and test equipment; determine needed action.	P-1
Charging System Diagnosis and Repair		
09.32	Perform charging system output test; determine needed action.	P-1
09.33	Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.	P-1
09.34	Inspect, adjust, and/or replace alternator (generator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P-1
09.35	Remove, inspect, and/or replace alternator (generator); determine needed action.	P-1
09.36	Perform charging circuit voltage drop tests; determine needed action.	P-1
Lighting Systems Diagnosis and Repair		
09.37	Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action.	P-1
09.38	Describe operation and diagnosis of an adaptive headlight system.	
09.39	Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2
09.40	Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.	
Instrument Cluster and Driver Information Systems Diagnosis and Repair		
09.41	Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action.	P-1
09.42	Diagnose the causes of incorrect operation of warning devices and other driver information systems; determine needed action.	P-1
09.43	Verify operation of instrument panel gauge sending units for causes of abnormal readings; determine needed action.	P-1
09.44	Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.	
Body Electrical Systems Diagnosis and Repair		
09.45	Diagnose vehicle comfort, convenience, access, safety, and related system operation; determine needed action.	P-2
09.46	Remove and reinstall door panel.	P-1
09.47	Diagnose 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-2

09.48	Diagnose 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-2
09.49	Describe disabling and enabling procedures for supplemental restraint system (SRS); verify indicator lamp operation.	P-1
09.50	Verify windshield wiper and washer operation; replace wiper blades.	P-1
09.51	Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back-up camera); determine needed repairs.	P-1
09.52	Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action.	P-1
09.53	Describe the process for software transfer, software updates, or reprogramming of electronic modules.	P-1
09.54	Diagnose heated glass, mirror, or seat operation; determine necessary action.	

Course Description: The Automotive Heating and Air Conditioning Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling.

Abbreviations:
HA = Heating and Air Conditioning

For every task in Automotive Heating and Air Conditioning Technician course, 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.

HA Task List:
P-1 = 20
P-2 = 14
P-3 = 2
Total 36

Course Number: AER0172 **Occupational Completion Point: H** **Automotive Heating and Air Conditioning Technician – 150 Hours**		**Priority Number**
10.0	Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling. The student will be able to:	
General: A/C System Diagnosis and Repair		
10.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1

10.02	Identify heating, ventilation, and air conditioning (HVAC) components and configurations.	P-1
10.03	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
10.04	Identify and interpret heating and air conditioning problems; determine needed action.	P-1
10.05	Performance test A/C system; identify problems.	
10.06	Identify abnormal operating noises in the A/C system; determine needed action.	P-2
10.07	Identify refrigerant type; test for sealant; select and connect proper gauge set/test equipment; record temperature and pressure readings.	P-1
10.08	Leak test A/C system; determine needed action.	P-1
10.09	Inspect condition/quantity of refrigerant oil removed from A/C system; determine needed action.	P-2
10.10	Determine recommended oil and oil capacity for system application and component(s) replacement.	P-1
Refrigeration System Component Diagnosis and Repair		
10.11	Inspect, remove, and/or replace A/C compressor drive belts, pulleys, tensioners and visually inspect A/C components for signs of leaks; determine needed action.	P-1
10.12	Inspect, test, and/or service A/C compressor clutch components and mountings; determine needed action.	P-2
10.13	Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity.	P-2
10.14	Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	
10.15	Determine need for an additional A/C system filter; perform needed action.	P-3
10.16	Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform needed action.	P-2
10.17	Inspect for proper A/C condenser airflow; determine needed action.	P-1
10.18	Remove, inspect, and replace receiver/drier or accumulator/drier; determine recommended oil type and quantity.	P-2
10.19	Remove, inspect, and install expansion valve or orifice (expansion) tube.	P-1
10.20	Inspect evaporator housing water drain; perform needed action.	P-1
10.21	Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action.	P-1
10.22	Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.	P-2
10.23	Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action.	
Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair		
10.24	Inspect engine cooling and heater systems hoses and pipes; perform needed action.	P-1

10.25 Inspect and test heater control valve(s); perform needed action.	P-2
10.26 Diagnose temperature control problems in the HVAC system; determine needed action.	P-2
10.27 Determine procedure to remove, inspect, reinstall, and/or replace heater core.	P-2
10.28 Inspect, test, and replace thermostat and gasket/seal.	
10.29 Determine coolant condition and coolant type for vehicle application; drain and recover coolant.	
10.30 Flush system; refill system with recommended coolant; bleed system.	
10.31 Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.	
10.32 Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.	
Operating Systems and Related Controls Diagnosis and Repair	
10.33 Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.	P-1
10.34 Diagnose A/C compressor clutch control systems; determine needed action.	P-1
10.35 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
10.36 Inspect., test remove and/or replace HVAC system control panel; determine needed action.	P-2
10.37 Inspect and test HVAC system control cables, motors, and linkages; perform needed action.	P-3
10.38 Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; perform needed action.	P-1
10.39 Identify the source of HVAC system odors.	P-2
10.40 Check operation of automatic HVAC control systems; determine needed action.	P-2
Refrigerant Recovery, Recycling, and Handling	
10.41 Demonstrate awareness of the need to recover, recycle, and handle refrigerant using roper equipment and procedures.	P-1
10.42 Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.	P-1
10.43 Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.	P-1
10.44 Recycle, label, and store refrigerant.	P-1

Course Description: The Automotive Engine Performance Technician course prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer, engine and emission control systems.

Abbreviations:
EP = Engine Performance

For every task in Automotive Engine Performance Technician course, 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.

EP Task List:	
	P-1 = 34
	P-2 = 13
	P-3 = 2
Total	**49**

Course Number: AER0503 Occupational Completion Point: I Automotive Engine Performance Technician – 300 Hours		**Priority Number**
11.0	Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems. The student will be able to:	
General: Engine Diagnosis		
11.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
11.02	Identify and interpret engine performance concerns; determine needed action.	P-1
11.03	Diagnose abnormal engine noises or vibration concerns; determine needed action.	P-2
11.04	Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.	P-2
11.05	Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action.	P-1
11.06	Perform cylinder power balance test; determine needed action.	P-1
11.07	Perform cylinder cranking and running compression tests; determine needed action.	P-1
11.08	Perform cylinder leakage test; determine needed action.	P-1
11.09	Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.	P-1
11.10	Verify proper engine cooling system operation; determine needed action.	P-1
11.11	Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT).	P-1
11.12	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	
11.13	Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.	
11.14	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.	

Computerized Controls Diagnosis and Repair		
11.15	Identify computerized control system components and configurations.	P-1
11.16	Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable.	P-1
11.17	Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1
11.18	Perform active tests of actuators using a scan tool; determine needed action.	P-1
11.19	Describe the use of OBD monitors for repair verification.	P-1
11.20	Diagnose the causes of emissions or drive-ability concerns with stored or active diagnostic trouble codes (DTC); obtain, graph, and interpret scan tool data.	P-1
11.21	Diagnose emissions or drive-ability concerns without stored or active diagnostic trouble codes; determine needed action.	P-1
11.22	Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO); perform needed action.	P-1
11.23	Diagnose drive-ability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, HVAC, automatic transmissions, non-OEM installed accessories, or similar systems); determine needed action.	P-2
11.24	Check for module communication (including CAN/BUS systems) errors using a scan tool.	
11.25	Describe the process for reprogramming or recalibrating the powertrain/engine control module (PCM/ECM).	P-1
Ignition System Diagnosis and Repair		
11.26	Identify ignition system components and configurations.	P-1
11.27	Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns; determine needed action.	P-1
11.28	Inspect and test crankshaft and camshaft position sensor(s); determine needed action.	P-1
11.29	Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as needed.	P-2
11.30	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1
11.31	Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.	
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair		
11.32	Identify fuel, air induction, and exhaust system components and configurations.	P-1
11.33	Diagnose (troubleshoot) 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; determine needed action.	P-2

11.34	Check fuel for contaminants; determine needed action.	P-2
11.35	Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; perform needed action.	P-1
11.36	Replace fuel filter(s) where applicable.	P-2
11.37	Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2
11.38	Inspect, test, and/or replace fuel injectors on low- and high-pressure systems.	P-1
11.39	Verify idle control operation.	P-1
11.40	Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform needed action.	P-1
11.41	Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.	P-1
11.42	Perform exhaust system back-pressure test; determine needed action.	P-2
11.43	Check and refill diesel exhaust fluid (DEF).	P-3
11.44	Test the operation of turbocharger/supercharger systems; determine needed action.	P-2
Emissions Control Systems Diagnosis and Repair		
11.45	Identify emission control system components and configurations.	P-1
11.46	Diagnose oil leaks, emissions, and drive-ability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.	P-2
11.47	Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform needed action.	P-2
11.48	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) systems; determine needed action.	P-1
11.49	Diagnose emissions and drive-ability concerns caused by the secondary air injection system; inspect, test, repair, and/or replace electrical/electronically-operated components and circuits of secondary air injection systems; determine needed action.	P-2
11.50	Diagnose emissions and drive-ability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.	P-1
11.51	Diagnose emission and drive-ability concerns caused by catalytic converter system; determine needed action.	P-1
11.52	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.	P-1
11.53	Inspect and test electrical/electronically operated components and circuits of secondary air injection systems; determine needed action.	P-3
11.54	Adjust valves on engines with mechanical or hydraulic lifters; as applicable.	

11.55	Remove and replace timing belt; verify correct camshaft timing.	
11.56	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	
11.57	Inspect engine oil and/or filter for condition and determine necessary action.	
11.58	Identify hybrid electric vehicle internal combustion engine service precautions.	

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 P-1, P-2, or P-3 are ASE tasks.

It is recommended that the program be Automotive Service Excellence (ASE) Education Foundation Master Certified (MAST) and the instructors be A1-A8 ASE Master and Advanced Engine Performance (L1) ASE Certified.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program	
Program Number	I490205
CIP Number	0649020500
Grade Level	30, 31
Program Length	320 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml
Basic Skills Level	N/A

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 a Class “A” Commercial Driver License.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Commercial Vehicle Driving industry, planning, management, labor issues, community issues and health, safety, and environmental issues. The content includes but is not limited to the following: Loading and unloading cargo; reporting delays or accidents on the road; verifying load against shipping papers; and keeping records.

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

Program Structure

This program is a planned sequence of instruction consisting of one occupational completion point.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	TRA0080	Tractor Trailer Truck Driver	COMM DRIV @7 7G	320 hours

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 Understand vehicle safety and accident prevention procedures.
02.0 Understand and comply with vehicle operating regulations.
03.0 Demonstrate proper cargo handling and documentation procedures.
04.0 Demonstrate trip planning preparation procedures.
05.0 Demonstrate vehicle inspection, maintenance, and servicing procedures.
06.0 Demonstrate basic vehicle control procedures.
07.0 Demonstrate backing skills and basic vehicle maneuvers.
08.0 Demonstrate coupling and uncoupling skills.
09.0 Demonstrate road driving skills.
10.0 Demonstrate hazardous driving skills.
11.0 Apply concepts learned for obtaining a Commercial Driver's License (CDL).

Florida Department of Education
Student Performance Standards

Program Title: **Commercial Vehicle Driving**
Career Certificate Program Number: **I490205**

Course Description: The Tractor Trailer Truck Driver course prepares students for entry into the trucking and logistics industry. Students explore career opportunities and requirements of a professional tractor trailer driver. Students study vehicle safety, accident prevention, operating regulations, cargo handling, documentation procedures, pre-trip preparation, vehicle inspection, maintenance, service, control procedures, backing, coupling, uncoupling, maneuvering, road and hazardous driving skills, and licensing requirements.

Course Number: TRA0080 **Occupational Completion Point: A** **Tractor Trailer Truck Driver – 320 Hours**
01.0 Understand vehicle safety and accident prevention procedures. The student will be able to:
01.01 Understand, identify and explain the use of vehicle safety equipment.
01.02 Understand the use of fire extinguishers.
01.03 Utilize seat belts and personal protection gear appropriate to type of operation.
01.04 Describe safe lifting procedures through use of hands-on labs or through viewing safety videos.
01.05 Describe personal safety equipment and procedures.
01.06 Describe actions applicable for vehicle accidents.
01.07 Review reports in a classroom activity.
01.08 Understand accident reporting requirements (company, state, federal).
01.09 Identify all information needed for accident reports to the State, the employer, and the insurance company.
01.10 Review an accident report.
01.11 Describe procedures for protecting the scene of an accident.
01.12 Describe personal liability requirements.
01.13 Identify hazardous road conditions that are a potential threat to the safety of the truck driver.
01.14 Describe activities and characteristics of other road users that make them potentially dangerous.
01.15 Describe the potential consequences of excessive speed.
01.16 Describe the potential consequences of use of drugs or alcohol.

	01.17 Demonstrate safety procedures for entering and exiting vehicles.
02.0	Understand and comply with vehicle operating regulations. The student will be able to:
	02.01 Understand and comply with hours-of-service regulations.
	02.02 Maintain a complete, neat, and accurate driver's duty status log including discussion of electronic logs.
	02.03 Keep accurate records required by hours-of-service regulations.
	02.04 Review mathematical calculations necessary to recap and apply totals to the hours-of-service regulations.
	02.05 Determine driving hours remaining on a particular day or tour of duty.
	02.06 Understand and comply with applicable United States Department of Transportation regulations including Federal Motor Carrier Safety Administration rules and regulations - Compliance, Safety, and Accountability (CSA) particularly the role of drivers and motor carriers.
	02.07 Understand and comply with Federal, State and Local traffic laws including restrictions on vehicle size and weight including permits when required.
03.0	Demonstrate proper cargo handling and documentation procedures. The student will be able to:
	03.01 Understand legal gross weight and axle weight.
	03.02 Describe cargo load to meet legal weight and safety requirements.
	03.03 Discuss how to secure cargo using blocking, bracing, packing, rope, cable, chains and strapping.
	03.04 Discuss the placement of placards when carrying hazardous materials.
	03.05 Discuss procedure for use of common cargo handling equipment, including pallets, jacks, dollies, hand trucks, nets, slings, poles and other equipment.
	03.06 Discuss categories of hazardous materials and the need for specialized training to handle hazardous materials.
	03.07 Discuss hazardous materials documentation requirements.
	03.08 Understand nature, amount, and condition of cargo on both pickup and delivery.
	03.09 Understand information on bill of lading and properly record and report discrepancies and damage to the cargo.
	03.10 Understand appropriate signatures on delivery receipts and other required forms.
	03.11 Compare door seal number against shipping document.
04.0	Demonstrate trip planning preparation procedures. The student will be able to:
	04.01 Plan a route from one point to another that is optimal in terms of travel time, fuel costs, potential hazards and federal, state and local travel restrictions.
	04.02 Describe the use of manual and contemporary GPS navigation systems.
	04.03 Estimate travel times and arrange for a secure place for layovers.

	04.04 Demonstrate map reading skills.
	04.05 Estimate fuel consumption and plan fuel stops.
	04.06 Estimate expense money and obtain funds and/or credit cards.
05.0	Demonstrate vehicle inspection, maintenance, and servicing procedures. The student will be able to:
	05.01 Describe function and operation of principle vehicle systems including, engine, engine auxiliary brake, drive train, coupling, suspension and electrical system, DEP engines, and regeneration processes where applicable.
	05.02 Check vehicle registration and permit.
	05.03 Check accident report packets for proper contents.
	05.04 Check for previous days DVIR.
	05.05 Check general appearance and condition of vehicle.
	05.06 Check fuel, oil, water, automatic transmission, and diesel emissions fluid levels (DEF).
	05.07 Check and clean all lights and reflectors.
	05.08 Check tires, rims, and suspension.
	05.09 Check horn, windshield wipers, and mirrors.
	05.10 Check fifth wheel, trailer hook-up and brake lines.
	05.11 Demonstrate proper procedure for expelling moisture from the air tanks after each trip.
	05.12 Test parking brake and service brake before moving/driving vehicle.
	05.13 Check emergency bi-directional reflective triangles, fire extinguishers, and spare fuses.
	05.14 Check instruments for normal readings.
	05.15 Check steering system, brake action and tractor protection valve.
	05.16 Check cargo-blocking, bracing and tie down (if applicable).
	05.17 Perform enroute inspections.
	05.18 Perform post-trip inspection of vehicle and all systems.
	05.19 Clean interior and exterior of vehicle.
	05.20 Check mud/rain flaps.
	05.21 Review adjusting procedures for tandem and fifth-wheel slides, if so equipped.
06.0	Demonstrate basic vehicle control procedures. The student will:
	06.01 Demonstrate safe starting procedures.

	06.02 Start, warm up and shut down the engine, according to the manufacturer's specifications.
	06.03 Build full pressure (120-140 PSI) in air tanks or to governed cut-out.
	06.04 Coordinate use of accelerator and clutch to achieve smooth acceleration and avoid clutch abuse (if applicable).
	06.05 Maintain proper engine RPM while driving (if applicable).
	06.06 Properly modulate air brakes to bring vehicle to a smooth stop.
	06.07 Properly shift up and down through all gears using clutch (if applicable).
	06.08 Double clutch non-synchronized transmissions and time shift for smooth and fuel-efficient performance (if applicable).
	06.09 Select proper gear for speed and highway conditions (if applicable).
	06.10 Operate manual, automatic, or semiautomatic transmissions as available training equipment allows.
	06.11 Coordinate steering, braking and acceleration to take the vehicle through a desired path.
	06.12 Adequately judge the path trailer will take (off tracking) as vehicle negotiates left or right curves and turns.
	06.13 Use clutch and gears to maintain proper operating range/power/RPM of the motor while slowing the vehicle (if applicable).
	06.14 Park the vehicle, set brakes and shut off the engine.
	06.15 Discuss chocking procedures.
07.0	Demonstrate backing skills and basic vehicle maneuvers. The student will:
	07.01 Check area before and during backing.
	07.02 Properly utilize guides and mirrors.
	07.03 Properly back in straight line and curved paths.
	07.04 Properly back into both a 45° and 90°alley docks.
	07.05 Navigate through a 100 feet alley both forward and backward.
	07.06 Properly demonstrate an offset left/right backing maneuver.
	07.07 Properly position unit for backing into a loading dock; back to a dock (actual or simulated).
	07.08 Properly stop unit within 36 inches of the dock without contacting dock (actual or simulated).
	07.09 Properly parallel park (sightside/blindside).
	07.10 Judge side, rear and overhead clearances, and path of the trailer.
	07.11 Make a straight-in approach to a lane.
08.0	Demonstrate coupling and uncoupling skills. The student will be able to:

08.01	Reverse-steer and articulate a vehicle.
08.02	Align the tractor properly to connect with trailer.
08.03	Back and secure the tractor properly into the trailer kingpin without damage.
08.04	Perform tug test against the locking mechanisms and visual checks to make sure coupling is secure.
08.05	Connect electrical and air lines properly.
08.06	Set in-cab air brake controls properly.
08.07	Retract and secure landing gear after coupling is secure.
08.08	Properly uncouple and secure the trailer.
09.0	Demonstrate road driving skills. The student will be able to:
09.01	Carefully enter traffic from a stopped or parked position.
09.02	Use clutch and gears properly (if applicable).
09.03	Proceed from a stopped position without rolling backward.
09.04	Use mirrors properly.
09.05	Signal intention to turn well in advance of turn.
09.06	Get into proper lane to turn well in advance of turn.
09.07	Select and shift to proper gear prior to beginning any turn (if applicable).
09.08	Check traffic conditions and turn only when intersection is clear.
09.09	Restrict traffic from passing on right when preparing to complete a righthand turn. Maintain 3 feet or less on right side of vehicle.
09.10	Execute a righthand turn maintaining 3 feet or less on right side of vehicle.
09.11	Complete a turn promptly and safely and not impede other traffic.
09.12	Obey all traffic signals.
09.13	Plan stop in advance and adjust speed correctly.
09.14	Discuss use of brakes properly on grades.
09.15	Plan stops far enough in advance to avoid hard braking.
09.16	Stop clear of crosswalks.
09.17	Come to a complete stop at all stop signs.
09.18	Yield right of way at intersections having yield signs.

09.19	Check for cross traffic regardless of traffic signals.
09.20	Approach all intersections prepared to stop if necessary.
09.21	Stop a minimum of 15 feet but not more than 50 feet before railroad grade crossing if stop is necessary.
09.22	Select proper gear to avoid shifting gears on railroad grade crossing (if applicable).
09.23	Determine sufficient space required for passing.
09.24	Pass only in safe locations.
09.25	Describe in detail how to pass safely on a two-lane highway.
09.26	Describe in detail how to pass safely on multiple lane highways.
09.27	Signal lane changes before and after passing.
09.28	Pass only when appropriate to avoid impeding other traffic.
09.29	Return to right lane promptly, but only when safe to do so.
09.30	Observe speed limits.
09.31	Adjust speed properly to road, weather, and traffic conditions.
09.32	Slowdown in advance of curves, danger zones and intersections.
09.33	Maintain consistent speed where possible.
09.34	Yield right of way.
09.35	Allow faster traffic to pass.
09.36	Understand or demonstrate the proper procedures for navigating a weigh station.
09.37	Comply with other inspection station procedures (e.g., agriculture).
09.38	Use horn only when necessary.
09.39	Park only in legally permissible parking areas.
09.40	Check instruments at regular intervals.
09.41	Determine minimum front-to-rear distances when following other vehicles using industry recognized standards.
10.0	Demonstrate hazardous driving skills. The student will be able to:
10.01	Understand preparation for operation in cold weather.
10.02	Understand proper procedure for checking ice accumulation on brakes, slack adjuster, air hoses, electrical wiring and radiator shutters during operation.
10.03	Perform operational adjustments necessary to maintain control in all weather conditions, including speed selection, braking and following distance.

10.04	Describe procedures to check safe operation of brakes after driving through deep water.
10.05	Perform proper use of windshield wipers, washers, and defrosters to maintain visibility.
10.06	Discuss how to recognize and evaluate changing road conditions that produce low traction, including initial rainfall, ice, snow, and mud.
10.07	Demonstrate or understand ability for recognizing conditions that produce low traction, including initial rainfall, ice, snow, and mud.
10.08	Describe and understand procedures to avoid skidding and jackknifing.
10.09	Understand procedures to avoid hydroplaning and describe the road and vehicle conditions that produce it.
10.10	Understand procedures for mounting and dismounting tire chains.
10.11	Understand procedures for extricating the vehicle from snow, sand and mud by maneuvering or towing.
10.12	Demonstrate ability to adjust rate of change in speed and direction to accommodate road conditions to avoid skidding.
10.13	Describe procedures required to coordinate acceleration and shifting to overcome the resistance of snow, sand, and mud.
10.14	Demonstrate ability to perform brake checks on equipment prior to mountain driving.
10.15	Discuss procedures required to use right lane or special truck lane going up grades.
10.16	Discuss procedures required to place transmission in appropriate gear for engine braking before starting downgrade.
10.17	Discuss procedures required to use proper braking techniques and maintain proper engine braking before starting downgrades.
10.18	Discuss proper use of truck escape ramp when brakes fail on a downgrade.
10.19	Discuss procedure required for observing temperature gauge frequently when pulling heavy loads up long grades.
10.20	Discuss the effect of vehicle weight and speed upon braking and shifting ability on long downgrades.
10.21	Identify the meaning and use of percent of grade signs.
10.22	Discuss bringing the truck to a stop in the shortest possible distance while maintaining directional control on a dry surface.
10.23	Discuss procedures to make an evasive turn off the roadway and return to the roadway while maintaining directional control.
10.24	Discuss procedures to bring the vehicle to a stop in the event of a brake failure.
10.25	Discuss procedures to maintain control of the vehicle in the event of a blowout.
10.26	Discuss procedures to bring truck to a stop in the shortest possible distance while maintaining directional control when operating on a slippery surface.
10.27	Discuss procedures to recover from vehicle skids induced by snow, ice, water, oil, sand, wet leaves, or other slippery surfaces.
10.28	Discuss procedures to counter steer out of a skid in a way that will regain directional control and not produce another skid.
10.29	Discuss procedure to operate brakes properly to provide maximum braking without loss of control.
11.0	Apply concepts learned for obtaining a Commercial Driver's License (CDL). The student will be able to:

11.01	Demonstrate competence in performing basic Commercial Vehicle Driving skills utilizing the CDL testing criteria.
11.02	Demonstrate understanding and knowledge of Commercial Vehicle Driving Laws as required, to safely, and legally operate a commercial vehicle.

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

Students entering this program must exhibit a safe driving record, be at least 18 years of age and comply with State and Federal licensing requirements as outlined by the Federal Motor Carrier Safety Administration (FMCSA). It is recommended that instruction includes 1000 miles of road driving under the supervision of a qualified commercial vehicle driver prior to completion of the program. Road driving activities will include experience on two-lane, four-lane, interstate, and city streets and highways. When conditions allow, students will be given instruction at night on both wet and/or dry roads. Instruction in driving bob-tail, empty and loaded vehicles will be given. **All students with a Commercial Learners Permit (CLP) must be accompanied by an instructor.**

Students are required to obtain their Class A Commercial Driver's License to be awarded a Program Certificate of Completion.

Highly recommended student to instructor ratios:

Classroom – 12 to 1
Lab – Variable
Range – 6 to 1
Road Instruction – 2 to 1 per vehicle

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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 to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Commercial Class "B" Driving**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program	
Program Number	l490251
CIP Number	0649020502
Grade Level	30, 31
Program Length	150 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml
Basic Skills Level	N/A

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 a Class "B" Commercial Driver License.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Commercial Vehicle Driving industry, planning, management, labor issues, community issues and health, safety, and environmental issues. The content includes but is not limited to the following: Loading and unloading cargo; reporting delays or accidents on the road; verifying load against shipping papers; and keeping records.

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

Program Structure

This program is a planned sequence of instruction consisting of one occupational completion point.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	TRA0084	Truck Driver Heavy Florida Class “B”	COMM DRIV @7 7G	150 hours

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 Understand vehicle safety and accident prevention procedures.
02.0 Understand and comply with vehicle operating regulations.
03.0 Demonstrate proper cargo handling and documentation procedures.
04.0 Demonstrate trip planning preparation procedures.
05.0 Demonstrate vehicle inspection procedures.
06.0 Demonstrate basic vehicle control procedures.
07.0 Demonstrate backing skills and basic vehicle maneuvers.
08.0 Demonstrate road driving skills.
09.0 Demonstrate hazardous driving skills.
10.0 Apply concepts learned for obtaining a Commercial Driver's License (CDL).

Florida Department of Education
Student Performance Standards

Program Title: **Commercial Class "B" Driving**
Career Certificate Program Number: **I490251**

Course Description: The Truck Driver Heavy Florida Class "B" course prepares students for entry into the trucking and logistics industry. Students explore career opportunities and requirements of a professional class "B" truck driver. Students study vehicle safety, accident prevention, operating regulations, cargo handling, documentation procedures, pre-trip preparation, vehicle inspection, maintenance, service, control procedures, backing, maneuvering, road and hazardous driving skills, and licensing requirements.

Course Number: TRA0084 **Occupational Completion Point: A** **Truck Driver Heavy Florida Class "B" – 150 Hours**	
01.0	Understand vehicle safety and accident prevention procedures. The student will be able to:
01.01	Understand, identify and explain the use of vehicle safety equipment.
01.02	Understand the use of fire extinguishers.
01.03	Utilize seat belts and personal protection gear appropriate to type of operation.
01.04	Describe safe lifting procedures through use of hands-on labs or through viewing safety videos.
01.05	Describe personal safety equipment and procedures.
01.06	Describe actions applicable for vehicle accidents.
01.07	Review reports in a classroom activity.
01.08	Understand accident reporting requirements (company, state, federal).
01.09	Identify all information needed for accident reports to the State, the employer, and the insurance company.
01.10	Review an accident report.
01.11	Describe procedures for protecting the scene of an accident.
01.12	Describe personal liability requirements.
01.13	Identify hazardous road conditions that are a potential threat to the safety of the truck driver.
01.14	Describe activities and characteristics of other road users that make them potentially dangerous.
01.15	Describe the potential consequences of excessive speed.
01.16	Describe the potential consequences of use of drugs or alcohol.

	01.17 Demonstrate safety procedures for entering and exiting vehicles.
02.0	Understand and comply with vehicle operating regulations. The student will be able to:
	02.01 Understand and comply with Hours-of-Service regulations.
	02.02 Maintain a complete, neat and accurate driver's duty status log including discussion of electronic logs.
	02.03 Keep accurate records required by hours-of-service regulations.
	02.04 Review mathematical calculations necessary to recap and apply totals to the hours-of-service regulations.
	02.05 Determine driving hours remaining on a particular day or tour of duty.
	02.06 Understand and comply with applicable United States Department of Transportation regulations including Federal Motor Carrier Safety Administration rules and regulations - Compliance, Safety, and Accountability (CSA) particularly the role of drivers and motor carriers.
	02.07 Understand and comply with Federal, State and local traffic laws including restrictions on vehicle size and weight including permits when required.
03.0	Demonstrate proper cargo handling and documentation procedures. The student will be able to:
	03.01 Understand legal gross weight and axle weight.
	03.02 Describe cargo load to meet legal weight and safety requirements.
	03.03 Understand how to secure cargo using blocking, bracing, packing, rope, cable, chains and strapping.
	03.04 Discuss the use of liftgates (as applicable).
	03.05 Discuss the placement of placards when carrying hazardous materials.
	03.06 Discuss categories of hazardous materials and the need for specialized training to handle hazardous materials.
	03.07 Discuss hazardous materials documentation requirements.
	03.08 Understand the nature, amount, and condition of cargo on both pickup and delivery.
	03.09 Understand the information on bill of lading and properly record and report discrepancies and damage to the cargo.
	03.10 Understand the appropriate signatures on delivery receipts and other required forms.
	03.11 Compare door seal number against shipping document.
04.0	Demonstrate trip planning preparation procedures. The student will be able to:
	04.01 Check vehicle registration and permit.
	04.02 Check accident report packets for proper contents.
	04.03 Plan a route from one point to another that is optimal in terms of travel time, fuel costs, potential hazards and federal, state and local travel restrictions.

	04.04 Describe the use of manual and contemporary GPS navigation systems.
	04.05 Estimate travel times and arrange for a secure place for layovers.
	04.06 Demonstrate map reading skills.
	04.07 Estimate fuel consumption and plan fuel stops.
	04.08 Estimate expense money and obtain funds and/or credit cards.
05.0	Demonstrate vehicle inspection, maintenance, and servicing procedures. The student will be able to:
	05.01 Describe function and operation of principle vehicle systems including, engine, engine auxiliary brake, drive train, coupling, suspension and electrical system, DEP engines, and regeneration processes where applicable.
	05.02 Check for previous days DVIR.
	05.03 Check general appearance and condition of vehicle.
	05.04 Check fuel, oil, water, automatic transmission, and diesel emissions fluid levels (DEF).
	05.05 Check signal lights, stoplights and running lights.
	05.06 Check tires, rims, and suspension.
	05.07 Check horn, windshield wipers, and mirrors.
	05.08 Check emergency bi-directional reflective triangles, fire extinguishers, and spare fuses.
	05.09 Check instruments for normal readings.
	05.10 Check steering system and brake action.
	05.11 Check cargo blocking, bracing and tie down (if applicable).
	05.12 Perform enroute inspections.
	05.13 Perform post-trip inspection of vehicle and all systems.
	05.14 Check tire air pressure.
	05.15 Check for proper tire and wheel mounting.
	05.16 Test parking brake and service brake before moving/driving vehicle.
	05.17 Clean interior and exterior of vehicle.
	05.18 Check mud/rain flaps.
	05.19 Demonstrate proper procedure for expelling moisture from the air tanks after each trip.
06.0	Demonstrate basic vehicle control procedures. The student will be able to:
	06.01 Demonstrate safe start procedures.

	06.02 Start, warm up and shut down the engine, according to the manufacturer's specifications.
	06.03 Build full pressure (120-140 PSI) in air tanks or to governed cut-out.
	06.04 Coordinate use of accelerator and clutch to achieve smooth acceleration and avoid clutch abuse (if applicable).
	06.05 Maintain proper engine RPM while driving (if applicable).
	06.06 Properly modulate air brakes to bring vehicle to a smooth stop.
	06.07 Properly shift up and down through all gears using clutch (if applicable).
	06.08 Double clutch non-synchronized transmissions and time shift for smooth and fuel-efficient performance (if applicable).
	06.09 Select proper gear for speed and highway conditions (if applicable).
	06.10 Operate manual, automatic, or semiautomatic transmissions as available training equipment allows.
	06.11 Coordinate steering, braking and acceleration to take the vehicle through a desired path forward and backward in a straight line.
	06.12 Use clutch and gears to maintain proper operating range/power/RPM of the motor while slowing the vehicle (if applicable).
	06.13 Park the vehicle, set brakes and shut off the engine.
	06.14 Discuss proper chocking procedures.
07.0	Demonstrate backing skills and basic vehicle maneuvers. The student will:
	07.01 Check area before and during backing.
	07.02 Properly utilize guides and mirrors.
	07.03 Properly back in straight line and curved paths.
	07.04 Properly back into both a 45°and 90°alley docks.
	07.05 Navigate through a 100 feet alley both forward and backward.
	07.06 Properly demonstrate an offset left/right backing maneuver.
	07.07 Properly position unit for backing into a loading dock; back to a dock (actual or simulated).
	07.08 Properly stop unit within 36 inches of the dock without contacting dock (actual or simulated).
	07.09 Properly parallel park (sightside/blindside).
	07.10 Judge side, rear and overhead clearances.
	07.11 Make a straight-in approach to a lane.
08.0	Demonstrate road driving skills. The student will be able to:
	08.01 Carefully enter traffic from a stopped or parked position.

08.02	Use clutch and gears properly (if applicable).
08.03	Proceed from a stopped position without rolling backward.
08.04	Use mirrors properly.
08.05	Signal intention to turn well in advance of turn.
08.06	Get into proper lane well in advance of turn.
08.07	Select and shift to proper gear prior to beginning any turn (if applicable).
08.08	Check traffic conditions and turn only when intersection is clear.
08.09	Restrict traffic from passing on right when preparing to complete a right-hand turn. Maintain 3 feet or less on right side of vehicle.
08.10	Execute a right-hand turn maintaining 3 feet or less on right side of vehicle.
08.11	Complete a turn promptly and safely and not impede other traffic.
08.12	Obey all traffic signals.
08.13	Plan stop in advance and adjust speed correctly.
08.14	Discuss the use brakes properly on grades.
08.15	Plan stops far enough in advance to avoid hard braking.
08.16	Stop clear of crosswalks.
08.17	Come to a complete stop at all stop signs.
08.18	Yield right of way at intersections having yield signs.
08.19	Check for cross traffic regardless of traffic signals.
08.20	Approach all intersections prepared to stop if necessary.
08.21	Stop a minimum of 15 feet but not more than 50 feet before railroad grade crossing if stop is necessary.
08.22	Select proper gear to avoid shifting gears on railroad grade crossing (if applicable).
08.23	Determine sufficient space required for passing.
08.24	Pass only in safe locations.
08.25	Describe in detail how to pass safely on a two-lane highway.
08.26	Describe in detail how to pass safely on multiple lane highways.
08.27	Signal lane changes before and after passing.
08.28	Pass only when appropriate to avoid impeding other traffic.

08.29	Return to right lane promptly, but only when safe to do so.
08.30	Observe speed limits.
08.31	Adjust speed properly to road, weather, and traffic conditions.
08.32	Slowdown in advance of curves, danger zones and intersections.
08.33	Maintain consistent speed where possible.
08.34	Yield right of way.
08.35	Allow faster traffic to pass.
08.36	Understand or demonstrate the proper procedures for navigating a weigh station.
08.37	Comply with other inspection station procedures (e.g., agriculture).
08.38	Use horn only when necessary.
08.39	Park only in legally permissible parking areas.
08.40	Check instruments at regular intervals.
08.41	Determine minimum front-to-rear distances when following other vehicles using industry recognized standards.
09.0	Demonstrate hazardous driving skills. The student will be able to:
09.01	Understand preparation for operation in cold weather.
09.02	Demonstrate proper procedure for expelling moisture from the air tanks after each trip.
09.03	Understand proper procedure for checking ice accumulation on brakes, slack adjuster, air hoses, electrical wiring and radiator shutters during operation.
09.04	Perform operational adjustments necessary to maintain control in all weather conditions, including speed selection, braking and following distance.
09.05	Describe procedures to check safe operation of brakes after driving through deep water.
09.06	Perform proper use of windshield wipers, washers, and defrosters to maintain visibility.
09.07	Demonstrate the ability to recognize and evaluate changing road conditions that produce low traction, including initial rainfall, ice, snow and mud.
09.08	Describe and understand procedures to avoid skidding.
09.09	Understand procedures to avoid hydroplaning and describe the road and vehicle conditions that produce it.
09.10	Understand procedures for mounting and dismounting tire chains.
09.11	Understand procedures for extricating the vehicle from snow, sand and mud by maneuvering or towing.
09.12	Demonstrate ability to adjust rate of change in speed and direction to accommodate road conditions to avoid skidding.

	09.13	Describe procedures required to coordinate acceleration and shifting to overcome the resistance of snow, sand and mud.
	09.14	Demonstrate ability to perform brake checks on equipment prior to mountain driving.
	09.15	Understand procedures required to use right lane or special truck lane going up grades.
	09.16	Understand procedures required to place transmission in appropriate gear for engine braking before starting downgrade.
	09.17	Understand procedures required to use proper braking techniques and maintain proper engine braking before starting downgrades.
	09.18	Understand proper use of truck escape ramp when brakes fail on a downgrade.
	09.19	Understand procedure required for observing temperature gauge frequently when pulling heavy loads up long grades.
	09.20	Understand the effect of vehicle weight and speed upon braking and shifting ability on long downgrades.
	09.21	Identify the meaning and use of percent of grade signs.
	09.22	Understand bringing the truck to a stop in the shortest possible distance while maintaining directional control on a dry surface.
	09.23	Understand procedures to make an evasive turn off the roadway and return to the roadway while maintaining directional control.
	09.24	Understand procedures to bring the vehicle to a stop in the event of a brake failure.
	09.25	Understand procedures to maintain control of the vehicle in the event of a blowout.
	09.26	Understand procedures to bring truck to a stop in the shortest possible distance while maintaining directional control when operating on a slippery surface.
	09.27	Understand procedures to recover from vehicle skids induced by snow, ice, water, oil, sand, wet leaves or other slippery surfaces.
	09.28	Understand procedures to counter-steer out of a skid in a way that will regain directional control and not produce another skid.
	09.29	Understand procedure to operate brakes properly to provide maximum braking without loss of control.
10.0	Apply concepts learned for obtaining a Commercial Driver's License (CDL). The student will be able to:	
	10.01	Demonstrate competence in performing basic Commercial Vehicle Driving skills utilizing the CDL testing criteria.
	10.02	Demonstrate understanding and knowledge of Commercial Vehicle Driving Laws as required, to operate a commercial vehicle safely and legally.

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

Students entering this program must exhibit a safe driving record, be at least 18 years of age and comply with State and Federal licensing requirements as outlined by the Federal Motor Carrier Safety Administration (FMCSA). Instruction will include 200 miles of road driving under the supervision of a qualified commercial vehicle driver prior to completion of the program. Road driving activities will include experience on two-lane, four-lane, interstate, and city streets and highways. When conditions allow, students will be given instruction at night on both wet and/or dry roads. Instruction in driving bob-tail, empty and loaded vehicles will be given. **All students with a Commercial Learners Permit (CLP) must be accompanied by an instructor.**

Students are required to obtain their Class B Commercial Driver's License to be awarded a Program Certificate of Completion.

Highly recommended student to instructor ratios:

Classroom – 12 to 1
Lab – Variable
Range – 6 to 1
Road Instruction – 2 to 1 per vehicle

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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 to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Control Tower Operator**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution & Logistics**

Career Certificate Program		
Program Number	T100100	
CIP Number	0649010501	
Grade Level	30, 31	
Program Length	1840 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	N/A	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

Through the challenging, fast-paced atmosphere of Air Traffic Control, this course offers a cohesive, interactive learning environment. This course aims to educate and prepare people with no prior training or experience in air traffic control to obtain their Control Tower Operator (CTO) and/or Remote Tower (RT) Operator Certification for international operations. The following is a summary of the training course and an estimate of how long each training session will last. This is a 40-week/10-months/40-week/1840-hour training course broken down into six sections.

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

Program Structure

This program is a planned sequence of instruction consisting of 16 weeks/4 months of classroom and simulation instruction in technical basics followed by 24 weeks /6 months of classroom and in-the-field training combined with live airport training and resulting in earning Control Tower Operator certification by students who meet qualifications.

Students are required to pass a Class II Flight Physical, drug screen, and criminal background check.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	ATT0830	Air Traffic Basics	Aerospace 7G	320 hours
	ATT0831	Initial Qualification Training		320 hours
	ATT0832	Flight Data		240 hours
	ATT0833	Clearance Delivery		240 hours
	ATT0834	Ground Control		240 hours
	ATT0835	Local Control/Cab Coordinator Position Training		480 hours

National Standards (NS)/Career Ready Practices

Industry or National Standards corresponding to the standards and/or benchmarks for the Control Tower Operator Certificate can be found using the following link as this Program is regulated by FAA JO 3120.4R.

Regulated Programs

This program is regulated by the Federal Aviation Administration (FAA) www.FAA.gov.

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 Understand Air Traffic Control (ATC) Systems and National Airspace Systems.
02.0 Demonstrate teamwork skills.
03.0 Understand Airport Markings and Lighting Systems.
04.0 Recognize separation procedures, forms, and fundamentals.
05.0 Demonstrate understanding of NOTAMs.
06.0 Understand the fundamentals of radar.
07.0 Understand FAA orders and manuals.
08.0 Demonstrate understanding of LOAs and SOPs.
09.0 Identify and recognize airspace definitions.
10.0 Demonstrate understanding of Federal Aviation Regulations (FARs).
11.0 Understand provisions of FAR, Part 91.
12.0 Identify principles of flight.
13.0 Understand wake turbulence.
14.0 Identify aircraft characteristics.
15.0 Identify special operations.
16.0 Understand basic navigation.
17.0 Recognize radio and satellite navigation.
18.0 Identify purpose, contents, and specifics of VFR charts and publications.
19.0 Identify purpose, contents, and specifics of En Route IFR charts.
20.0 Identify purpose, contents, and specifics of SIDs and STARs.
21.0 Understand approaches.
22.0 Demonstrate understanding of pilot's environment.
23.0 Identify emergencies.
24.0 Recognize fundamentals of search and rescue.
25.0 Understand fundamentals of weather and aviation weather services.
26.0 Identify hazardous weather.
27.0 Identify current weather.
28.0 Understand Pilot Weather Reports (PIREPs).
29.0 Demonstrate understanding of forecasts and advisories.
30.0 Understand basic communication.
31.0 Identify strip marking.
32.0 Understand ATC clearances.
33.0 Explain overview of Initial Tower Cab training.
34.0 Demonstrate understanding of Air Traffic Facility training.
35.0 Understand aircraft characteristics and recognition.
36.0 Identify and define a terminal controller.

37.0 Demonstrate understanding of tower equipment.
38.0 Understand dissemination weather course.
39.0 Demonstrate understanding of the Automated Surface Observing System (ASOS).
40.0 Recognize and respond to tower visibility scenarios.
41.0 Describe airport conditions, uses, and lighting.
42.0 Demonstrate full understanding of Bartow (KBOW) airport layout.
43.0 Understand and identify Bartow (KBOW) airspace and instrument procedures.
44.0 Properly utilize local strip marking.
45.0 Understand Flight Data Input/Output (FDIO).
46.0 Utilize and understand Automatic Terminal Information System (ATIS).
47.0 Demonstrate full understanding of flight data, clearance, and delivery.
48.0 Explain General Control.
49.0 Describe position relief briefing.
50.0 Understand and demonstrate Ground Control (GC) duties and responsibilities.
51.0 Explain taxi and ground movement areas.
52.0 Demonstrate understanding of Wind Shear and Low Level Wind Shear Alert System (LLWAS).
53.0 Demonstrate understanding of Local Control (LC) position.
54.0 Understand VFR arrival procedures.
55.0 Understand VFR departure procedures.
56.0 Apply IFR arrival and departure procedures.
57.0 Apply visual operations procedures.
58.0 Understand and apply wake turbulence and separation rules.
59.0 Demonstrate understanding of runway incursions.
60.0 Understand fatigue awareness.
61.0 Demonstrate knowledge of human factors in Air Traffic Control.
62.0 Understand and perform basic air traffic tasks.
63.0 Apply technical and performance tasks at increased traffic volume.
64.0 Demonstrate understanding of special flight procedures.
65.0 Understand and apply Clearance Delivery.
66.0 Demonstrate understanding of emergency procedures.
67.0 Demonstrate understanding of special flight procedures at an increased traffic volume.
68.0 Identify and understand Ground Control procedures and equipment.
69.0 Demonstrate understanding of emergency procedures at increased traffic volume.
70.0 Understand and identify basic ATC skill set along with special flight/increased traffic procedures.
71.0 Understand and identify Local Control procedures and equipment.
72.0 Demonstrate knowledge/skills of sequencing and separating in simulated and live environments.
73.0 Demonstrate knowledge/skills of abnormal/emergency operations in simulated and live environments.
74.0 Demonstrate mastery of complete air traffic skill set.

Florida Department of Education
Student Performance Standards

Program Title: **Control Tower Operator**
Career Certificate Program Number: **T100100**

Course Description: Provides the fundamental aviation/air traffic knowledge needed for students to begin training in a classroom environment that includes the following topics: introduction to the Air Traffic Control (ATC) system, publications, Federal Aviation Regulations (FAR), principles of aerodynamics, aircraft types and characteristics, fundamentals of navigation, pilot's environment, flight assistance and emergencies, wake turbulence, weather, and communications. Classroom lectures are accompanied by graphics and video as well as group discussions and exercises with limited hands-on practice and demonstrations. Student proficiency is measured through academic block exams plus a final comprehensive academic exam. A passing score of 70 percent is required on the final comprehensive exam.

Course Number: ATT0830 **Occupational Completion Point: A** **Air Traffic Basics (ATB) – 320 Hours**	
01.0	Understand Air Traffic Control (ATC) Systems and National Airspace Systems. The student will be able to:
	01.01 Understand and identify National Airspace System's components (NAS).
	01.02 Understand and identify the function of the NAS's Traffic Management System (TMS).
	01.03 Understand and explain the ATC System's objectives and duties.
	01.04 Define the purpose of the Automated Flight Service Station (AFSS).
	01.05 Define nomenclature of the ATC facilities in the NAS.
	01.06 Determine the air traffic controller's operational priorities, procedural preferences, and order of duty.
	01.07 Describe the function of the various ATC facilities.
02.0	Demonstrate teamwork skills. The student will be able to:
	02.01 Explain and define the characteristics of effective teams.
	02.02 Understand and identify the functions affecting team performance.
	02.03 Explain the stages of group development.
03.0	Understand Airport Markings and Lighting Systems. The student will be able to:
	03.01 Identify runway, taxiway, and ramp markings.
	03.02 Identify airport lighting components and requirements of use
04.0	Recognize separation procedures, forms, and fundamentals. The student will recognize standard holding procedures, the following forms of separation, and the fundamental prerequisites for offering each type and be able to:

	04.01 Explain vertical separation.
	04.02 Explain lateral separation.
	04.03 Explain longitudinal separation.
	04.04 Explain Radar separation.
	04.05 Explain Visual separation.
	04.06 Explain Runway separation.
05.0	Demonstrate understanding of NOTAMs. The student will be able to:
	05.01 Define methods of disseminating airmen's information.
	05.02 Define types and uses of NOTAMs.
	05.03 Identify responsibilities and responsibilities for reporting Notices to Airmen (NOTAMs).
06.0	Understand the fundamentals of radar. The student will identify airport uses and characteristics and be able to:
	06.01 Describe primary radar.
	06.02 Describe secondary radar.
07.0	Understand FAA orders and manuals. The student will have a thorough understanding of ATC and be able to:
	07.01 Become familiar with and describe subject matter of local, regional, and national regulations.
	07.02 Use appropriate manuals to find applicable rules and regulations
08.0	Demonstrate understanding of LOAs and SOPs. The student will be able to:
	08.01 Define terms and definitions.
	08.02 Explain general operating rules.
	08.03 Explain general flight rules.
	08.04 Explain purpose, process, and requirements of ATC certification processes.
	08.05 Understand and explain medical requirements.
09.0	Identify and recognize airspace definitions. The student will be able to:
	09.01 Define classes of airspace and their utilization.
	09.02 Define purpose of special use airspace.
10.0	Demonstrate understanding of Federal Aviation Regulations (FARs). The student will be able to:
	10.01 Explain terms and definitions.

	10.02 Define general operating rules.
	10.03 Define general flight rules.
	10.04 Explain purpose, process, and requirements for ATC certification.
	10.05 Explain medical requirements.
11.0	Understand provisions of FAR, Part 91. The student will identify selected provisions of VFR and IFR flights rules and be able to:
	11.01 Define flight plans.
	11.02 Understand and explain aircraft operations responsibilities.
	11.03 Explain pilot's responsibilities.
	11.04 Define conditions and use of Supplemental Oxygen Requirements.
12.0	Identify principles of flight. The student will be able to:
	12.01 Explain primary and secondary sources of lift.
	12.02 Explain relative wind.
	12.03 Identify and explain function of types and parts of airfoils.
	12.04 Define the four forces that affect aircraft in flight, their interrelationships, and the effects on aircraft performance.
13.0	Understand wake turbulence. The student will identify the following categories related to wake turbulence and be able to:
	13.01 Define wake turbulence.
	13.02 Explain factors affecting wake turbulence intensity.
	13.03 Explain and define wingtip vortices.
	13.04 Identify causes and possible results of induced roll.
	13.05 Understand and explain helicopter downwash.
	13.06 Understand and explain jet blast.
14.0	Identify aircraft characteristics. The student will be able to:
	14.01 Identify aircraft:
	• Categories
	• Weight classes.
	• Designators.
	• Performance characteristics.

	• Identification features.
	14.02 Recognize selected aircraft.
15.0	Identify special operations. The student will be able to:
	15.01 Identify flights requiring special handling.
	15.02 Understand and define terms and definitions.
	15.03 Define procedures and requirements.
16.0	Understand basic navigation. The student will be able to:
	16.01 Understand and define reference lines of the earth and their purpose.
	16.02 Understand and define great circle route, distance, and direction measurements.
	16.03 Explain methods of time conversion and acronyms used with time.
	16.04 Explain magnetic variations and headings.
17.0	Recognize radio and satellite navigation. The student will be able to:
	17.01 Use and define radio and satellite navigation.
	17.02 Use and define Federal Airway System.
18.0	Identify purpose, contents, and specifics of VFR charts and publications. The student will be able to:
	18.01 Identify and understand information on sectional aeronautical charts.
	18.02 Identify and understand VFR terminal area charts.
	18.03 Identify and understand world aeronautical charts.
	18.04 Identify and understand airport/facility directory.
19.0	Identify purpose, contents and specifics of En Route IFR charts. The student will be able to:
	19.01 Understand and identify low altitude information.
	19.02 Understand and identify high altitude information.
	19.03 Understand and identify IFR area.
20.0	Identify purpose, type, contents, and specifics of SIDs and STARs. The student will be able to:
	20.01 Understand and identify SIDs (altitudes, headings, etc.).
	20.02 Understand and identify STARs (altitudes, headings, etc.).
21.0	Understand approaches. The student will be able to:

	21.01 Understand and identify types of approaches and their purpose.
	21.02 Understand and identify contents of instruments approach charts.
	21.03 Understand and identify specific items and information of instruments approach charts.
22.0	Demonstrate understanding of pilot's environment. The student will be able to:
	22.01 Understand and demonstrate characteristics and uses of aircraft instrumentation.
	22.02 Explain physiological factors affecting flight.
23.0	Identify Emergencies. The student will be able to:
	23.01 Identify and explain terms associated with emergency services.
	23.02 Identify and explain roles and responsibilities of the pilot and controller during an emergency.
	23.03 Identify the minimum and additional information necessary to handle an emergency.
	23.04 Identify types of emergencies.
24.0	Recognize fundamentals of search and rescue. The student will be able to:
	24.01 Understand the purpose of the national Search and Rescue Plan.
	24.02 Define roles, responsibilities and procedures of search and rescue.
25.0	Understand fundamentals of weather and aviation weather services. The student will be able to:
	25.01 Understand and define characteristics of the atmosphere.
	25.02 Understand and define principles of atmospheric temperature.
	25.03 Understand and define characteristics and modifications of air masses.
	25.04 Understand and define characteristics of atmospheric pressure.
	25.05 Understand and define formation and types of fronts.
	25.06 Understand and define characteristics of convection currents.
	25.07 Understand and define causes of wind.
	25.08 Understand and define formation and types of clouds.
	25.09 Understand and define formation and types of precipitation.
26.0	Identify hazardous weather. The student will be able to:
	26.01 Identify the characteristics of hazardous weather that impact aviation.
	26.02 Identify the effects of hazardous weather on aviation.

27.0	Identify current weather. The student will be able to:
	27.01 Identify the contents of a METAR.
	27.02 Decode a METAR.
28.0	Understand Pilot Weather Reports (PIREPs). The student will be able to:
	28.01 Identify the purpose, uses and contents of Pilot Weather Reports.
	28.02 Decode a PIREP.
29.0	Demonstrate understanding of forecasts and advisories. The student will identify the contents and purpose and decode of the following weather products and be able to:
	29.01 Understand and explain Terminal Aerodrome Forecasts (TAF).
	29.02 Understand and explain Area Forecast (FA).
	29.03 Understand and explain Airman's Meteorological Information (AIRMET).
	29.04 Understand and explain Significant Meteorological Information (SIGMET).
	29.05 Understand and explain Convective SIGMET (WST).
	29.06 Understand and explain Center Weather Advisory (CWA).
	29.07 Understand and explain Meteorological Impact Statement (MIS).
	29.08 Understand and explain Winds and Temperatures Aloft Forecast (FB).
30.0	Understand basic communication. The student will be able to:
	30.01 Define and demonstrate radio and interphone communication.
	30.02 Define and demonstrate ICAO phonetics.
	30.03 Define and demonstrate number usage.
	30.04 Define and demonstrate basic phraseology.
	30.05 Define and demonstrate coordination procedures.
	30.06 Define and demonstrate the purpose and steps of the position relief briefing.
31.0	Identify strip marking. The student will be able to:
	31.01 Understand and explain the purpose and legal requirements of flight progress strips.
	31.02 Define the meaning of selected abbreviations and symbols used in strip marking.
	31.03 Explain content requirements of selected blocks in terminal, en route and flight service strips.
32.0	Understand ATC clearances. The student will be able to:

32.01	Define purpose of an ATC clearance.
32.02	Explain pilot's responsibility for compliance with an ATC clearance.
32.03	Define ATC clearance items and their sequence.
32.04	Identify and explain clearance prefixes and their uses.
32.05	Define the various types of ATC clearances.

Course Description: Initial Tower Cab (ITC) provides instruction on Tower Cab training in a course consisting of 320 hours. 30% of this course is dedicated to academic instruction, with the remaining 70% dedicated to hands on laboratory training. The laboratory training will take place in two different lab environments- tabletops and TSS. An overall score of 70% or greater is required for successful completion of the academic and performance evaluations. Students must complete Air Traffic Basics in order to advance to Initial Tower Cab.

Course Number: ATT0831 Occupational Completion Point: A Initial Qualification Training – 320 Hours	
33.0	Explain overview of Initial Tower Cab training. The student will be able to:
33.01	Explain what to expect during tower cab training.
33.02	Explain what the course outline and the timeframe for each lesson.
33.03	Explain brake down of position training and the expectations of the students.
34.0	Demonstrate understanding of Air Traffic Facility training. The student will be able to:
34.01	Explain and understand the characteristics of the air traffic facility.
34.02	Explain and understand training team responsibilities.
34.03	Explain and understand responsibilities of the members of the training team.
34.04	Explain and understand the documentation involved with training.
35.0	Understand aircraft characteristics and recognition. The student will identify aircraft local to KBOW and be able to:
35.01	Recognize and identify aircraft.
	• Categories.
	• Weight classes.
	• Designators.
	• Performance characteristics.
	• Identification features.

36.0	Identify and define a terminal controller. The student will be able to:
	36.01 Define a terminal controller.
	36.02 Explain where they work.
37.0	Demonstrate understanding of tower equipment. The student will be able to:
	37.01 Identify the different equipment at KBOW tower.
	37.02 Demonstrate the proper usage of the equipment.
38.0	Understand dissemination weather course. The student will be able to:
	38.01 Properly issue perinate weather information.
	38.02 Demonstrate how to disseminate weather information to adjacent facility and pilots.
	38.03 Record weather information.
39.0	Demonstrate understanding of the Automated Surface Observing System (ASOS). The student will be able to:
	39.01 Identify the components of the ASOS system.
	39.02 Update current weather information.
	39.03 Read and record weather information.
40.0	Recognize and respond to tower visibility scenarios. The student will be able to:
	40.01 Take prevailing visibility.
	40.02 Record and relay tower visibility.
	40.03 Identify when to take tower visibility.
41.0	Describe airport conditions, uses, and lighting. The student will be able to:
	41.01 Describe when weather conditions and traffic volume e affect arrival/departure procedures.
	41.02 Identify different airfield lighting and their usage requirements.
	41.03 Demonstrate proper usage of airfield lighting.
42.0	Demonstrate full understanding of Bartow (KBOW) airport layout. The student will be able to:
	42.01 Label an airfield diagram.
	42.02 Visually locate different portions of the airfield.
	42.03 Describe the different areas within KBOW airfield.
43.0	Understand and identify Bartow (KBOW) airspace and instrument procedures. The student will be able to:

	43.01 Describe approaches unique to KBOW and their layout.
	43.02 Draw out approach charts specific to KBOW with altitudes and mileages.
	43.03 Apply procedures that coincide with each approach into KBOW.
44.0	Properly utilize local strip marking. The student will be able to:
	44.01 Properly utilize strip marking(s) specific to KBOW.
	44.02 Demonstrate the ability to utilize flight progress strip appropriately.
	44.03 Input traffic count.
45.0	Understand Flight Data Input/Output (FDIO). The student will be able to:
	45.01 Describe the FDIO system and its components.
	45.02 Properly change flight progress strips.
46.0	Utilize and understand Automatic Terminal Information System (ATIS). The student will be able to:
	46.01 Demonstrate the ability to issue an ATIS.
	46.02 Describe the usage of the ATIS and its components.
	46.03 Manage ATIS information.
47.0	Demonstrate full understanding of flight data, clearance, and delivery. The student will be able to:
	47.01 Describe the difference between flight data and clearance delivery.
	47.02 Explain the roles and responsibilities of each position.
	47.03 Describe the location of each position in the terminal environment.
48.0	Explain General Control. The student will be able to:
	48.01 Explain the tower cab positions and responsibilities.
	48.02 Explain the different components that make the ATC system.
49.0	Describe position relief briefing. The student will be able to:
	49.01 Explain and demonstrate the method and step by step process for conducting a position relief briefing and transferring position responsibilities from on specialist to another.
	49.02 Describe term associated with the position relief briefing.
	49.03 Explain the precaution to take during a position relief brief.
50.0	Understand and demonstrate Ground Control (GC) duties and responsibilities. The student will be able to:
	50.01 Explain the roles and responsibilities of the GC position.

	50.02 Describe the location of the GC position in the tower cab.
	50.03 Demonstrate the ability to control traffic.
51.0	Explain taxi and ground movement areas. The student will be able to:
	51.01 Explain what ground traffic movement.
	51.02 Properly utilize phraseology appropriate with ground control.
	51.03 Explain precision approach critical areas.
52.0	Demonstrate understanding of Wind Shear and Low-Level Wind Shear Alert System (LLWAS). The student will be able to:
	52.01 Define and explain LLWAS.
	52.02 Apply LLWAS procedures.
	52.03 Use appropriate phraseology when issuing LLWAS information.
53.0	Demonstrate understanding of Local Control (LC) position. The student will be able to:
	53.01 Explain the roles and responsibilities of the LC position.
	53.02 Describe the location of the LC position in the tower cab.
	53.03 Demonstrate the ability to control traffic.
54.0	Understand VFR arrival procedures. The student will be able to:
	54.01 Describe VFR arrivals.
	54.02 Understand how to sequence and issue traffic.
	54.03 Use proper phraseology when clearing to land.
55.0	Understand VFR departure procedures. The student will be able to:
	55.01 Describe VFR departures.
	55.02 Understand how to sequence and issue traffic.
	55.03 Use proper phraseology when clearing for takeoff.
56.0	Apply IFR arrival and departure procedures. The student will be able to:
	56.01 Describe IFR flight operations.
	56.02 Issue control instructions to aircraft operating under IFR.
	56.03 Apply separation standards with other aircraft.
57.0	Apply visual operations procedures. The student will be able to:

	57.01 Define visual operations.
	57.02 Issue control instructions to aircraft operating visually.
	57.03 Apply separation standards with other aircraft.
58.0	Understand and apply wake turbulence and separation rules. The students will be able to:
	58.01 Define wake turbulence.
	58.02 Issue wake turbulence cautionary advisories.
	58.03 Apply separation standards with other aircraft.
59.0	Demonstrate understanding of runway incursions. The student will be able to:
	59.01 Describe the procedures required following a runway incursion.
	59.02 Explain how to avoid/prevent runway incursions.
	59.03 Understand the importance of airfield safety.
60.0	Understand fatigue awareness. The student will be able to:
	60.01 Explain the dangers of fatigue.
	60.02 Explain and understand the importance of rest, hydration and nutrition.
61.0	Demonstrate knowledge of human factors in Air Traffic Control. The student will be able to:
	61.01 Define human factors that affect flight.
	61.02 Define factors of stress and fatigue.
	61.03 Explain why hypoxia, hyperventilation, and spatial disorientation effect ATC.

Course Description: Flight Data will prepare the student to perform independently, under general supervision, all duties of the FD position within the ATCT to attain certification. This stage of training is administered for two positions and in two parts, classroom, and OJT, for each position. If simulation is available, simulation training may be added to this stage of training.

Course Number: ATT0832 Occupational Completion Point: A Flight Data (FD) – 240 Hours	
Note: This block will introduce the student to procedures and equipment specific to the FD position.	
62.0	Understand and perform basic air traffic tasks. The student will be able to:
	62.01 Describe the responsibilities of Flight Data.
	62.02 State minimum conditions for supervisory notification.

62.03	Describe/demonstrate the operation of the following pieces of tower equipment: FDIO system to include the monitor, changing strips, printer controls, and keyboard usage/entries, ASOS (the process of retrieving weather information), Tower Light Guns, operate radios / landlines, and intercoms.
62.04	Define terms such as; RVR, CWW, Prevailing Visibility. Describe which runway has RVR capabilities.
62.05	Define aircraft priorities and define duty and operational priorities.
62.06	Demonstrate the ability to properly mark flight progress strips and describe locally authorized strip marking to include arrival and departure strips.
62.07	Describe the procedures used to assign/change beacon codes.
62.08	Demonstrate the ability to coordinate transfer of control and/or radio communications to/with the appropriate position/facility.
62.09	Define the term “NOTAM” and describe the procedures for relaying and copying NOTAM information.
62.10	Describe the procedures for responding to requests from non-ATC agencies (i.e., information concerning incidents, mishaps, and security issues).
62.11	Understand and explain when SVFR operations are authorized and state the phraseology used to authorize aircraft to conduct SVFR operations.
62.12	Demonstrate the ability to maintain surveillance of the surface area and explain the responsibilities of movement/surface area surveillance for each operating position in the tower cab.
62.13	Demonstrate how and when to respond to operational requests, provide additional services, describe and apply duty and operational priorities.
62.14	Explain how to obtain the current altimeter setting and when to issue it to arriving and departing aircraft.
62.15	Define the terms Instrument Departure Procedure, Standard Terminal Arrival and Standard Instrument Departure.
62.16	Describe the procedures and requirements for conducting pre-duty familiarization and transferring position responsibility.
62.17	Demonstrate the ability to coordinate opposite direction operations using correct phraseology.
Note: This block will be utilized to build the students basic skill set while adding technical/performance tasks at an increased traffic volume. Block 2 will also introduce the student to procedures used during emergencies.	
63.0	Apply Technical and Performance Tasks at Increased Traffic Volume. – The student will be able to:
63.01	Demonstrate the ability to issue cautionary wake-turbulence advisories, properly execute coordination procedures for arriving and departing helicopter operations and safely control taxi operations of aircraft.
63.02	Describe how and when the terms “immediately” and “expedite” are used.
63.03	Explain when SVFR operations are authorized and state the phraseology used to authorize aircraft to conduct SVFR operations and describe the basic items of an IFR clearance to include aircraft identification, clearance limit, etc.
63.04	Solicit, copy, relay, and issue PIREP information, relay low-level wind shear advisories and define procedures for relaying hazardous weather information to include areas of jurisdiction, frequencies used to broadcast information and phraseology used.
63.05	Describe the procedures and phraseology used to inform aircraft/adjacent facilities of observed aircraft abnormalities.

63.06	Describe the handling and priority given to flight-check aircraft, aircraft carrying dangerous materials, MEDEVAC, AIR EVAC, and HOSP aircraft.
63.07	Define/describe the location of the hot brake, dangerous cargo and Arm/De-Arm areas.
63.08	Describe the procedures used to obtain acknowledgement from receiver-only aircraft to include fixed-wing aircraft and helicopters.
63.09	Describe the minimum amount of information needed for an aircraft emergency IAW FAAO 7110.65, list all agencies that are connected to the Primary Crash Alarm System (PCAS) and the agencies with two-way communication capability.
Note: This block will be utilized to build the students basic skill set while adding technical/performance tasks at an increased traffic volume. Block 3 will also introduce the student to procedures used during special flights.	
64.0	Demonstrate Understanding of Special Flight Procedures. – The student will be able to:
64.01	Describe the phraseology for issuing closed/unsafe runway information.
64.02	Describe the procedures used to obtain acknowledgement from receiver-only aircraft to include fixed-wing aircraft and helicopters.
64.03	Describe the actions taken by a pilot to indicate the aircraft is being hijacked and state the code phrases used by pilots and controllers and the coordination/responses required.
64.04	Define what constitutes ECM/ECCM activity and its effect on air traffic control operations.
64.05	Define the handling provided to aircraft conducting search and rescue operations.
64.06	Describe what type of assistance and priority is afforded to assist aircraft conducting law enforcement operations.

Course Description: Clearance Delivery will prepare the student to perform independently, under general supervision, all duties of the CD position within the ATCT and to attain certification. This stage of training is administered in two parts, classroom, and OJT, for each position. If simulation is available, simulation training may be added to this stage of training.

Course Number: ATT0833 Occupational Completion Point: A Clearance Delivery (CD) – 240 Hours	
Note: This block will introduce the student to procedures and equipment specific to the Clearance Delivery position.	
65.0	Understand and apply Clearance Delivery. Students will familiarize with basic air traffic tasks. The student will be able to:
65.01	Demonstrate the ability to properly mark flight progress strips and describe locally authorized strip marking to include arrival and departure strips.
65.02	Describe the procedures used to assign/change beacon codes.
65.03	Demonstrate the ability to coordinate transfer of control and/or radio communications to/with the appropriate position/facility.
65.04	Demonstrate the ability to issue or relay departure clearance information and amendments using correct phraseology.
65.05	Explain the pilot responsibility upon clearance issuance and ATC clearance and instruction readback.

	65.06 Demonstrate the relay of clearance limits, route of flight, altitude data, holding instructions.
Note: This block will be utilized to build the students basic skill set while adding technical/performance tasks at an increased traffic volume. Block 2 will also introduce the student to procedures used during emergencies.	
66.0	Demonstrate understanding of emergency procedures. The student will be able to:
	66.01 Demonstrate the ability to issue or relay departure restrictions, clearance void times, hold for release, and release times and properly execute coordination procedures for VFR release of IFR aircraft.
	66.02 Understand and explain how to respond to operational requests, provide additional services, describe and apply duty and operational priorities.
	66.03 Define the terms jet route and airway and explain the differences between them.
Note: This block will be utilized to build the students basic skill set while adding technical/performance tasks at an increased traffic volume. Block 3 will also introduce the student to procedures used during special flights.	
67.0	Demonstrate understanding of special flight procedures at an increased traffic volume. The student will be able to:
	67.01 Describe the actions taken by a pilot to indicate the aircraft is being hijacked and state the code phrases used by pilots and controllers and the coordination/responses required.
	67.02 Understand and explain how to relay clearance limits, route of flight, altitude data, holding instructions.
	67.03 Demonstrate how to amend clearances and issue special VFR clearance.

Course Description: Ground Control will prepare the student to perform independently, under general supervision, all duties of the GC position within the ATCT and to attain certification on those positions. This stage of training is administered in up to three parts: classroom, OJT, and simulation, if simulation capabilities exist. An airport tour must also be provided where resources permit.

Course Number: ATT0834 Occupational Completion Point: A Ground Control (GC) – 240 Hours	
Note: This block will introduce the student to procedures and equipment specific to the GC position.	
68.0	Identify and understand Ground Control procedures and equipment. The student will familiarize with basic air traffic tasks and will be able to:
	68.01 Describe the responsibilities of Ground Control.
	68.02 Understand and state minimum conditions for supervisory notification.
	68.03 Define terms such as: RVR, CWW, prevailing visibility.
	68.04 Define aircraft priorities and define duty and operational priorities.
	68.05 Demonstrate the ability to properly mark flight progress strips and describe locally authorized strip marking to include arrival and departure strips.

68.06	Describe the procedures used to assign/change beacon codes.
68.07	Demonstrate the ability to coordinate transfer of control and/or radio communications to/with the appropriate position/facility.
68.08	Define the term “NOTAM” and describe the procedures for relaying and copying NOTAM information.
68.09	Describe the procedures for responding to requests from non-ATC agencies (i.e., information concerning incidents, mishaps, and security issues).
68.10	Explain when SVFR operations are authorized and state the phraseology used to authorize aircraft to conduct SVFR operations.
68.11	Demonstrate the ability to issue or relay departure clearance information and amendments using correct phraseology.
68.12	Demonstrate the ability to maintain surveillance of the surface area and explain the responsibilities of movement/surface area surveillance for each operating position in the tower cab.
68.13	Respond to operational requests, provide additional services, describe, and apply duty and operational priorities.
68.14	Describe the coordination required for authorizing an aircraft or a vehicle to cross or use any portion of an active runway.
68.15	Demonstrate the ability to safely coordinate ground movement operations of personnel and vehicles.
68.16	Define the terms jet route and airway and explain the differences between them.
68.17	Explain how to obtain the current altimeter setting and when to issue it to arriving and departing aircraft.
68.18	Define the terms instrument departure procedure, standard terminal arrival and standard instrument departure.
68.19	Demonstrate the ability to determine an aircraft’s position on the airport and safely control taxi operations.
Note: This block will be utilized to build the students basic skill set while adding technical/performance tasks at an increased traffic volume. Block 2 will also introduce the student to procedures used during emergencies.	
69.0	Demonstrate understanding of emergency procedures at increased traffic volume. The student will be able to:
69.01	Demonstrate the ability to safely coordinate ground movement operations of personnel and vehicles.
69.02	Demonstrate the ability to issue cautionary wake-turbulence advisories, properly execute coordination procedures for arriving and departing helicopter operations and safely control taxi operations of aircraft.
69.03	Describe how and when the terms “immediately” and “expedite” are used to include expediting aircraft or a vehicle.
69.04	Explain when SVFR operations are authorized and state the phraseology used to authorize aircraft to conduct SVFR operations and describe the basic items of an IFR clearance to include aircraft identification, clearance limit, etc.
69.05	Demonstrate the ability to issue or relay departure restrictions, clearance void times, hold for release, and release times and properly execute coordination procedures for VFR release of IFR aircraft.
69.06	Solicit, copy, relay, and issue PIREP information, relay low-level wind shear advisories and define procedures for relaying hazardous weather information to include areas of jurisdiction, frequencies used to broadcast information and phraseology used.
69.07	Describe the procedures and phraseology used to inform aircraft/adjacent facilities of observed aircraft abnormalities.
69.08	Define/describe the location of the hot brake, dangerous cargo and Arm/De-Arm areas.

	69.09 Describe the procedures used to obtain acknowledgement from receiver-only aircraft to include fixed-wing aircraft and helicopters.
Note: Block 3 will be utilized to build the students basic skill set while adding technical/performance tasks at an increased traffic volume. Block 3 will also introduce the student to procedures used during special flights.	
70.0	Understand and identify basic ATC skill set along with special flight/increased traffic procedures. The student will be able to:
	70.01 Demonstrate the ability to safely coordinate ground movement operations of personnel and vehicles.
	70.02 Demonstrate the ability to safely control taxi operations of aircraft.
	70.03 Describe the phraseology for issuing closed/unsafe runway information.
	70.04 Describe the procedures used to obtain acknowledgement from receiver-only aircraft to include fixed-wing aircraft and helicopters.
	70.05 Describe the actions taken by a pilot to indicate the aircraft is being hijacked and state the code phrases used by pilots and controllers and the coordination/responses required.
	70.06 Define what constitutes ECM/ECCM activity and its effect on air traffic control operations.
	70.07 Define the handling provided to aircraft conducting search and rescue operations.
	70.08 Describe what type of assistance and priority is afforded to assist aircraft conducting law enforcement operations.

Course Description: Local Control/Cab Coordinator Position Training will prepare the student to perform independently, under general supervision, all duties of the LC position in the ATCT and to attain certification. This stage of training is administered in three parts: classroom, simulation, and OJT.

Course Number: ATT0835 Occupational Completion Point: A Local Control/Cab Coordinator Position Training – 480 Hours	
Note: Block 1 will familiarize the student with basic air traffic task. It will also introduce the student to procedures and equipment specific to the LC position.	
71.0	Understand and identify Local Control procedures and equipment. The student will be able to:
	71.01 Describe the procedures and requirements for conducting pre-duty familiarization and transferring position responsibility.
	71.02 Define requirements for position relief and equipment checklists and define when a checklist is utilized.
	71.03 Respond to operational requests, provide additional services, describe, and apply duty and operational priorities.
	71.04 Demonstrate the ability to issue traffic advisories and describe the situations that would warrant the issuance of a safety alert.
	71.05 Demonstrate the ability to use correct phraseology and apply procedures during radio and interphone communications, describe the responsibilities of Local Control as outlined in JO 7110.65 and the facility operating instruction and demonstrate the ability to notify the supervisor of any information which may impact position operations to include weather, equipment status, emergency situations, special flights/operations, etc.

71.06	Operate all frequencies and landlines on the STVS.
71.07	Demonstrate the ability to properly mark flight progress strips and describe locally authorized strip marking to include arrival and departure strips.
71.08	Describe the type of airport lighting available at KBOW and define conditions that necessitate the need to activate airport lighting.
71.09	Demonstrate the ability to activate each light gun signal.
71.10	Explain the purposes that certified tower displays may be used for and who has authority to alter those uses.
71.11	Define/state information about/describe/differentiate aircraft characteristics and be able to define aircraft priorities and define duty and operational priorities as per JO 7110.65.
71.12	Describe the coordination required for authorizing an aircraft or a vehicle to cross or use any portion of an active runway and describe the procedures for runway selection and runway changes.
71.13	Demonstrate the ability to maintain surveillance of the surface area and explain the responsibilities of movement/surface area surveillance for each operating position in the tower cab.
71.14	Describe the location, dimensions, and restrictions of the precision approach critical areas and demonstrate the ability to safely coordinate ground movement operations of personnel and vehicles.
71.15	Describe/demonstrate relay of timely information as described in the 7110.65 and define the term “NOTAM” and describe the facility/agency responsible for dispatching NOTAM information.
71.16	Demonstrate the ability to properly mark flight progress strips and describe locally authorized strip marking to include arrival and departure strips.
71.17	Define the term RVR and describe which runway has RVR capabilities.
71.18	Demonstrate the ability to coordinate transfer of control and/or radio communications to/with the appropriate position/facility.
71.19	Demonstrate the ability to provide a landing clearance or alternate instructions to aircraft prior to the minimum distance to the runway, demonstrate the ability to issue landing information to airborne aircraft and describe procedures for clearing aircraft to land without having the aircraft in sight.
71.20	The student will be able to explain how to obtain the current altimeter setting and when to issue it to arriving aircraft.
71.21	Demonstrate the ability to issue and cancel takeoff/landing clearances.
71.22	Demonstrate the ability to issue departure control instructions to aircraft, describe the basic items of an IFR clearance and demonstrate the ability to issue or relay departure clearance information and amendments using correct phraseology.
71.23	Define KBOW traffic patterns to include altitudes, restrictions, and direction of turns.
71.24	Demonstrate the ability to control and apply appropriate procedures for aircraft requesting/conducting visual, instrument and VFR practice approaches.
71.25	Demonstrate the ability to issue or relay departure restrictions, clearance void times, hold for release, and release times.
Note: Block 2 will familiarize the student with sequencing and separating. The student will be required to obtain the knowledge/skills through self-study and facilitation then apply this knowledge in a live/simulated environment.	
72.0	Demonstrate knowledge/skills of sequencing and separating in simulated and live environments. – The student will be able to:

72.01	Identify and describe equipment limitations and describe approaches conducted into KBOW under IFR service.
72.02	Describe procedures to take during and after a NAVAID Malfunction.
72.03	Describe the RAU procedures to include distance and meaning of each light steadied and flashing.
72.04	Describe requirements to solicit and report PIREPs.
72.05	Describe aircraft priorities and Med Evac/Air Evac/HOSP procedures.
72.06	Describe the phraseology for expeditious compliance procedures.
72.07	Describe the procedures for proper speed adjustments.
72.08	Explain when SVFR operations are authorized and state the phraseology used to authorize aircraft to conduct SVFR operations.
72.09	Properly and timely issue bird advisories, traffic advisories, and safety alerts.
72.10	Demonstrate the ability to control and apply appropriate procedures for aircraft requesting/conducting visual, circling and instrument approaches.
72.11	Demonstrate the ability to control aircraft requesting/conducting VFR Practice approaches.
72.12	Demonstrate the ability to sequence and separate arrivals and departures and apply reduced runway separation.
72.13	Describe when to utilize missed approach, breakout or go-around instructions.
72.14	Demonstrate the ability to apply visual separation between aircraft.
72.15	Demonstrate the ability to issue cautionary wake turbulence advisories and apply wake turbulence separation.
72.16	Demonstrate the ability to coordinate and control simultaneous same and opposite direction operations using correct phraseology.
72.17	Demonstrate the ability to separate aircraft utilizing intersecting runways.
72.18	Demonstrate the ability to coordinate and control opposite direction operations using correct phraseology.
72.19	Define standard and non-standard formations and describe the required separation for standard/non-standard formation flights.
72.20	Demonstrate the ability to properly execute coordination procedures for arriving and departing helicopter operations.
72.21	Describe the procedures for coordinating VFR transitions.
72.22	Demonstrate the ability to properly execute coordination procedures for VFR release of IFR aircraft.
Note: Block 3 will familiarize the student with abnormal/emergency operations. The student will be required to obtain the knowledge/skills through self-study and facilitation then apply this knowledge in a live/simulated environment.	
73.0	Demonstrate knowledge/skills of abnormal/emergency operations in simulated and live environments. The student will be able to:
73.01	Define/describe the location of the dangerous cargo and Arm/De-Arm areas.
73.02	Describe the local weather phenomena associated with the local airport and state the quality types and terms used to describe

	braking action.
73.03	Demonstrate the ability to issue wind shear advisories and report weather conditions.
73.04	Describe aircraft priorities and Med Evac/Air Evac/HOSP Operations procedures.
73.05	Describe correct intra/inter-facility coordination procedures for coordinating use of airspace.
73.06	Describe the correct procedures for open/closing a runway and state who has the authority to open, close, and suspend runway operations.
73.07	Define the term “Emergency Locator Transmitter” (ELT) and describe when operational testing of an ELT is authorized.
73.08	Describe the procedures used to obtain acknowledgement from receiver-only aircraft to include fixed-wing aircraft and helicopters.
73.09	Describe the actions taken when an aircraft reports “Minimum Fuel” and when an aircraft is overdue.
73.10	Describe TCAS resolution advisories, the situations that would warrant the issuance of a safety alert and demonstrate the ability to issue traffic advisories.
73.11	Describe the procedures for relaying divert advisories to aircraft.
73.12	Describe some examples of unusual maneuvers and when these operations may be approved.
73.13	Demonstrate the ability to separate aircraft utilizing intersecting runways.
73.14	Demonstrate the ability to sequence and separate arrivals and departures and apply reduced runway separation.
73.15	Demonstrate the ability to properly execute coordination procedures for arriving and departing helicopter operations.
73.16	Demonstrate the ability to coordinate and control simultaneous same and opposite direction operations using correct phraseology.
73.17	Demonstrate the ability to coordinate and control opposite direction operations using correct phraseology
73.18	Demonstrate the ability to control and apply appropriate procedures for aircraft requesting/conducting circling and instrument approaches.
73.19	Describe the procedures for proper speed adjustments.
73.20	Describe what the call sign “Flight Check” is used for, and the handling and priority given to flight check aircraft.
73.21	Describe the capabilities and limitations by group of current UAS.
Note: Block 4 will be utilized to hone the student’s complete skill set while adding more technical/performance tasks in addition to those added in previous blocks at an increased traffic volume.	
74.0	Demonstrate mastery of complete air traffic skill set. The student will be able to:
74.01	Demonstrate the ability to separate aircraft utilizing intersecting runways, sequence and separate arrivals and departures and apply reduced runway separation.
74.02	Demonstrate the ability to properly execute coordination procedures for helicopter operations and control simultaneous and opposite direction operations using correct phraseology.

74.03	Define what constitutes ECM/ECCM activity and its effect on air traffic control operations.
74.04	Define the handling provided to aircraft conducting search and rescue operations and describe what type of assistance and priority is afforded to assist aircraft conducting law enforcement operations.
74.05	Describe the location of and local procedures for the bailout, external stores jettison and fuel dump areas.
74.06	Describe the minimum amount of information needed for an aircraft emergency IAW FAAO 7110.65 and define procedures used to relay emergency aircraft information to concerned ATC and non-ATC agencies.
74.07	Describe the actions taken by a pilot to indicate the aircraft is being hijacked and describe the steps taken and agencies to be notified when information is received that a bomb has been placed on or near an aircraft.
74.08	Describe ESCAT basic terminology and fundamental concepts using the information.
74.09	Demonstrate the ability to issue traffic advisories.

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

Field Qualification Training (FQT): Students must receive FQT at Field Facilities as outlined in FAA Order JO 3120.4R and in their facility training directive. To complete each stage, the student must achieve a passing score. In accordance with FAA Order JO 3000.22, a passing score is defined as a score of at least 70 percent. If a passing score is not achieved on an end-of-lesson test, a review of the lesson must be conducted, and study time afforded to the student. One retake of the failed end-of-lesson test must be provided. If a passing score is not achieved after one retake, the TA will terminate training. The student will be notified in writing via memorandum.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete the program are: Computation (Mathematics) and Communications (Language and Reading 9). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (RULE 6A-10.040). Students served in exceptional student education (except gifted) as defined in s.1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology, and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program		
Program Number	T300100	
CIP Number	0652020300	
Grade Level	30, 31	
Program Length	600 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	TRA0180	Packer	BUS ED 1 LOG TECH 7G	150 hours
B	TRA0181	Material Handler		150 hours
		OR		
B	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours
C	TRA0182	Shipping, Receiving and Traffic Clerk	BUS ED 1 LOG TECH 7G	150 hours
D	TRA0183	Logistics Technician		150 hours

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.

Material Handler

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

Information Technology Assistant (OTA0040) – Standards 15.0 – 29.0 are associated with this course.

15.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
16.0 Develop an awareness of microcomputers.
17.0 Demonstrate an understanding of networks.
18.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
19.0 Use presentation applications to enhance communication skills.
20.0 Use spreadsheet applications to enhance communication skills.
21.0 Use database applications to store and organize data.
22.0 Use electronic mail to enhance communication skills.
23.0 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.
24.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.

25.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
26.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies.
27.0 Demonstrate an understanding of basic html by creating a simple web page.
28.0 Demonstrate comprehension and communication skills.
29.0 Use social media to enhance online communication and develop an awareness of a digital footprint.
30.0 Demonstrate an understanding of warehouse operations.
31.0 Demonstrate an understanding of storage and control operations.
32.0 Demonstrate an understanding of protection skills.
33.0 Demonstrate an understanding of economics.
34.0 Demonstrate an understanding of career readiness.
35.0 Demonstrate employability skills.
36.0 Demonstrate competencies in a specific career.
37.0 Demonstrate career acquisition.
38.0 Demonstrate career retention.
39.0 Demonstrate integrated learning and life skills.
40.0 Demonstrate technology and information.

Florida Department of Education
Student Performance Standards

Program Title: **Global Logistics and Supply Chain Technology**
Career Certificate Program Number: **T300100**

Course Description: The Packer 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.

Course Number: TRA0180 **Occupational Completion Point: A** **Packer – 150 Hours**	
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.
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.
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.

Course Description: The Material Handler course is designed to build on the skills and knowledge students learned in the Packer course 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.

Course Number: TRA0181 Occupational Completion Point: B Material Handler – 150 Hours	
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)
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.
	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 using 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.
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.
	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:
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 cultures.

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 OCP B, Information Technology Assistant.

Course Number: OTA0040
Occupational Completion Point: B
Information Technology Assistant – 150 Hours

Information Technology Assistant (OTA0040) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (015.0 – 29.0) have been placed in a separate document. To access this document, visit: Information Technology Assistant (OTA0040)

Course Description: The Shipping, Receiving and Traffic Clerk course is designed to build on the skills and knowledge students learned in the Packer and the Materials Handler 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.

Course Number: TRA0182
Occupational Completion Point: C
Shipping, Receiving and Traffic Clerk – 150 Hours

30.0	Demonstrate an understanding of warehouse operations. The student will be able to:	
	30.01	Identify and discuss the characteristics, purpose and importance of warehouse operations and supply chain management.
	30.02	Define material handling logistics as it applies to the warehousing function.
	30.03	Describe procedures for using computerized warehouse data.
	30.04	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.
	30.05	Define movement in a warehouse and identify the various locations within the warehouse where planned efficient movement of materials takes place.
	30.06	Explain channels of distribution.
	30.07	Discuss safety regulatory requirements and procedures.
	30.08	Explain the importance of storage in a warehouse.
	30.09	Define control as it applies to warehousing.
	30.10	Explain the relationship between physical structure and protection.
	30.11	Identify various types of equipment available to enhance the efficient movement of materials within a warehouse.
	30.12	Identify the various types of loading docks and cross docking.
	30.13	Define the term "peaks and valleys" as it applies to warehouse activity.
	30.14	Explain the importance of staging and JIT.
	30.15	Identify the primary types of hand-operated pieces of warehouse equipment.

30.16	Identify the important characteristics of industrial trucks.
30.17	Explain the concept of "balancing" as it applies to counterbalanced lift trucks.
30.18	Define the term narrow aisle as it applies to fork trucks.
30.19	Identify warehouse documents (e.g., pick tickets, special orders, inventory forms).
30.20	Display and interpret inventory screens, receive, inspect, and stock inventory.
31.0	Demonstrate an understanding of storage and control operations. The student will be able to:
31.01	Explain the concepts involved in determining the best method for storage and the equipment needed to facilitate a cost effective and efficient warehouse.
31.02	Identify the factors that are involved with the calculating and estimating of the storage area needed for retention of materials in a warehouse.
31.03	Identify the possibilities and combinations of systems and equipment that can be used for storage areas in a warehouse.
31.04	Define the following storage related terms: Size, Volume, Density, Pallet, and Case.
31.05	Define the terms packaging, SKU, stacking frame, term "Logistics Execution Systems" (LES), signage and signposting, "real time" and barcoding.
31.06	Explain how the volume of materials, space usage, and control affect the design of storage space in a warehouse design.
31.07	Explain various inventory control methods and their importance.
31.08	Identify and analyze various warehouse storage systems.
31.09	Identify the two key issues in planning block stacking.
31.10	Identify the basic configuration for pallet rack.
31.11	Explain the concept of control in the broadest possible context and the importance of keeping track of materials and goods.
31.12	Identify the various types of technologies developed over the years to keep track of goods within the warehouse.
31.13	Identify various labeling and packaging schemes available for securing and tracking the movement of items through a warehouse.
31.14	Define the components of an LES.
31.15	Explain the importance of addresses in signage.
31.16	Define information-filled labeling.
31.17	Identify key magnetic devices used in automatic data capture.
31.18	Define radio frequency identification (RFID).
31.19	Explain the importance of automation in warehousing.
31.20	Identify the value of emerging technologies related to warehouse operations.

32.0	Demonstrate an understanding of protection skills. The student will be able to:
32.01	Identify the role that protection plays in the total concept of "warehousing".
32.02	Identify the various forms of unit load formation equipment that is used for protecting materials.
32.03	Identify the types of load containment materials which include the machinery that dispenses them.
32.04	Situations where they are most advantageously used.
32.05	Explain the following: the need and means for protecting warehouse personnel and materials as they go about their duties.
32.06	Identify the advantages and disadvantages of open-air or soft wall warehousing for protection of warehoused items.
32.07	Compliance issues.
33.0	Demonstrate economics. The student will be able to:
33.01	Demonstrate understanding of goals, resources, and structure of an organization.
33.02	Understand the concepts and contributions of entrepreneurship.
33.03	Compare and contrast the advantages and disadvantages of the various forms of business ownership.
33.04	Understand economic principles affecting business cycles and the workforce.
33.05	Analyze possible solutions to specific business problems.
33.06	Apply economic decisions related to personal financial affairs, the successful operation of organizations and within a global economy.
33.07	Understand the role of a consumer, producer, saver and investor in the market system.
33.08	Understand the concepts and laws pertaining to customs and free trade.

Course Description: The Logistics Technician course is designed to build on the skills and knowledge students learned in the Packer, Materials Handler, and Shipping, Receiving and Traffic Clerk 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.

Course Number: TRA0183 Occupational Completion Point: D Logistics Technician – 150 Hours	
34.0	Demonstrate an understanding of career readiness. The student will be able to:
34.01	Explain the importance of life-long learning.
34.02	Evaluate/research occupational interests.
34.03	Demonstrate attitudes/ethics needed for career success.

	34.04	Assess personal strengths, talents, values and interests to appropriate jobs and careers to maximize career potential.
	34.05	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.
	34.06	Evaluate postsecondary training opportunities related to career interests, including certification, licensing, apprenticeships, college and military options.
	34.07	Relate and identify career interests and transferable skills necessary for opportunities in the global workforce.
	34.08	Develop an individual career plan and portfolio.
	34.09	Analyze needs of business and industry on labor and economic trends.
	34.10	Describe the changing roles including non-traditional occupations in the workplace.
35.0	Demonstrate employability skills. The student will be able to:	
	35.01	Identify and utilize resources used in a job search (e.g., newspaper, Internet, networking).
	35.02	Discuss importance of drug tests and criminal background checks in identifying possible employment options.
	35.03	Identify steps in the job application process including arranging for references and proper documentation.
	35.04	Identify procedures and complete documents required when applying for a job (e.g., application, W-4, I-9).
	35.05	Prepare a resume (electronic and traditional), cover letter, letter of application, follow-up letter, acceptance/rejection letter, and letter of resignation.
	35.06	Demonstrate appropriate dress and grooming for employment.
	35.07	Demonstrate effective interviewing skills (e.g., behavioral).
	35.08	Describe methods for handling illegal interview and application questions.
	35.09	Discuss state and federal labor laws regulating the workplace (e.g., Child Labor Law, sexual harassment, EEOC, ADA, FMLA).
	35.10	Identify positive work attitudes and behaviors such as honesty, compassion, respect, responsibility, fairness, trustworthiness, and caring.
	35.11	Describe importance of producing quality work and meeting performance standards.
	35.12	Identify personal and business ethics (e.g., preventing theft, pilfering, and unauthorized discounting).
	35.13	Demonstrate orderly and systematic behavior by creating and maintaining a personal planner.
	35.14	Identify qualities typically required for promotion (e.g., productivity, dependability, responsibility).
	35.15	Identify how to prepare for job separation and re-employment.
	35.16	Create and maintain a career portfolio (e.g., resume, letters of recommendation, awards, evidence of participation in school/community/volunteer activities, employer evaluations).
36.0	Demonstrate competencies in a specific career. The student will able to:	

36.01	Demonstrate job performance skills as outlined in the training plan
36.02	Exhibit effective workplace safety practices including use of protective devices
36.03	Display an acceptable level of productivity and quality control
36.04	Demonstrate effective written and oral communication and listening skills when interacting with customers, co-workers, and managers
36.05	Demonstrate decision making and problem-solving processes and techniques used in the workplace.
36.06	Demonstrate acceptable work habits and conduct in the workplace as defined by company policy
36.07	Demonstrate an understanding of the company's vision and mission statements.
36.08	Demonstrate an understanding of the company's goals and objectives
36.09	Demonstrate familiarity with the company's products and services
36.10	Demonstrate the ability to identify authority, rights, and responsibilities of both employers and employees
37.0	Demonstrate career acquisition. The student will be able to:
37.01	Participate in work-based learning opportunities such as: mentoring, cooperative work, job shadows, apprenticeships and internships.
37.02	Demonstrate effective oral and written communication skills necessary for employment.
37.03	Demonstrate job search skills using a variety of resources.
37.04	Apply the decision-making process to the various stages of the work life cycle.
37.05	Identify and demonstrate employability skills including job search, selection, the interviewing process, proper dress and presentation.
37.06	Compare and contrast compensation packages that include varying levels of wages and benefits.
38.0	Demonstrate career retention. The student will be able to:
38.01	Demonstrate positive personal qualities and self-management skills (i.e., time management, organization, punctuality and attendance).
38.02	Describe how productivity, work ethic and quality affect job stability.
38.03	Demonstrate communication team building and leadership skills.
38.04	Demonstrate personal health and workplace safety procedures.
38.05	Identify biases, harassment and discriminatory behaviors impacting job success and advancement.
38.06	Acknowledge and respond to constructive criticism and employment evaluation.
38.07	Understand the importance of following company policy and procedures and the legal ramifications of labor laws impacting employment.

	38.08 Understand the role of compromise in conflict resolution.
39.0	Demonstrate integrated learning and life skills. The student will be able to:
	39.01 Demonstrate the integration and application of academic and occupational skills in school, work, and personal lives.
	39.02 Use communication, mathematical and technical skills to compare compute, and analyze complex information.
	39.03 Discuss how personal choices, experiences, technology, education/training and other factors correlate with earning a living.
	39.04 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.
	39.05 Compare and contract strategies for personal finance and risk management.
	39.06 Demonstrate the ability to set, monitor and achieve clearly defined goals.
40.0	Demonstrate technology and information. The students will be able to:
	40.01 Apply knowledge of technology to identify and solve problems.
	40.02 Identify and evaluate how information technology developments have changed the way people work.
	40.03 Select, apply, and troubleshoot software and hardware as they apply to a variety of work applications.
	40.04 Describe how new developments in varied fields or technology affect the job market and the level of worker ‘s responsibilities.
	40.05 Analyze the ethical issues surrounding access, privacy, and confidentiality of information in emerging technologies.
	40.06 Explore current and future positions and career paths in the field of technology.
	40.07 Identify job tasks that presently are and will be in the future performed in the specified occupation (training plan).
	40.08 Create a training plan indicating competencies mastered.
	40.09 Maintain a record of employment hours and wages for auditing and budgetary purposes (e.g., timecards, budget sheets).
	40.10 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.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program		
Program Number	T400210	
CIP Number	0647061611	
Grade Level	30,31	
Program Length	1350	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 six occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	MTE0003	Marine Rigger	DIESEL MECH @7 7G GASENG RPR @7 7G	300 hours
B	MTE0090	Outboard Engine Technician		300 hours
C	MTE0074	Outboard Engine Diagnostics Technician		150 hours
D	MTE0092	Inboard Gas Engine Technician		300 hours
E	MTE0093	Drive Train Technician		150 hours
F	MTE0056	Inboard Diesel Technician		150 hours

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 Apply basic computer skills.
22.0 Troubleshoot and solve problems with outboard engines using industry recognized computer-based diagnostic equipment.
23.0 Set up electric and digital control box, and gauges.
24.0 Maintain and repair basic four-stroke cycle inboard gas engine.
25.0 Maintain and repair inboard fuel systems.
26.0 Maintain and repair inboard gas cooling systems.
27.0 Maintain and repair inboard gas lubrication systems.
28.0 Maintain and repair electronic ignition systems.
29.0 Maintain and repair stern drive upper gear cases.
30.0 Maintain and repair stern drive lower gear cases.
31.0 Maintain and repair stern drive intermediate housing.
32.0 Maintain and repair inboard gas transmissions.
33.0 Maintain and repair inboard diesel fuel systems.
34.0 Maintain and repair inboard diesel cooling systems.
35.0 Maintain and repair inboard diesel lubrication systems.
36.0 Maintain and repair inboard diesel charging systems.

Florida Department of Education
Student Performance Standards

Program Title: **Marine Service Technologies**
Career Certificate Program Number: **T400210**

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, fuel systems on boats, 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.

Course Number: MTE0003 **Occupational Completion Point: A** **Marine Rigger – 300 Hours**	
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.
01.06	Read, interpret, and apply service manuals.
01.07	Identify the safe use of paints, chemicals, fiberglass, and compounds
01.08	Demonstrate, apply, and provide evidence of safely using paints, chemicals, fiberglass, and compounds.
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.
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 safety requirements for material handling equipment such as rigging, ladders, and scaffolds related to the marine industry.
01.21	Explain 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 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	Explain various emergency alarms and procedures.
01.29	Apply clean-up procedures for spills.
01.30	Identify and apply procedures for handling hazardous material.
01.31	Perform safety and environmental inspections.
01.32	Perform leak checks to determine if toxic or hazardous material is escaping from a piece of equipment.
01.33	Demonstrate 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.
02.02	Remove and replace lighting systems.
02.03	Remove, inspect, repack, and replace wheel bearings and springs.
02.04	Remove and replace (R & R) 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.
	03.02 Explain a galvanic series.
	03.03 Explain the theory for using given materials in boat repair activities.
	03.04 Perform basic fiberglass repair.
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.
	04.02 Identify types of two-stroke cycle engines.
	04.03 Locate engine serial and model numbers.
	04.04 Set up and use precision measurement tools.
	04.05 Drill and remove broken studs and install helicoils.
	04.06 Demonstrate appropriate heating techniques and skills.
	04.07 Identify engine assemblies and systems.
	04.08 R & R powerhead.
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.).
	05.02 Sketch and label the parts of total fuel systems.
	05.03 Service fuel lines and primer bulbs (vacuum test).
	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.
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.
	06.03 Locate and identify electrical circuit components.
	06.04 Sketch a typical circuit using a single wire system.

06.05	Test storage batteries using proper industry recognized battery testing equipment.
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.
06.11	Remove and replace gauges or indicating lights.
06.12	Remove and replace fuel-sending units.
06.13	Diagnose gauges 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.
06.16	Demonstrate proficiency in applying industry standard wire terminal practices.
06.17	Demonstrate proper installation of 2 position and 3 position battery switches.
06.18	Demonstrate correct procedure for connecting batteries in series and parallel.
06.19	Check alternator output voltage with engine running compare with specifications.
06.20	Apply 33CFR Standards (if applicable).
06.21	Apply ABYC electrical standards (if applicable).
07.0	Prepare delivery checklist. The student will be able to:
07.01	Formulate center line measurements for outboard motor installation.
07.02	Locate manufacturers' I.D. plates.
07.03	Mount control boxes at the helm.
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	Connect the steering cable to the engine.
07.07	Find suitable locations for accessories and mount them to the boat.
07.08	Lubricate shafts, install propellers and fasten both securely.
07.09	Check for proper fluid levels (as required).

	07.10 Check manufacturers' specifications.
	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.
	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.
	08.02 Set up and use ohmmeters.
	08.03 Set up and use a DVA tester or equivalent.
	08.04 Set up and use spark testers.
	08.05 Set up and use timing lights.
	08.06 Set up and use multi-meter.
	08.07 Locate and identify parts of capacitor discharge ignition (CDI) systems.
	08.08 Locate and match electrical units by their symbols on a wiring diagram.
	08.09 Sketch and label complete C/D ignition systems.
	08.10 Check coil resistance, shorts, and grounds with an ohmmeter.
	08.11 Check stator windings with an ohmmeter.
	08.12 Check sensor coils, charge coils, ignition coils and shorts to ground with a DVA tester or equivalent.
	08.13 Check power packs with an ohmmeter and a DVA tester or equivalent.
09.0	Maintain and repair outboard fuel systems. The student will be able to:
	09.01 Identify the major types of carburetors.
	09.02 Check and adjust throttle.
	09.03 Identify and service different types of EFI/DFI systems.

	09.04 Identify air cleaners/flame arrestors.
	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.
	10.02 Identify the skills needed to be a parts specialist.
	10.03 Demonstrate appropriate computer skills.
	10.04 Identify different parts and accessories.

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, cranking systems, lubrication systems, cooling systems, lower gear cases, lower units and housing assemblies, employability, and entrepreneurship.

Course Number: MTE0090 Occupational Completion Point: B Outboard Engine Technician – 300 Hours	
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.
	11.02 Identify types of four-stroke cycle engines.
	11.03 Locate engine serial and model numbers.
	11.04 Identify engine assemblies and systems.
	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.
	11.07 Perform cylinder leak down test.
	11.08 Disassemble engines and inspect parts.
	11.09 Clean and inspect heads for cracks, warpage and damaged spark plug threads.
	11.10 Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin.

	11.11 Adjust valves.
	11.12 Remove and inspect camshafts and lifters.
	11.13 Clean and inspect lifters for wear.
	11.14 Time valve drive assemblies.
	11.15 R & R powerhead and associated parts.
	11.16 Inspect oil seals.
	11.17 Inspect/replace timing belt/chain.
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.
	12.02 Disassemble charging systems and identify the components.
	12.03 Perform stator and rectifier testing on charging systems.
	12.04 Reassemble and test charging systems.
	12.05 Set up and use ohmmeters.
	12.06 Reassemble and test complete units.
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.
	13.02 Locate and match electrical units by their symbols on a wiring diagram.
	13.03 Sketch and label complete battery ignition systems.
	13.04 Check coil resistance with an ohmmeter.
	13.05 Set up and use test equipment.
	13.06 Set timing using timing light.
	13.07 Clean and re-gap spark plugs.
	13.08 Explain the functions of sensors in Electronic Fuel Injection (EFI) systems.
	13.09 Explain the function of actuators.
	13.10 Explain the function of control modules.
14.0	Maintain and repair outboard cranking systems. The student will be able to:
	14.01 Disassemble recoil starters.

	14.02 Inspect components of recoil starters.
	14.03 Reassemble recoil starters.
	14.04 Identify components of electrical starting systems.
	14.05 Bench test switches.
	14.06 Troubleshoot starting systems using multi-meter.
	14.07 Locate opens, short and grounds.
15.0	Maintain and repair outboard lubrication systems. The student will be able to:
	15.01 Identify the types and functions of lubrication systems.
	15.02 Explain the principles of lubrication systems.
	15.03 Identify and locate components of lubrication systems.
	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.
	16.02 Trace water flow through cooling systems.
	16.03 Disassemble, examine for problems, and reassemble water pumps.
	16.04 Remove, check, and replace thermostats.
	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.
	17.03 Refill lower gear cases with specified oil.
	17.04 Determine propeller pitch diameter and hub type.

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	Describe the process for disassembling and assembling exhaust housings and water tube assemblies.
18.03	Describe the process for replacing motor mounts and shock absorbers.
18.04	Lubricate all fittings.
18.05	Pressure and vacuum test gear cases.
18.06	Demonstrate the process for removing and servicing cylinders and rams.
18.07	Adjust the trim and tilt.
18.08	Determine the differences between mechanical, electrical, and hydraulic shifting units.
18.09	Explain the shifting theory of the lower unit.
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.
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.

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 basic computer skills, computer-based diagnostic equipment, electrical, control box, and gauges.

Course Number: MTE0074 **Occupational Completion Point: C** **Outboard Engine Diagnostics Technician – 150 Hours**	
21.0	Apply basic computer skills. The student will be able to:
	21.01 Identify and apply the proper procedures for turning on and turning off a computer.
	21.02 Identify and apply the proper procedures for logging on and logging off a computer.
	21.03 Demonstrate knowledge of properly using and navigating operating systems.
	21.04 Identify and properly use various peripheral devices. (e.g., printers, scanners, external storage devices)
	21.05 Demonstrate and apply the process for locating, copying, pasting, saving, and backing up a file and folder
	21.06 Demonstrate the process for opening and saving a file using program specific extensions. (e.g., .docx, .pdf, .txt)
	21.07 Identify and apply the proper procedures for securely uploading and downloading files over external and internal networks.
	21.08 Demonstrate the proper procedures for using and navigating e-mail programs.
	21.09 Create and send messages using proper electronic communication etiquette.
	21.10 Show understanding for properly attaching a file within an e-mail message.
22.0	Troubleshoot and solve problems with outboard engines using industry recognized computer-based diagnostic equipment. The student will be able to:
	22.01 Demonstrate and understand the proper procedures for connecting diagnostic equipment to an outboard engine.
	22.02 Identify and demonstrate the proper procedures for opening and closing diagnostic programs.
	22.03 Use multiple research techniques to identify faults and data to be used to solve outboard engine trouble.
	22.04 Formulate a plan to repair outboard engines given the data found.
	22.05 Download, save, and print output data from an outboard engine.
23.0	Set up electric and digital control box, and gauges. The student will be able to:

23.01	Assign position to outboard engines.
23.02	Set up trim and tilt limits.
23.03	Set up digital gauges.

Course Description: Students will learn skills for the inboard 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.

Course Number: MTE0092 Occupational Completion Point: D Inboard Gas Engine Technician – 300 Hours	
24.0	Maintain and repair basic four-stroke cycle inboard gas engines. The student will be able to:
24.01	Diagnose valve and head problems by use of the visual inspection method.
24.02	Diagnose valve and head problems by use of the compression tester method.
24.03	Understand R & R procedures.
24.04	Clean and inspect heads for cracks, warpage, and damaged spark plug threads.
24.05	Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin.
24.06	Adjust valves.
24.07	Understand R & R procedures.
24.08	Demonstrate the process for cleaning and inspecting lifters for wear.
24.09	Time valve drive assemblies.
25.0	Maintain and repair inboard fuel systems. The student will be able to:
25.01	Identify and locate fuel system components (fuel tanks, lines, filters, etc.).
25.02	Sketch and label typical fuel gauge systems.
25.03	Sketch and label the parts of total fuel systems.
25.04	Remove and replace fuel gauges.
25.05	Service fuel lines.
25.06	Remove and replace fuel-sending units.
25.07	Describe or demonstrate the process for removing, cleaning, inspecting and installing fuel tanks.
25.08	Vacuum test fuel system.

	25.09 Remove, replace service and check the pressure of fuel pumps.
	25.10 Remove, clean and replace in-line filters.
	25.11 Identify the major types of carburetors.
	25.12 Check and adjust throttle linkages.
	25.13 Identify and service different types of EFI systems.
	25.14 Identify and understand different types of Vapor Separator Tank (VST) systems.
	25.15 Remove, service, and replace flame arrestors.
26.0	Maintain and repair inboard gas cooling systems. The student will be able to:
	26.01 Explain the principles of cooling systems, including fresh water-cooling systems.
	26.02 Trace water flow through cooling systems.
	26.03 Disassemble and reassemble water pumps.
	26.04 Remove, check, and replace thermostats.
	26.05 Check thermostat pressure relief systems.
	26.06 Service manifolds, risers, and thermostat housings.
27.0	Maintain and repair inboard gas lubrication systems. The student will be able to:
	27.01 Identify the types and functions of lubrication systems.
	27.02 Explain the principles of lubrication systems.
	27.03 Identify and locate components of lubrication systems.
	27.04 Check engines for oil leaks.
	27.05 Change engine oil and filters.
	27.06 Check engine oil pressure and level.
	27.07 Recognize and use only recommended oil.
28.0	Maintain and repair electronic ignition systems. The student will be able to:
	28.01 Locate and match electrical units by their symbols on a wiring diagram.
	28.02 Sketch and label complete battery ignition systems.
	28.03 Set up and use test equipment.
	28.04 Set timing using a timing light

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 stern drive upper and lower cases, intermediate housings, and inboard gas transmissions.

Course Number: MTE0093 Occupational Completion Point: E Drive Train Technician – 150 Hours	
29.0	Maintain and repair stern drive upper gear case. The student will be able to:
29.01	Identify components of upper gear case.
29.02	Use the proper oil to refill upper and lower gear cases.
29.03	Check manufacturers' installation procedures for stern drive units.
30.0	Maintain and repair stern drive lower gear cases. The student will be able to:
30.01	Identify components of lower gear case.
30.02	Remove and replace lower gear cases.
30.03	Refill lower gear cases with specified oil.
30.04	Determine propeller pitch, diameter and hub type.
30.05	Disassemble, examine for problems, and reassembly water pumps on stern drive (if applicable).
31.0	Maintain and repair stern drive intermediate housings. The student will be able to:
31.01	Check engine alignment.
31.02	Check electrical components with proper test equipment.
31.03	Describe and demonstrate the process for removing and replacing "U" joints.
31.04	Identify components of transom plates.
31.05	Service, install, and adjust trim and tilt systems.
32.0	Maintain and repair inboard gas transmissions. The student will be able to:
32.01	Remove and replace transmissions.
32.02	Drain transmissions.
32.03	Determine capacity using the transmission service manuals.
32.04	Refill transmissions according to manufacturers' specifications.
32.05	Describe or demonstrate procedure for aligning the engine to with the drive shaft.

Course Description: Students will learn entry-level skills for the diesel marine service industry. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of diesel fuel, cooling, lubrication, and charging systems.

Course Number: MTE0056 Occupational Completion Point: F Inboard Diesel Technician – 150 Hours	
33.0	Maintain and repair inboard diesel fuel systems. The student will be able to:
33.01	Identify and locate fuel system components (fuel tanks, lines, filters, etc.).
33.02	Sketch and label the parts of total fuel systems.
33.03	Service fuel lines.
33.04	Describe or demonstrate the process for removing, cleaning, inspecting and installing fuel tanks.
33.05	Identify and locate fuel control devices.
33.06	Remove, clean and replace in-line filters.
33.07	Check and adjust throttle and governor linkages.
33.08	Check fuel systems for leaks.
33.09	Bleed systems for starting.
33.10	Set the injection pump angle (timing).
33.11	Check or replace glow plugs.
33.12	Check; stop solenoids.
33.13	Describe the function of diesel engine electronic control systems.
34.0	Maintain and repair inboard diesel cooling systems. The student will be able to:
34.01	Disassemble and reassemble water pumps.
34.02	Remove, check, and replace thermostats.
34.03	Use thermostat pressure relief systems.
34.04	Service manifolds, risers, and thermostat housings.
34.05	Service water-cooling systems for diesel engines.
35.0	Maintain and repair inboard diesel lubrication systems. The student will be able to:
35.01	Identify the types and functions of lubrication systems.
35.02	Explain the principles of lubrication systems.

	35.03 Identify and locate components of lubrication systems.
	35.04 Check engines for oil leaks.
	35.05 Change engine oil and filters.
	35.06 Check engine oil pressure and level.
	35.07 Recognize and use only recommended oil.
36.0	Maintain and repair inboard diesel charging systems. The student will be able to:
	36.01 Inspect, remove, and replace alternator belts.
	36.02 Check the output of charging systems.
	36.03 Analyze malfunctions.

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program		
Program Number	T400310	
CIP Number	0647060905	
Grade Level	30, 31	
Program Length	1200 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please se the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in 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 six occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	AVS0680	Basic Electronics Wiring Installer/Technician	AVIONICS @7 7G ELECTRONIC @7 7G	150 hours
B	AVS0681	Electrical Systems Technician		150 hours
C	AVS0682	Analog Circuits Technician		150 hours
D	AVS0683	Aircraft Electronics Technician		150 hours
E	AVS0684	Avionics Installer/Technician		300 hours
F	AVS0685	Advanced Avionics Installer/Technician		300 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Avionics Systems Technician program can be found using the following links: www.faa.gov/ and www.eta-i.org/

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 Demonstrate proficiency in installing avionics systems.
26.0 Demonstrate proficiency in structural applications.
27.0 Demonstrate proficiency in avionics radio station regulations and procedures.
28.0 Demonstrate proficiency in AM and FM transmitters.
29.0 Demonstrate proficiency in AM and FM receivers.
30.0 Demonstrate proficiency in AM and FM transceivers.
31.0 Demonstrate proficiency in electromagnetic wave emissions.
32.0 Demonstrate proficiency in line maintenance of airborne communication systems.
33.0 Demonstrate proficiency in line maintenance of aircraft instrument systems.
34.0 Demonstrate proficiency in aircraft data bus systems.
35.0 Demonstrate proficiency in line maintenance of airborne navigation systems and equipment.
36.0 Demonstrate proficiency in primary and secondary radar systems.

37.0 Demonstrate proficiency with in-flight entertainment systems.
38.0 Demonstrate proficiency with engine and airframe monitoring systems.
39.0 Demonstrate proficiency with pitot-static systems.
40.0 Demonstrate proficiency with aircraft safety systems.

Florida Department of Education
Student Performance Standards

Program Title: **Avionics Systems Technician**
Career Certificate Program Number: **T400310**

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.

Course Number: AVS0680 **Occupational Completion Point: A** **Basic Electronics Wiring Installer/Technician – 150 Hours**	
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.
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.
	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.
	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.

Course Description: Students in the Electrical Systems Technician course will learn basic and advanced AC circuitry, components, aircraft AC power systems, and aircraft drawings.

Course Number: AVS0681 Occupational Completion Point: B Electrical Systems Technician – 150 Hours	
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 circuit.
	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.
	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.
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.

Course Description: Students in the Analog Circuits Technician course will learn solid state devices, analog circuits, basic avionics corrosion, aircraft aerodynamics, foundations of Unmanned Aerial Systems, and Unmanned Aerial Systems operations.

Course Number: AVS0682 Occupational Completion Point: C Analog Circuits Technician – 150 Hours	
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.
	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.
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 because 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.

Course Description: Students in the Aircraft Electronics Technician course will learn digital circuitry, microprocessors, workplace safety skills, communication skills, employability skills, entrepreneurship, and the basics of avionic systems**.**

Course Number: AVS0683 Occupational Completion Point: D Aircraft Electronics Technician – 150 Hours	
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.
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.
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.
	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.

Course Description: Students in the Avionics Installer/Technician course will learn avionic systems installation, structural applications, radio station regulation, AM and FM transmitter/receiver/transceiver principles, electromagnetic wave emission, and airborne communication systems.

Course Number: AVS0684 Occupational Completion Point: E Avionics Installer/Technician – 300 Hours	
25.0	Demonstrate proficiency in installing avionics systems. The student will be able to:
	25.01 Prepare an avionics installation plan
	25.02 Design wiring interconnection for Comm, Nav, GPS, Traffic Avoidance, Audio Integrating etc.
	25.03 Install circuit protective devices, switches, lamps, and relays.
	25.04 Fabricate wiring harnesses

	25.05 Perform a mechanical avionics installation
	25.06 Perform an electrical installation
	25.07 Perform an original manufacturers equipment (OEM) installation
	25.08 Determine antenna placement with regards to noise interference
26.0	Demonstrate proficiency in structural applications. The student will be able to:
	26.01 Select, install, and remove conventional and special fasteners
	26.02 Layout, form, inspect, modify, and repair metal structures.
	26.03 Fabricate, modify, and repair composite structures
	26.04 Install aircraft antennas and doubler plates.
27.0	Demonstrate proficiency in avionics radio station regulations and procedures. The student will be able to:
	27.01 Define repair station related regulatory and standardization agencies and their purposes.
	27.02 Define repair station certification requirements.
	27.03 Define requirements for certification of radio repair technicians.
	27.04 Practice proper station operation procedures.
	27.05 Prepare repair station reports and documentation.
	27.06 Describe FCC rules pertaining to AM and FM transmitter maintenance and operation.
28.0	Demonstrate proficiency in AM and FM transmitters. The student will be able to:
	28.01 Define Double Sideband (DSB), Single Sideband (SSB) and FM modulation.
	28.02 Analyze and troubleshoot AM and FM Radio Frequency (RF) oscillator circuits.
	28.03 Analyze and troubleshoot buffer and multiplier circuits.
	28.04 Analyze and troubleshoot RF power amplifier circuits.
	28.05 Analyze and troubleshoot AM and FM modulation circuits.
	28.06 Analyze and troubleshoot microphone circuits.
	28.07 Analyze and troubleshoot balanced modulators and SSB filter circuits.
	28.08 Analyze and troubleshoot AM and FM power supply circuits.
	28.09 Make power, frequency and modulation measurements of AM and FM transmitters.
	28.10 Align and troubleshoot AM and FM transmitters.

29.0	Demonstrate proficiency in AM and FM receivers. The student will be able to:
29.01	Analyze and troubleshoot receiver audio voltage and power amplifiers and speaker/headphone circuits.
29.02	Analyze and troubleshoot AM and FM detector circuits.
29.03	Analyze and troubleshoot AM Intermediate Frequency (IF) amplifier circuits.
29.04	Analyze and troubleshoot FM IF amplifier and limited circuits.
29.05	Analyze and troubleshoot receiver oscillator and automatic frequency control (AFC) circuits.
29.06	Analyze and troubleshoot RF mixer/heterodyne circuits.
29.07	Analyze and troubleshoot receiver RF amplifier circuits.
29.08	Analyze and troubleshoot automatic voltage control/automatic gain control (AVC/AGC) circuits.
29.09	Analyze and troubleshoot receiver power supplies.
29.10	Align and troubleshoot AM and FM receivers.
30.0	Demonstrate proficiency in AM and FM transceivers. The student will be able to:
30.01	Analyze and troubleshoot transceiver control, metering and switching circuits.
30.02	Analyze and troubleshoot transceiver frequency synthesizers and phase locked loop circuits.
30.03	Analyze and troubleshoot squelch circuits.
30.04	Align and troubleshoot transceivers.
31.0	Demonstrate proficiency in electromagnetic wave emissions. The student will be able to:
31.01	Define the radio frequency spectrum.
31.02	Define types and classification of RF emissions.
31.03	Define the characteristics of radio waves.
31.04	Define radio wave propagation method.
31.05	Define the basic types of antennas.
31.06	Draw the voltage and current relationships and radiation patterns for the basic types of antennas.
31.07	Define methods for antenna tuning, gain and directivity.
31.08	Define transmission lines in terms of electrical and physical properties.
31.09	Define standing waves, cause and effect, and measure standing wave ratios.
31.10	Define tuned transmission lines and describe applications.

	31.11 Construct transmission lines.
	31.12 Define waveguides, resonant cavities and their applications.
32.0	Demonstrate proficiency in line maintenance of airborne communication systems. The student will be able to:
	32.01 Identify regulatory agencies affecting aircraft electronic systems
	32.02 Analyze and troubleshoot Aircraft Audio Integration Systems
	32.03 Analyze and troubleshoot VHF Communication Systems
	32.04 Analyze and troubleshoot HF Communication Systems
	32.05 Analyze and troubleshoot Satellite Communication Systems
	32.06 Describe the operation of a selective calling system.
	32.07 Define the operation and the types of data managed by the Aircraft Communication Automatic Reporting System (ACARS).

Course Description: Students in the Advanced Avionics Installer/Technician course will learn aircraft instrument systems, data bus systems, navigation systems, primary and secondary radar systems, in-flight entertainment systems, engine and airframe monitoring systems, pitot-static systems, and aircraft safety systems.

Course Number: AVS0685 Occupational Completion Point: F Advanced Avionics Installer/Technician – 300 Hours	
33.0	Demonstrate proficiency in line maintenance of aircraft instrument systems. The student will be able to:
	33.01 Identify and define the operation of basic flight instruments.
	33.02 Identify and define the operation of electronic flight instruments.
	33.03 Identify and define the operation of navigation instruments to include HSI, RMI, VOR.
	33.04 Identify, and define the operation of compass systems.
34.0	Demonstrate proficiency in aircraft data bus systems. The student will be able to:
	34.01 Define the operation of an aircraft digital data communications system
	34.02 Compare and contrast the differences between ARINC data bus systems used in commercial aircraft.
	34.03 Identify data bus systems used in general aviation aircraft and explain their operation.
	34.04 Troubleshoot an aircraft data bus system.
35.0	Demonstrate proficiency in line maintenance of airborne navigation systems and equipment. The student will be able to:
	35.01 Use navigation principles to understand dead-reckoning, earth coordinate system, great circle navigation, short-range navigation

		and long-range navigation.
	35.02	Understand the operating principles of Global Position Satellite (GPS) System.
	35.03	Distinguish the operation principles of a VHF Omni Range (VOR) System.
	35.04	Define the operating characteristics of a Distance Measuring Equipment (DME) System.
	35.05	Explain the purpose and operation of, and the precautions when using, an Automatic Direction Finder (ADF) System.
	35.06	Define the elements of an Instrument Landing System (ILS) to include the characteristics of the localizer, glide slope, and marker beacon.
	35.07	Explain the operating principles of a Microwave Landing System (MLS).
	35.08	Describe the purpose and operation of ADS-B/transponder systems.
	35.09	Understand the relationships of various navigation systems to the aircraft flight management system.
	35.10	Define the operation of an autopilot, auto-throttle, and auto stabilization system.
36.0		Demonstrate proficiency in primary and secondary radar systems. The student will be able to:
	36.01	Explain the theory and operation of the primary radar system.
	36.02	Given a primary radar block diagram, explain the relationship between the major components of the system.
	36.03	Describe the operation of a Doppler radar.
	36.04	Secondary (ATC) Radar Transponder.
	36.05	Define the purpose and operation of the altitude encoding function of radar.
	36.06	Define the purpose and operation of the lightning detection function of radar.
	36.07	Describe the operation of a XM Weather System.
	36.08	Analyze and troubleshoot a radar system.
37.0		Demonstrate proficiency with in-flight entertainment systems. The student will be able to:
	37.01	Describe the types of in-flight entertainment systems and compare their operation to each other.
	37.02	Determine installation considerations when installing or upgrading an in-flight entertainment system.
38.0		Demonstrate proficiency with engine and airframe monitoring systems. The student will be able to.
	38.01	Identify and interpret data from various types of displays.
	38.02	Define aircraft built-in test equipment systems.
	38.03	Interpret data from built-in test equipment.
39.0		Demonstrate proficiency with pitot-static systems. The students will be able to:

	39.01 Understand purpose and function of pitot-static systems
	39.02 Perform pitot-static integrity checks
	39.03 Troubleshoot pitot-static systems
40.0	Demonstrate proficiency with aircraft safety systems. The students will be able to:
	40.01 Understand purpose and function of caution, warning and advisory systems
	40.02 Understand the purpose and operation of terminal collision avoidance systems (TCAS)
	40.03 Understand the purpose and operation of ground proximity warning systems (GPWS).
	40.04 Define the purpose and data collected by the aircraft flight data computer and voice recorder.
	40.05 Describe the purpose, operation and testing of the Emergency Locator Transmitter (ELT)
	40.06 Describe the operation of the stall warning and avoidance 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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Master Automotive Service Technology 1**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T400700	
CIP Number	0647060411	
Grade Level	30, 31	
Program Length	1050 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 five occupational completion points.

NOTE: It is recommended that students complete **OCP-A (Automobile Services Assistor)** and/or demonstrate mastery of the outcomes in **OCP-A (Automobile Services Assistor)** prior to enrolling in additional Automotive Service Technology courses. **The sequence of OCP's, after completing and/or demonstrating mastery of OCP-A (Automobile Services Assistor), is at the discretion of the instructor.**

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

When offered at the postsecondary level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	AER0014	Automobile Services Assistor	AUTO IND @7 %7 %G AUTO MECH @7 7G	300 hours
B	AER0418	Automotive Brake System Technician		150 hours
C	AER0453	Automobile Suspension and Steering Technician		150 hours
D	AER0360	Automotive Electrical/Electronic System Technician		300 hours
E	AER0110	Engine Repair Technician		150 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Automotive Service Technology program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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 drum\disc brake, hydraulics, power assist units, electronic brakes, traction control, stability control systems and miscellaneous (wheel bearings, parking brake, electrical, etc.) systems.
05.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions systems, wheel alignment, and wheels and tires.
06.0 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.
07.0 Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, engine block, lubrication and cooling systems.

Florida Department of Education
Student Performance Standards

Program Title: **Automotive Service Technology 1**
Career Certificate Program Number: **T400700**

Course Description: The Automotive Service Assistor course prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study equipment skills, safety regulations, routine maintenance, and customer service.

Abbreviations:
ASE = Supplemental Tasks

ER Task List	
	P-1 = 12
	P-2 = 6
	P-3 = 0
Total	**18**

For every task in Automotive Services Assistor course, 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.

Course Number: AER0014 **Occupational Completion Point: A** **Automotive Services Assistor – 300 Hours**	**Priority Number**
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
01.02 Demonstrate knowledge of appropriate automotive industry certifications.	
01.03 Identify and define career opportunities in the automotive service industry.	
01.04 Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).	
01.05 Identify appropriate emergency first aid procedures.	
01.06 Utilize and demonstrate safe procedures for handling of tools and equipment.	ASE
01.07 Identify and use proper placement of floor jacks and jack stands.	ASE
01.08 Identify and use proper procedures for safe lift operation.	ASE
01.09 Utilize proper ventilation procedures for working within the lab/shop area.	ASE

	01.10 Identify proper procedures for safe pit usage.	
	01.11 Identify marked safety areas.	ASE
	01.12 Identify the location and the types of fire extinguishers and other fire safety equipment.	ASE
	01.13 Demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.	ASE
	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 personal protection equipment (PPE) to include safety glasses, ear protection, gloves, shoes, and other devices as required 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.	
	01.20 Identify and describe typical automotive lubricants and lubricant properties.	
	01.21 Identify and describe typical automotive seals and gaskets.	
	01.22 Identify the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, battery electric vehicles, and hybrid electric vehicle high voltage circuits.	ASE
	01.23 Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.	
	01.24 Identify the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)	ASE
	01.25 Locate and demonstrate knowledge of Safety Data Sheets (SDS).	ASE
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
	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
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
	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	Demonstrate use of the three C's (Concern, Cause, and Correction).	ASE
03.05	Review vehicle service history.	ASE
03.06	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	ASE
03.07	Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.	
03.08	Determine the presence of a Tire Pressure Monitoring System (TPMS).	
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.	
03.13	Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.	
03.14	Use proper chemicals for cleaning and lubrication.	P-1
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.	P-1
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.	P-1
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.	P-2
03.28	Check manual transmission fluid level; note unusual conditions; service as required.	P-1
03.29	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.	

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	Change engine oil and filter.	P-1
03.33	Inspect, service, or replace air filters, filter housings, and intake duct work.	P-1
03.34	Inspect and replace fuel filters; as applicable.	P-2
03.35	Inspect and replace air filter.	
03.36	Inspect and replace cabin air filter.	
03.37	Inspect, replace and adjust drive belts; inspect tensioners and pulleys.	P-2
03.38	Document observed damage, unusual conditions, and concerns.	
03.39	Inspect struts, springs, and related components; service as required.	
03.40	Inspect stabilizer bar(s), bushings, brackets, and links; service as required.	
03.41	Inspect springs, torsion bars, and related components; service as required.	
03.42	Inspect shock absorbers and related components.	
03.43	Inspect constant velocity (CV) axle shaft boots; service as required.	
03.44	Identify service considerations when equipped with a Tire Pressure Monitoring System (TPMS).	
03.45	Identify nitrogen-filled tires.	
03.46	Inspect tires, diagnose tire wear patterns, inspect spare and mounting system; check and adjust tire pressure; where applicable.	
03.47	Dismount, inspect, and remount tire on wheel (with/without TPMS); balance wheel and tire assembly.	P-1
03.48	Identify indirect and direct tire pressure monitoring system (TPMS); calibrate system; verify operation of instrument panel lamps.	P-1
03.49	Perform Road Force balance /match mounting.	P-2
03.50	Reinstall wheel; torque wheel fasteners to specification.	
03.51	Check wheel bearings for play and other signs of wear.	
03.52	Perform a visual inspection of a drum brake system.	
03.53	Perform a visual inspection of a disc brake system.	
03.54	Check operation of brake stop light system.	P-1
03.55	Check parking brake operation (manual/electric); check parking brake components for unusual conditions.	
03.56	Check wiper blades, inserts, and arms; replace wiper blades or inserts.	

03.57	Lubricate door latches and hinges.	
03.58	Inspect fuel tank, fuel cap and seal; inspect and replace fuel lines, fittings, and hoses; as applicable.	
03.59	Perform battery state-of-charge test; determine needed action.	P-1
03.60	Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action.	P-1
03.61	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.	
03.62	Perform battery, starting, and charging system tests using appropriate tester.	
03.63	Start a vehicle using jumper cables or a battery auxiliary power supply (jump box).	
03.64	Maintain or restore electronic memory functions if required.	P-2
03.65	Inspect and test fusible links, circuit breakers, and fuses; confirm proper circuit operation; replace as needed.	
03.66	Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.	P-1
03.67	Aim headlights.	P-2

Course Description: The Automotive Brake System Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of brake systems, drum brakes, disc brakes, power assist units, electronic brakes, traction, and stability control.

Abbreviations:
BR = Brakes

For every task in Automotive Brake System Technician course, 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.

BR Task List:	
	P-1 = 30
	P-2 = 23
	P-3 = 3
Total	**56**

Course Number: AER0418 Occupational Completion Point: B Automotive Brake System Technician – 150 Hours		**Priority Number**
04.0	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		

04.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
04.02	Identify and interpret brake system concerns; determine needed action.	P-1
04.03	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
04.04	Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).	P-1
04.05	Install wheel and torque lug nuts.	P-1
04.06	Identify and interpret brake system concerns; determine needed action.	P-1
Hydraulic System Diagnosis and Repair		
04.07	Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).	P-1
04.08	Measure brake pedal height, travel, and free play (as applicable); determine needed action.	P-1
04.09	Check master cylinder for internal/external leaks and proper operation; determine needed action.	P-1
04.10	Remove, bench bleed, and reinstall master cylinder.	P-1
04.11	Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.	P-1
04.12	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear; and loose fittings/supports; determine needed action.	P-1
04.13	Replace brake lines, hoses, fittings, and supports.	P-2
04.14	Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).	P-2
04.15	Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P-1
04.16	Inspect, test, and/or replace components of brake warning light system.	P-3
04.17	Identify components of hydraulic brake warning light system.	P-2
04.18	Bleed and/or replace brake fluid.	P-1
04.19	Test brake fluid for contamination.	P-1
04.20	Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.	
Drum Brake Diagnosis and Repair		
04.21	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.	P-2
04.22	Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P-2

04.23	Refinish brake drum and measure final drum diameter; compare with specification.	P-2
04.24	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-2
04.25	Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2
04.26	Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	P-2
Disc Brake Diagnosis and Repair		
04.27	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.	P-1
04.28	Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action.	P-1
04.29	Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action.	P-1
04.30	Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action.	P-1
04.31	Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks.	P-1
04.32	Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.	P-1
04.33	Remove and reinstall/replace rotor.	P-1
04.34	Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P-1
04.35	Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-2
04.36	Retract and re-adjust caliper piston on an integrated parking brake system.	P-1
04.37	Check brake pad wear indicator; determine needed action.	
04.38	Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer’s recommendations.	P-1
04.39	Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts.	
Power-Assist Units Diagnosis and Repair		
04.40	Check brake pedal travel with and without engine running to verify proper power booster operation.	P-2
04.41	Identify components of the brake power assist system (vacuum, hydraulic, and electric).	P-2
04.42	Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster; determine needed action.	P-2
04.43	Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine needed action.	P-2
04.44	Inspect electric power booster unit; determine needed action.	P-3

Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair	
04.45 Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action.	P-1
04.46 Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.	P-2
04.47 Check parking brake operation (including electric parking brakes); check parking brake indicator light system operation; determine needed action.	P-2
04.48 Check parking brake operation and parking brake indicator light system operation; determine needed action.	P-1
04.49 Replace wheel bearing and race.	P-3
04.50 Remove, reinstall, and/or replace sealed wheel bearing assembly.	P-1
04.51 Inspect and replace wheel studs.	P-2
Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) Systems Diagnosis and Repair	
04.52 Identify and inspect electronic brake control system components (ABS, TCS, & ESC); determine needed action.	P-1
04.53 Describe the operation of a regenerative braking system.	P-2
04.54 Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action.	P-2
04.55 Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action.	P-2
04.56 Depressurize high-pressure components of an electronic brake control system.	P-2
04.57 Bleed the electronic brake control system hydraulic circuits.	P-1
04.58 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).	P-2
04.59 Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).	P-2
04.60 Remove and install electronic brake control system electrical/electronic and hydraulic components.	

Course Description: The Automotive Suspension and Steering Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of general suspension, steering systems, front suspensions, rear suspensions, wheel alignment, and tires.

Abbreviations:
SS = Suspension and Steering

For every task in Automotive Suspension and Steering Technician course, 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.

SS Task List:	
P-1 =	27
P-2 =	22
P-3 =	6
Total	55

Course Number: AER0453 Occupational Completion Point: C Automotive Suspension and Steering Technician – 150 Hours	Priority Number
05.0 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: Suspension and Steering Systems	
05.01 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
05.02 Identify and interpret suspension and steering system concerns; determine needed action.	P-1
Steering Systems Diagnosis and Repair	
05.03 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1
05.04 Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).	P-1
05.05 Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action.	P-2
05.06 Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2
05.07 Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2
05.08 Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.	P-2
05.09 Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.	P-2
05.10 Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.	P-1
05.11 Inspect power steering fluid level and condition.	P-1
05.12 Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.	P-2
05.13 Inspect for power steering fluid leakage; determine needed action.	P-1
05.14 Remove, inspect, replace, and/or adjust power steering pump drive belt.	P-1
05.15 Remove and reinstall power steering pump.	P-2
05.16 Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.	P-2

05.17 Inspect, remove and/or replace power steering hoses and fittings.	P-2
05.18 Inspect, remove and/or replace pitman arm, relay (center-link/intermediate) rod, idler arm, mountings, and steering linkage damper.	P-2
05.19 Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps.	P-1
05.20 Inspect, test and diagnose electrically- assisted power steering systems (including using a scan tool); determine needed action.	P-2
05.21 Identify hybrid vehicle power steering system electrical circuits and safety precautions.	P-2
05.22 Test power steering system pressure; determine needed action.	P-2
Suspension Systems Diagnosis and Repair	
05.23 Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
05.24 Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
05.25 Inspect, remove, and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.	P-3
05.26 Inspect, remove, and/or replace strut rods and bushings.	P-3
05.27 Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators).	P-2
05.28 Inspect, remove, and/or replace steering knuckle assemblies.	P-3
05.29 Inspect, remove and/or replace short and long arm suspension system coil springs and spring insulators.	P-3
05.30 Inspect, remove, and/or replace torsion bars and mounts	P-3
05.31 Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.	P-3
05.32 Inspect, remove, and/or replace strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.	P-3
05.33 Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings.	P-3
05.34 Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.	P-1
Related Suspension and Steering Service	
05.35 Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.	P-1
05.36 Remove, inspect, service and/or replace front and rear wheel bearings.	P-1
05.37 Describe the function of suspension and steering control systems and components, (i.e., active suspension and stability control).	P-3
Wheel Alignment Diagnosis, Adjustment, and Repair	
05.38 Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering	P-1

	return concerns; determine needed action.	
05.39	Perform pre-alignment inspection; measure vehicle ride height; determine needed action.	P-1
05.40	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
05.41	Check toe-out-on-turns (turning radius); determine needed action.	P-2
05.42	Check steering axis inclination (SAI) and included angle; determine needed action.	P-2
05.43	Check rear wheel thrust angle; determine needed action.	P-1
05.44	Check for front wheel setback; determine needed action.	P-2
05.45	Check front and/or rear cradle (sub-frame) alignment; determine needed action.	P-3
05.46	Reset steering angle sensor and related equipment.	P-2
Wheels and Tires Diagnosis and Repair		
05.47	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
05.48	Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.	P-2
05.49	Rotate tires according to manufacturer's recommendation including vehicles equipped with tire pressure monitoring systems (TPMS)	P-1
05.50	Measure wheel, tire, axle flange, and hub runout; determine needed action.	P-2
05.51	Diagnose tire pull problems; determine needed action.	P-1
05.52	Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.	P-1
05.53	Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-1
05.54	Inspect tire and wheel assembly for air loss; perform needed action.	P-1
05.55	Repair tire following vehicle manufacturer approved procedure.	P-1
05.56	Identify indirect and direct tire pressure monitoring system (TPMS); calibrate system; verify operation of instrument panel lamps.	P-1
05.57	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure	P-1
05.58	Reinstall wheel; torque lug nuts.	

Course Description: The Automotive Electrical/Electronic System Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of electrical/electronics, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems.

Abbreviations:
EE = Electrical/Electronic Systems

For every task in Automotive Electrical/Electronic System Technician course, 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.

EE Task List:	
P-1 =	40
P-2 =	6
P-3 =	0
Total	46

Course Number: AER0360 Occupational Completion Point: D Automotive Electrical/Electronic System Technician – 300 Hours		Priority Number
06.0	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		
06.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
06.02	Identify electrical/electronic system components and configurations.	P-1
06.03	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
06.04	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1
06.05	Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.	P-1
06.06	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1
06.07	Describe types of test lights; use appropriate test light to check operation of electrical circuits per service information.	P-1
06.08	Use fused jumper wires to check operation of electrical circuits.	P-1
06.09	Use wiring diagrams during the diagnosis of electrical/electronic circuit problems (e.g., symbols).	P-1
06.10	Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.	P-1
06.11	Inspect and test fusible links, circuit breakers, and fuses; determine needed action.	P-1
06.12	Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.	P-1

06.13 Test and measure circuit using an oscilloscope and/or graphing multimeter (GMM); interpret results; determine needed action.	P-1
06.14 Identify repair procedures for network connected systems.	P-1
06.15 Identify and interpret electrical/electronic system concern; determine necessary action.	
Battery Diagnosis and Service	
06.16 Maintain or restore electronic memory functions.	P-1
06.17 Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1
06.18 Perform slow/fast battery charge according to manufacturer's recommendations.	P-1
06.19 Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1
06.20 Identify safety precautions for high voltage systems on electric, hybrid, hybrid-electric, and diesel vehicles.	
06.21 Identify electrical/electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.	P-2
06.22 Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.	
06.23 Perform battery conductance test; determine necessary action.	
Starting System Diagnosis and Repair	
06.24 Perform starter current draw tests; determine needed action.	P-1
06.25 Perform starter circuit voltage drop tests; determine needed action.	P-1
06.26 Inspect and test starter relays and solenoids; determine needed action.	P-2
06.27 Remove and install starter in a vehicle.	P-1
06.28 Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.	P-1
06.29 Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.	P-1
06.30 Demonstrate knowledge of an automatic idle-stop/start-stop system.	P-1
06.31 Diagnose a no-crank condition using a wiring diagram and test equipment; determine needed action.	P-1
Charging System Diagnosis and Repair	
06.32 Perform charging system output test; determine needed action.	P-1
06.33 Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.	P-1
06.34 Inspect, adjust, and/or replace alternator (generator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P-1
06.35 Remove, inspect, and/or replace alternator (generator); determine needed action.	P-1

06.36 Perform charging circuit voltage drop tests; determine needed action.	P-1
Lighting Systems Diagnosis and Repair	
06.37 Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action.	P-1
06.38 Describe operation and diagnosis of an adaptive headlight system.	
06.39 Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2
06.40 Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.	
Instrument Cluster and Driver Information Systems Diagnosis and Repair	
06.41 Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action.	P-1
06.42 Diagnose the causes of incorrect operation of warning devices and other driver information systems; determine needed action.	P-1
06.43 Verify operation of instrument panel gauge sending units for causes of abnormal readings; determine needed action.	P-1
06.44 Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.	
Body Electrical Systems Diagnosis and Repair	
06.45 Diagnose vehicle comfort, convenience, access, safety, and related system operation; determine needed action.	P-2
06.46 Remove and reinstall door panel.	P-1
06.47 Diagnose 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-2
06.48 Diagnose 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-2
06.49 Describe disabling and enabling procedures for supplemental restraint system (SRS); verify indicator lamp operation.	P-1
06.50 Verify windshield wiper and washer operation; replace wiper blades.	P-1
06.51 Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back-up camera); determine needed repairs.	P-1
06.52 Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action.	P-1
06.53 Describe the process for software transfer, software updates, or reprogramming of electronic modules.	P-1
06.54 Diagnose heated glass, mirror, or seat operation; determine necessary action.	

Course Description: The Engine Repair Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of general engine, cylinder heads, valve trains, engine block, lubrication, and cooling systems.

Abbreviations:
ER = Engine Repair

For every task in Engine Repair Technician course, 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.

ER Task List:	
P-1	**22**
P-2	**19**
P-3	**9**
Total	**50**

Course Number: AER0110 **Occupational Completion Point: E** **Engine Repair Technician – 150 Hours**		**Priority Number**
07.0	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)		
07.01	Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advance driver assistance systems (ADAS).	P-1
07.02	Retrieve and record DTCs, OBD monitor status, and freezeframe data; clear codes and date when directed.	
07.03	Verify operation of the instrument panel engine warning indicators.	P-1
07.04	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action.	P-1
07.05	Install engine covers using gaskets, seals, and sealers as required.	P-1
07.06	Verify engine mechanical timing and identify variable timing procedures.	P-1
07.07	Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.	
07.08	Inspect, remove and/or replace engine mounts.	P-2
07.09	Identify service precautions related to service of the internal combustion engine of a hybrid electric vehicle.	P-2
07.10	Remove and reinstall engine on a newer vehicle equipped with OBD; reconnect all attaching components and restore the vehicle to running condition.	P-3
07.11	Identify and interpret engine concern; determine necessary action.	
07.12	Locate and interpret vehicle and major component identification numbers.	

07.13	Diagnose engine noises and vibrations; determine necessary action.	
07.14	Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.	
07.15	Perform engine vacuum tests; determine necessary action.	
07.16	Identify cylinder head and valve train components and configurations.	P-1
07.17	Perform cylinder power balance tests; determine necessary action.	
07.18	Perform cylinder cranking and running compression tests; determine necessary action.	
07.19	Perform cylinder leakage tests; determine necessary action.	
Cylinder Head and Valve Train Diagnosis and Repair		
07.20	Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure.	P-1
07.21	Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1
07.22	Inspect valve actuating mechanisms for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-2
07.23	Adjust valves (mechanical or hydraulic lifters).	P-1
07.24	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
07.25	Inspect valve springs for squareness and free height comparison; determine needed action.	P-3
07.26	Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action.	P-3
07.27	Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action.	P-3
07.28	Inspect valves and valve seats; determine needed action.	P-3
07.29	Check valve spring assembled height and valve stem height; determine needed action.	P-3
07.30	Inspect valve lifters and hydraulic lash adjusters; determine needed action.	P-2
07.31	Inspect and/or measure camshaft for runout, journal wear and lobe wear.	P-3
07.32	Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action.	P-3
Engine Block Assembly Diagnosis and Repair		
07.33	Identify engine block assembly components and configurations.	P-1
07.34	Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-1

07.35	Disassemble engine block; clean and prepare components for inspection and reassembly.	P-1
07.36	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.	P-2
07.37	Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.	P-2
07.38	Deglaze and clean cylinder walls.	P-2
07.39	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.	P-2
07.40	Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine needed action.	P-2
07.41	Inspect main and connecting rod bearings for damage and wear; determine needed action.	P-2
07.42	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.	P-3
07.43	Inspect and measure piston skirts and ring lands; determine needed action.	P-2
07.44	Determine piston-to-bore clearance.	P-2
07.45	Inspect, measure, and install piston rings.	P-2
07.46	Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance and/or silencer); inspect shaft(s) and support bearings for damage and wear; determine needed action; reinstall and time.	P-2
07.47	Remove and replace piston pin; where applicable.	
07.48	Assemble engine block.	P-1
Lubrication and Cooling Systems Diagnosis and Repair		
07.49	Identify lubrication and cooling system components and configurations.	
07.50	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 needed action.	P-1
07.51	Identify causes of engine overheating.	P-1
07.52	Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
07.53	Inspect and/or test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.	P-1
07.54	Inspect, remove, and replace water pump.	P-2
07.55	Remove and replace radiator.	P-2
07.56	Remove, inspect, and replace thermostat and gasket/seal.	P-1

07.57	Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.	P-1
07.58	Perform oil pressure tests; determine needed action.	P-1
07.59	Perform engine oil and filter change; use proper fluid type per manufacturer specification.	P-1
07.60	Inspect auxiliary coolers; determine needed action.	P-2
07.61	Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
07.62	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.	P-2
07.63	Inspect and replace engine cooling and heater system hoses.	

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 P-1, P-2, or P-3 are ASE tasks.

It is recommended that the program be Automotive Service Excellence (ASE) Education Foundation Master Certified (MAST) and the instructors be A1-A8 ASE Master and Advanced Engine Performance (L1) ASE Certified.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Automotive Electrical Technician**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T400720	
CIP Number	0647060424	
Grade Level	30, 31	
Program Length	750 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 three occupational completion points.

NOTE: It is recommended that students complete **OCP-A (Automobile Services Assistor)** and/or demonstrate mastery of the outcomes in **OCP-A (Automobile Services Assistor)** prior to enrolling in additional Automotive Service Technology courses. **The sequence of OCP's, after completing and/or demonstrating mastery of OCP-A (Automobile Services Assistor), is at the discretion of the instructor.**

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

When offered at the postsecondary level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	AER0014	Automobile Services Assistor	AUTO IND @7 %7 %G AUTO MECH @7 7G	300 hours
B	AER0360	Automotive Electrical/Electronic System Technician		300 hours
C	AER0172	Automotive Heating and Air Conditioning Technician		150 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Automotive Service Technology program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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 electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems.
05.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling.

Florida Department of Education
Student Performance Standards

Program Title: **Automotive Electrical Technician**
Career Certificate Program Number: **T400720**

Course Description: The Automotive Service Assistor course prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study equipment skills, safety regulations, routine maintenance, and customer service.

Abbreviations:
ASE = Supplemental Tasks

For every task in Automotive Services Assistor course, 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.

Course Number: AER0014 **Occupational Completion Point: A** **Automotive Services Assistor – 300 Hours**		**Priority Number**
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
01.02	Demonstrate knowledge of appropriate automotive industry certifications.	
01.03	Identify and define career opportunities in the automotive service industry.	
01.04	Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).	
01.05	Identify appropriate emergency first aid procedures.	
01.06	Utilize and demonstrate safe procedures for handling of tools and equipment.	ASE
01.07	Identify and use proper placement of floor jacks and jack stands.	ASE
01.08	Identify and use proper procedures for safe lift operation.	ASE
01.09	Utilize proper ventilation procedures for working within the lab/shop area.	ASE
01.10	Identify proper procedures for safe pit usage.	

	01.11 Identify marked safety areas.	ASE
	01.12 Identify the location and the types of fire extinguishers and other fire safety equipment.	ASE
	01.13 Demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.	ASE
	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.	
	01.20 Identify and describe typical automotive lubricants and lubricant properties.	
	01.21 Identify and describe typical automotive seals and gaskets.	
	01.22 Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	ASE
	01.23 Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.	
	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
	01.25 Locate and demonstrate knowledge of Safety Data Sheets (SDS).	ASE
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
	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
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
	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 Demonstrate use of the three C's (Concern, Cause, and Correction).	ASE

03.05	Review vehicle service history.	ASE
03.06	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	ASE
03.07	Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.	
03.08	Determine the presence of a Tire Pressure Monitoring System (TPMS).	
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.	
03.13	Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.	
03.14	Use proper chemicals for cleaning and lubrication.	
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.	
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.	
03.28	Check manual transmission fluid level; note unusual conditions; service as required.	
03.29	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.	
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	Change engine oil and filter.	
03.33	Inspect and replace fuel filters; as applicable.	
03.34	Inspect and replace air filter.	
03.35	Inspect and replace cabin air filter.	
03.36	Inspect, replace, and adjust drive belts; inspect tensioners and pulleys.	
03.37	Document observed damage, unusual conditions, and concerns.	
03.38	Inspect struts, springs, and related components; service as required.	
03.39	Inspect stabilizer bar, bushings, brackets, and links; service as required.	
03.40	Inspect springs, torsion bars, and related components; service as required.	
03.41	Inspect shock absorbers and related components.	
03.42	Inspect constant velocity (CV) axle shaft boots; service as required.	
03.43	Identify service considerations when equipped with a Tire Pressure Monitoring System (TPMS).	
03.44	Identify nitrogen-filled tires.	
03.45	Inspect tires, diagnose tire wear patterns, inspect spare and mounting system; check and adjust tire pressure; where applicable.	
03.46	Rotate tires according to manufacturer’s recommendations.	
03.47	Balance wheel and tire assembly (static, dynamic and road force balance); where applicable.	
03.48	Dismount, inspect, and remount tire on wheel.	
03.49	Repair tire according to industry standards.	
03.50	Reinstall wheel; torque wheel fasteners to specification.	
03.51	Check wheel bearings for play and other signs of wear.	
03.52	Perform a visual inspection of a brake drum system.	
03.53	Perform a visual inspection of a disc brake system.	
03.54	Check parking brake operation; check parking brake components for unusual conditions.	
03.55	Check wiper blades, inserts, and arms; replace wiper blades or inserts.	
03.56	Lubricate door latches and hinges.	
03.57	Inspect fuel tank, fuel cap and seal; inspect and replace fuel lines, fittings, and hoses; as applicable.	

03.58	Perform slow/fast battery charge.	
03.59	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.	
03.60	Perform battery, starting, and charging system tests using appropriate tester.	
03.61	Start a vehicle using jumper cables or a battery auxiliary power supply (jump box).	
03.62	Maintain or restore electronic memory functions if required.	
03.63	Inspect and test fusible links, circuit breakers, and fuses; confirm proper circuit operation; replace as needed.	
03.64	Inspect and replace exterior and courtesy lamps.	

Course Description: The Automotive Electrical/Electronic System Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of electrical/electronics, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems.

Abbreviations:
EE = Electrical/Electronic Systems

For every task in Automotive Electrical/Electronic System Technician course, 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.

EE Task List:
P-1 = 29
P-2 = 16
P-3 = 1
Total 46

Course Number: AER0360 Occupational Completion Point: B Automotive Electrical/Electronic System Technician – 300 Hours		**Priority Number**
04.0	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		
04.01	Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.	P-1
04.02	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1
04.03	Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.	P-1

04.04	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1
04.05	Demonstrate proper use of a test light on an electrical circuit.	P-1
04.06	Use fused jumper wires to check operation of electrical circuits.	P-1
04.07	Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.	P-1
04.08	Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.	P-1
04.09	Inspect and test fusible links, circuit breakers, and fuses; determine needed action.	P-1
04.10	Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.	P-1
04.11	Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.	P-2
04.12	Repair data bus wiring harness.	P-1
04.13	Identify and interpret electrical/electronic system concern; determine necessary action.	
04.14	Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures.	
Battery Diagnosis and Service		
04.15	Perform battery state-of-charge test; determine needed action.	P-1
04.16	Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action.	P-1
04.17	Maintain or restore electronic memory functions.	P-1
04.18	Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1
04.19	Perform slow/fast battery charge according to manufacturer’s recommendations.	P-1
04.20	Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1
04.21	Identify safety precautions for high voltage systems on electric, hybrid, hybrid-electric, and diesel vehicles.	P-2
04.22	Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery.	P-1
04.23	Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.	P-2
04.24	Perform battery conductance test; determine necessary action.	
Starting System Diagnosis and Repair		
04.25	Perform starter current draw tests; determine needed action.	P-1
04.26	Perform starter circuit voltage drop tests; determine needed action.	P-1
04.27	Inspect and test starter relays and solenoids; determine needed action.	P-2

04.28	Remove and install starter in a vehicle.	P-1
04.29	Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.	P-2
04.30	Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.	P-2
04.31	Demonstrate knowledge of an automatic idle-stop/start-stop system.	P-2
Charging System Diagnosis and Repair		
04.32	Perform charging system output test; determine needed action.	P-1
04.33	Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.	P-1
04.34	Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P-1
04.35	Remove, inspect, and/or replace generator (alternator).	P-1
04.36	Perform charging circuit voltage drop tests; determine needed action.	P-1
Lighting Systems Diagnosis and Repair		
04.37	Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action.	P-1
04.38	Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.	P-1
04.39	Aim headlights.	P-2
04.40	Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2
04.41	Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.	
Instrument Cluster and Driver Information Systems Diagnosis and Repair		
04.42	Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action.	P-2
04.43	Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine needed action.	P-2
04.44	Reset maintenance indicators as required.	P-2
04.45	Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.	
Body Electrical Systems Diagnosis and Repair		
04.46	Diagnose operation of comfort and convenience accessories and related circuits (such as: power window, power seats, pedal height, power locks, truck locks, remote start, moonroof, sunroof, sun shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, cruise control, and auto dimming headlamps); determine needed repairs.	P-2

04.47	Diagnose 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-2
04.48	Diagnose 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
04.49	Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back-up camera); determine needed repairs.	P-1
04.50	Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action.	P-2
04.51	Describe the process for software transfer, software updates, or reprogramming of electronic modules.	P-2
04.52	Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action.	

Course Description: The Automotive Heating and Air Conditioning Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling.

Abbreviations:
HA = Heating and Air Conditioning

For every task in Automotive Heating and Air Conditioning Technician course, 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.

HA Task List:
P-1 = 16
P-2 = 16
P-3 = 4
Total 36

Course Number: AER0172 Occupational Completion Point: C Automotive Heating and Air Conditioning Technician – 150 Hours		**Priority Number**
05.0	Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling. The student will be able to:	
General: A/C System Diagnosis and Repair		
05.01	Identify and interpret heating and air conditioning problems; determine needed action.	P-1
05.02	Research vehicle service information including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.	P-1
05.03	Performance test A/C system; identify problems.	P-1

05.04	Identify abnormal operating noises in the A/C system; determine needed action.	P-2
05.05	Identify refrigerant type; select and connect proper gauge set/test equipment; record temperature and pressure readings.	P-1
05.06	Leak test A/C system; determine needed action.	P-1
05.07	Inspect condition of refrigerant oil removed from A/C system; determine needed action.	P-2
05.08	Determine recommended oil and oil capacity for system application.	P-1
05.09	Using a scan tool, observe and record related HVAC data and trouble codes.	P-3
Refrigeration System Component Diagnosis and Repair		
05.10	Inspect, remove, and/or replace A/C compressor drive belts, pulleys, tensioners and visually inspect A/C components for signs of leaks; determine needed action.	P-1
05.11	Inspect, test, service and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.	P-2
05.12	Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity.	P-2
05.13	Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	P-2
05.14	Determine need for an additional A/C system filter; perform needed action.	P-3
05.15	Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform needed action.	P-2
05.16	Inspect for proper A/C condenser airflow; determine needed action.	P-1
05.17	Remove, inspect, and replace receiver/drier or accumulator/drier; determine recommended oil type and quantity.	P-2
05.18	Remove, inspect, and install expansion valve or orifice (expansion) tube.	P-1
05.19	Inspect evaporator housing water drain; perform needed action.	P-1
05.20	Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action.	P-2
05.21	Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.	P-2
05.22	Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action.	
Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair		
05.23	Inspect engine cooling and heater systems hoses and pipes; perform needed action.	P-1
05.24	Inspect and test heater control valve(s); perform needed action.	P-2
05.25	Diagnose temperature control problems in the HVAC system; determine needed action.	P-2

05.26 Determine procedure to remove, inspect, reinstall, and/or replace heater core.	P-2
05.27 Inspect, test, and replace thermostat and gasket/seal.	
05.28 Determine coolant condition and coolant type for vehicle application; drain and recover coolant.	
05.29 Flush system; refill system with recommended coolant; bleed system.	
05.30 Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.	
05.31 Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.	
Operating Systems and Related Controls Diagnosis and Repair	
05.32 Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.	P-1
05.33 Diagnose A/C compressor clutch control systems; determine needed action.	P-2
05.34 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
05.35 Inspect and test HVAC system control panel assembly; determine needed action.	P-3
05.36 Inspect and test HVAC system control cables, motors, and linkages; perform needed action.	P-3
05.37 Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; perform needed action.	P-1
05.38 Identify the source of HVAC system odors.	P-2
05.39 Check operation of automatic or semi-automatic HVAC control systems; determine needed action.	P-2
Refrigerant Recovery, Recycling, and Handling	
05.40 Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.	P-1
05.41 Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.	P-1
05.42 Recycle, label, and store refrigerant.	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

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

It is recommended that the program be ASEEF Master Certified (MAST) and the instructors be A1-A8 ASE Master and Advanced Engine Performance (L1) ASE Certified.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Automotive General Service Technician**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T400730	
CIP Number	0647060425	
Grade Level	30, 31	
Program Length	750 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 four occupational completion points.

NOTE: It is recommended that students complete **OCP-A (Automobile Services Assistor)** and/or demonstrate mastery of the outcomes in **OCP-A (Automobile Services Assistor)** prior to enrolling in additional Automotive Service Technology courses. **The sequence of OCP's, after completing and/or demonstrating mastery of OCP-A (Automobile Services Assistor), is at the discretion of the instructor.**

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

When offered at the postsecondary level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	AER0014	Automobile Services Assistor	AUTO IND @7 %7 %G AUTO MECH @7 7G	300 hours
B	AER0418	Automotive Brake System Technician		150 hours
C	AER0453	Automobile Suspension and Steering Technician		150 hours
D	AER0110	Engine Repair Technician		150 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Automotive Service Technology program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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 drum\disc brake, hydraulics, power assist units, electronic brakes, traction control, stability control systems and miscellaneous (wheel bearings, parking brake, electrical, etc.) systems.
05.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions systems, wheel alignment, and wheels and tires.
06.0 Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, engine block, lubrication, and cooling systems.

Florida Department of Education
Student Performance Standards

Program Title: **Automotive General Service Technician**
Career Certificate Program Number: **T400730**

Course Description: The Automotive Service Assistor course prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study equipment skills, safety regulations, routine maintenance, and customer service.

Abbreviations:
ASE = Supplemental Tasks

For every task in Automotive Services Assistor course, 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.

Course Number: AER0014 **Occupational Completion Point: A** **Automotive Services Assistor – 300 Hours**	**Priority Number**
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
01.02 Demonstrate knowledge of appropriate automotive industry certifications.	
01.03 Identify and define career opportunities in the automotive service industry.	
01.04 Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).	
01.05 Identify appropriate emergency first aid procedures.	
01.06 Utilize and demonstrate safe procedures for handling of tools and equipment.	ASE
01.07 Identify and use proper placement of floor jacks and jack stands.	ASE
01.08 Identify and use proper procedures for safe lift operation.	ASE
01.09 Utilize proper ventilation procedures for working within the lab/shop area.	ASE
01.10 Identify proper procedures for safe pit usage.	

	01.11 Identify marked safety areas.	ASE
	01.12 Identify the location and the types of fire extinguishers and other fire safety equipment.	ASE
	01.13 Demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.	ASE
	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.	
	01.20 Identify and describe typical automotive lubricants and lubricant properties.	
	01.21 Identify and describe typical automotive seals and gaskets.	
	01.22 Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	ASE
	01.23 Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.	
	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
	01.25 Locate and demonstrate knowledge of Safety Data Sheets (SDS).	ASE
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
	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
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
	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 Demonstrate use of the three C's (Concern, Cause, and Correction).	ASE

03.05	Review vehicle service history.	ASE
03.06	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	ASE
03.07	Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.	
03.08	Determine the presence of a Tire Pressure Monitoring System (TPMS).	
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.	
03.13	Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.	
03.14	Use proper chemicals for cleaning and lubrication.	
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.	
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.	
03.28	Check manual transmission fluid level; note unusual conditions; service as required.	
03.29	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.	
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	Change engine oil and filter.	
03.33	Inspect and replace fuel filters; as applicable.	
03.34	Inspect and replace air filter.	
03.35	Inspect and replace cabin air filter.	
03.36	Inspect, replace and adjust drive belts; inspect tensioners and pulleys.	
03.37	Document observed damage, unusual conditions, and concerns.	
03.38	Inspect struts, springs, and related components; service as required.	
03.39	Inspect stabilizer bar, bushings, brackets, and links; service as required.	
03.40	Inspect springs, torsion bars, and related components; service as required.	
03.41	Inspect shock absorbers and related components.	
03.42	Inspect constant velocity (CV) axle shaft boots; service as required.	
03.43	Identify service considerations when equipped with a Tire Pressure Monitoring System (TPMS).	
03.44	Identify nitrogen-filled tires.	
03.45	Inspect tires, diagnose tire wear patterns, inspect spare and mounting system; check and adjust tire pressure; where applicable.	
03.46	Rotate tires according to manufacturer’s recommendations.	
03.47	Balance wheel and tire assembly (static, dynamic and road force balance); where applicable.	
03.48	Dismount, inspect, and remount tire on wheel.	
03.49	Repair tire according to industry standards.	
03.50	Reinstall wheel; torque wheel fasteners to specification.	
03.51	Check wheel bearings for play and other signs of wear.	
03.52	Perform a visual inspection of a brake drum system.	
03.53	Perform a visual inspection of a disc brake system.	
03.54	Check parking brake operation; check parking brake components for unusual conditions.	
03.55	Check wiper blades, inserts, and arms; replace wiper blades or inserts.	
03.56	Lubricate door latches and hinges.	
03.57	Inspect fuel tank, fuel cap and seal; inspect and replace fuel lines, fittings, and hoses; as applicable.	

03.58	Perform slow/fast battery charge.	
03.59	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.	
03.60	Perform battery, starting, and charging system tests using appropriate tester.	
03.61	Start a vehicle using jumper cables or a battery auxiliary power supply (jump box).	
03.62	Maintain or restore electronic memory functions if required.	
03.63	Inspect and test fusible links, circuit breakers, and fuses; confirm proper circuit operation; replace as needed.	
03.64	Inspect and replace exterior and courtesy lamps.	

Course Description:
The Automotive Brake System Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of brake systems, drum brakes, disc brakes, power assist units, electronic brakes, traction, and stability control.

Abbreviations:
BR = Brakes

For every task in Automotive Brake System Technician course, 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.

BR Task List:	
	P-1 = 40
	P-2 = 11
	P-3 = 5
Total	**56**

Course Number: AER0418 Occupational Completion Point: B Automotive Brake System Technician – 150 Hours		**Priority Number**
04.0	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		
04.01	Identify and interpret brake system concerns; determine needed action.	P-1
04.02	Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
04.03	Describe procedure for performing a road test to check brake system operation including an anti-lock brake system (ABS).	P-1

04.04	Install wheel and torque lug nuts.	P-1
04.05	Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals).	
Hydraulic System Diagnosis and Repair		
04.06	Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).	P-1
04.07	Measure brake pedal height, travel, and free play (as applicable); determine needed action.	P-1
04.08	Check master cylinder for internal/external leaks and proper operation; determine needed action.	P-1
04.09	Remove, bench bleed, and reinstall master cylinder.	P-1
04.10	Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.	P-1
04.11	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear; and loose fittings/supports; determine needed action.	P-1
04.12	Replace brake lines, hoses, fittings, and supports.	P-2
04.13	Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).	P-2
04.14	Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P-1
04.15	Inspect, test, and/or replace components of brake warning light system.	P-3
04.16	Identify components of hydraulic brake warning light system.	P-2
04.17	Bleed and/or flush brake system.	P-1
04.18	Test brake fluid for contamination.	P-1
04.19	Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.	
Drum Brake Diagnosis and Repair		
04.20	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.	P-1
04.21	Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P-1
04.22	Refinish brake drum and measure final drum diameter; compare with specification.	P-1
04.23	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
04.24	Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2
04.25	Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	P-1

Disc Brake Diagnosis and Repair	
04.26 Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.	P-1
04.27 Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action.	P-1
04.28 Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action.	P-1
04.29 Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action.	P-1
04.30 Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks.	P-1
04.31 Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.	P-1
04.32 Remove and reinstall/replace rotor.	P-1
04.33 Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P-1
04.34 Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-1
04.35 Retract and re-adjust caliper piston on an integrated parking brake system.	P-2
04.36 Check brake pad wear indicator; determine needed action.	P-1
04.37 Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.	P-1
04.38 Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts.	
Power-Assist Units Diagnosis and Repair	
04.39 Check brake pedal travel with and without engine running to verify proper power booster operation.	P-2
04.40 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
04.41 Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine needed action.	P-1
04.42 Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine needed action.	P-3
04.43 Measure and adjust master cylinder pushrod length.	P-3
Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair	
04.44 Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action.	P-1
04.45 Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.	P-2
04.46 Check parking brake system and components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.	P-1

04.47 Check parking brake operation and parking brake indicator light system operation; determine needed action.	P-1
04.48 Check operation of brake stop light system.	P-1
04.49 Replace wheel bearing and race.	P-3
04.50 Remove, reinstall, and/or replace sealed wheel bearing assembly.	P-1
04.51 Inspect and replace wheel studs.	P-1
Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) Systems Diagnosis and Repair	
04.52 Identify and inspect electronic brake control system components (ABS, TCS, ESC); determine needed action.	P-1
04.53 Describe the operation of a regenerative braking system.	P-3
04.54 Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action.	P-2
04.55 Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action.	P-2
04.56 Depressurize high-pressure components of an electronic brake control system.	P-2
04.57 Bleed the electronic brake control system hydraulic circuits.	P-1
04.58 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).	P-2
04.59 8. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).	P-1
04.60 Remove and install electronic brake control system electrical/electronic and hydraulic components.	

Course Description: The Automotive Suspension and Steering Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of general suspension, steering systems, front suspensions, rear suspensions, wheel alignment, and tires.

Abbreviations:
SS = Suspension and Steering

For every task in Automotive Suspension and Steering Technician course, 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.

SS Task List:
P-1 = 27
P-2 = 20
P-3 = 10
Total 57

Course Number: AER0453 Occupational Completion Point: C Automotive Suspension and Steering Technician – 150 Hours	Priority Number
05.0 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: Suspension and Steering Systems	
05.01 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
05.02 Identify and interpret suspension and steering system concerns; determine needed action.	P-1
Steering Systems Diagnosis and Repair	
05.03 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1
05.04 Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).	P-1
05.05 Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action.	P-2
05.06 Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2
05.07 Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2
05.08 Inspect steering shaft universal joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.	P-2
05.09 Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.	P-2
05.10 Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.	P-1
05.11 Inspect power steering fluid level and condition.	P-1
05.12 Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.	P-2
05.13 Inspect for power steering fluid leakage; determine needed action.	P-1
05.14 Remove, inspect, replace, and/or adjust power steering pump drive belt.	P-1
05.15 Remove and reinstall power steering pump.	P-2
05.16 Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.	P-2
05.17 Inspect, remove and/or replace power steering hoses and fittings.	P-2
05.18 Inspect, remove and/or replace pitman arm, relay (center-link/intermediate) rod, idler arm, mountings, and steering linkage damper.	P-2
05.19 Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps.	P-1

05.20	Inspect, test and diagnose electrically- assisted power steering systems (including using a scan tool); determine needed action.	P-2
05.21	Identify hybrid vehicle power steering system electrical circuits and safety precautions.	P-2
05.22	Test power steering system pressure; determine needed action.	P-2
Suspension Systems Diagnosis and Repair		
05.23	Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
05.24	Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
05.25	Inspect, remove, and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.	P-3
05.26	Inspect, remove, and/or replace strut rods and bushings.	P-3
05.27	Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators).	P-2
05.28	Inspect, remove, and/or replace steering knuckle assemblies.	P-3
05.29	Inspect, remove and/or replace short and long arm suspension system coil springs and spring insulators.	P-3
05.30	Inspect, remove, and/or replace torsion bars and mounts	P-3
05.31	Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.	P-3
05.32	Inspect, remove, and/or replace strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.	P-3
05.33	Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings.	P-3
05.34	Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.	P-1
Related Suspension and Steering Service		
05.35	Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.	P-1
05.36	Remove, inspect, service and/or replace front and rear wheel bearings.	P-1
05.37	Describe the function of suspension and steering control systems and components, (i.e. active suspension and stability control).	P-3
Wheel Alignment Diagnosis, Adjustment, and Repair		
05.38	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action.	P-1
05.39	Perform pre-alignment inspection; measure vehicle ride height; determine needed action.	P-1
05.40	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

05.41 Check toe-out-on-turns (turning radius); determine needed action.	P-2
05.42 Check steering axis inclination (SAI) and included angle; determine needed action.	P-2
05.43 Check rear wheel thrust angle; determine needed action.	P-1
05.44 Check for front wheel setback; determine needed action.	P-2
05.45 Check front and/or rear cradle (sub-frame) alignment; determine needed action.	P-3
05.46 Reset steering angle sensor.	P-2
Wheels and Tires Diagnosis and Repair	
05.47 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
05.48 Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.	P-2
05.49 Rotate tires according to manufacturer's recommendation including vehicles equipped with tire pressure monitoring systems (TPMS)	P-1
05.50 Measure wheel, tire, axle flange, and hub runout; determine needed action.	P-2
05.51 Diagnose tire pull problems; determine needed action.	P-1
05.52 Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.	P-1
05.53 Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-1
05.54 Inspect tire and wheel assembly for air loss; perform needed action.	P-1
05.55 Repair tire following vehicle manufacturer approved procedure.	P-1
05.56 Identify indirect and direct tire pressure monitoring system (TPMS); calibrate system; verify operation of instrument panel lamps.	P-1
05.57 Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure	P-1
05.58 Reinstall wheel; torque lug nuts.	

Course Description: The Engine Repair Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of general engine, cylinder heads, valve trains, engine block, lubrication, and cooling systems.

Abbreviations:
ER = Engine Repair

For every task in Engine Repair Technician course, the following safety requirement MUST be strictly enforced:

ER Task List:	
	P-1 = 24
	P-2 = 16
	P-3 = 11
Total	**51**

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.

Course Number: AER0110 Occupational Completion Point: D Engine Repair Technician – 150 Hours	**Priority Number**
06.0 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)	
06.01 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P-1
06.02 Research vehicle service information including fluid type, internal engine operation, vehicle service history, service precautions, and technical service bulletins.	P-1
06.03 Verify operation of the instrument panel engine warning indicators.	P-1
06.04 Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action.	P-1
06.05 Install engine covers using gaskets, seals, and sealers as required.	P-1
06.06 Verify engine mechanical timing.	P-1
06.07 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
06.08 Inspect, remove and/or replace engine mounts.	P-2
06.09 Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.	P-2
06.10 Remove and reinstall engine on a newer vehicle equipped with OBD; reconnect all attaching components and restore the vehicle to running condition.	P-3
06.11 Identify and interpret engine concern; determine necessary action.	
06.12 Locate and interpret vehicle and major component identification numbers.	
06.13 Diagnose engine noises and vibrations; determine necessary action.	
06.14 Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.	
06.15 Perform engine vacuum tests; determine necessary action.	
06.16 Perform cylinder power balance tests; determine necessary action.	
06.17 Perform cylinder cranking and running compression tests; determine necessary action.	
06.18 Perform cylinder leakage tests; determine necessary action.	

Cylinder Head and Valve Train Diagnosis and Repair		
06.19	Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure.	P-1
06.20	Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1
06.21	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-2
06.22	Adjust valves (mechanical or hydraulic lifters).	P-1
06.23	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
06.24	Establish camshaft position sensor indexing.	P-1
06.25	Inspect valve springs for squareness and free height comparison; determine needed action.	P-3
06.26	Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action.	P-3
06.27	Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action.	P-3
06.28	Inspect valves and valve seats; determine needed action.	P-3
06.29	Check valve spring assembled height and valve stem height; determine needed action.	P-3
06.30	Inspect valve lifters; determine needed action.	P-2
06.31	Inspect and/or measure camshaft for runout, journal wear and lobe wear.	P-3
06.32	Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action.	P-3
Engine Block Assembly Diagnosis and Repair		
06.33	Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-1
06.34	Disassemble engine block; clean and prepare components for inspection and reassembly.	P-1
06.35	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.	P-2
06.36	Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.	P-2
06.37	Deglaze and clean cylinder walls.	P-2
06.38	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.	P-3
06.39	Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine needed action.	P-1

06.40	Inspect main and connecting rod bearings for damage and wear; determine needed action.	P-2
06.41	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.	P-3
06.42	Inspect and measure piston skirts and ring lands; determine needed action.	P-2
06.43	Determine piston-to-bore clearance.	P-2
06.44	Inspect, measure, and install piston rings.	P-2
06.45	Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance and/or silencer); inspect shaft(s) and support bearings for damage and wear; determine needed action; reinstall and time.	P-2
06.46	Assemble engine block.	P-1
06.47	Remove and replace piston pin; where applicable.	
Lubrication and Cooling Systems Diagnosis and Repair		
06.48	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 needed action.	P-1
06.49	Identify causes of engine overheating.	P-1
06.50	Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
06.51	Inspect and/or test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.	P-1
06.52	Inspect, remove, and replace water pump.	P-2
06.53	Remove and replace radiator.	P-2
06.54	Remove, inspect, and replace thermostat and gasket/seal.	P-1
06.55	Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.	P-1
06.56	Perform oil pressure tests; determine needed action.	P-1
06.57	Perform engine oil and filter change; use proper fluid type per manufacturer specification.	P-1
06.58	Inspect auxiliary coolers; determine needed action.	P-3
06.59	Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
06.60	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.	P-2
06.61	Inspect and replace engine cooling and heater system hoses.	

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 P-1, P-2, or P-3 are ASE tasks.

It is recommended that the program be ASEEF Master Certified (MAST) and the instructors be A1-A8 ASE Master and Advanced Engine Performance (L1) ASE Certified.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Master Automotive Service Technology 2**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T400800	
CIP Number	0647060412	
Grade Level	30, 31	
Program Length	750 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 four occupational completion points.

NOTE: It is recommended that students complete **OCP-A (Automobile Services Assistor) of Automotive Service Technology 1** and/or demonstrate mastery of the outcomes in **OCP-A (Automobile Services Assistor) of Automotive Service Technology 1** prior to enrolling in additional Automotive Service Technology courses. **The sequence of OCP's, after completing and/or demonstrating mastery of OCP-A (Automobile Services Assistor) of Automotive Service Technology 1, is at the discretion of the instructor.**

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

When offered at the postsecondary level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	AER0503	Automotive Engine Performance Technician	AUTO IND @7 %7 %G AUTO MECH @7 7G	300 hours
B	AER0257	Automatic Transmission and Transaxle Technician		150 hours
C	AER0274	Manual Drivetrain and Axle Technician		150 hours
D	AER0172	Automotive Heating and Air Conditioning Technician		150 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Automotive Service Technology program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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 Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems.
02.0 Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles.
03.0 Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive.
04.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling.

Florida Department of Education
Student Performance Standards

Program Title: **Automotive Service Technology 2**
Career Certificate Program Number: **T400800**

Course Description: The Automotive Engine Performance Technician course prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems.

Abbreviations:
EP = Engine Performance

For every task in Automotive Engine Performance Technician course, 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.

EP Task List:	
P-1 =	34
P-2 =	13
P-3 =	2
Total	49

Course Number: AER0503 Occupational Completion Point: A Automotive Engine Performance Technician – 300 Hours		Priority Number
01.0	Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems. The student will be able to:	
General: Engine Diagnosis		
01.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
01.02	Identify heating, ventilation, and air conditioning (HVAC) components and configurations.	P-1
01.03	Identify and interpret engine performance concerns; determine needed action.	P-1
01.04	Diagnose abnormal engine noises or vibration concerns; determine needed action.	P-2
01.05	Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.	P-2
01.06	Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action.	P-1
01.07	Perform cylinder power balance test; determine needed action.	P-1

01.08	Perform cylinder cranking and running compression tests; determine needed action.	P-1
01.09	Perform cylinder leakage test; determine needed action.	P-1
01.10	Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.	P-1
01.11	Verify proper engine cooling system operation; determine needed action.	P-1
01.12	Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT).	P-1
01.13	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	
01.14	Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.	
01.15	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.	
Computerized Controls Diagnosis and Repair		
01.16	Identify computerized control system components and configurations.	P-1
01.17	Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable.	P-1
01.18	Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1
01.19	Perform active tests of actuators using a scan tool; determine needed action.	P-1
01.20	Describe the use of OBD monitors for repair verification.	P-1
01.21	Diagnose the causes of emissions or drive-ability concerns with stored or active diagnostic trouble codes (DTC); obtain, graph, and interpret scan tool data.	P-1
01.22	Diagnose emissions or drive-ability concerns without stored or active diagnostic trouble codes; determine needed action.	P-1
01.23	Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO); perform needed action.	P-1
01.24	Diagnose drive-ability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, HVAC, automatic transmissions, non-OEM installed accessories, or similar systems); determine needed action.	P-2
01.25	Check for module communication (including CAN/BUS systems) errors using a scan tool.	
01.26	Describe the process for reprogramming or recalibrating the powertrain/engine control module (PCM/ECM).	P-1
Ignition System Diagnosis and Repair		
01.27	Identify ignition system components and configurations.	P-1
01.28	Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns; determine needed action.	P-1

01.29	Inspect and test crankshaft and camshaft position sensor(s); determine needed action.	P-1
01.30	Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as needed.	P-2
01.31	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1
01.32	Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.	
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair		
01.33	Identify fuel, air induction, and exhaust system components and configurations.	P-1
01.34	Diagnose (troubleshoot) 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; determine needed action.	P-2
01.35	Check fuel for contaminants; determine needed action.	P-2
01.36	Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; perform needed action.	P-1
01.37	Replace fuel filter(s) where applicable.	P-2
01.38	Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2
01.39	Inspect, test, and/or replace fuel injectors on low- and high-pressure systems.	P-1
01.40	Verify idle control operation.	P-1
01.41	Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform needed action.	P-1
01.42	Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.	P-1
01.43	Perform exhaust system back-pressure test; determine needed action.	P-2
01.44	Check and refill diesel exhaust fluid (DEF).	P-3
01.45	Test the operation of turbocharger/supercharger systems; determine needed action.	P-2
Emissions Control Systems Diagnosis and Repair		
01.46	Identify emission control system components and configurations.	P-1
01.47	Diagnose oil leaks, emissions, and drive-ability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.	P-2
01.48	Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform needed action.	P-2
01.49	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) systems; determine needed	P-1

	action.	
01.50	Diagnose emissions and drive-ability concerns caused by the secondary air injection system; inspect, test, repair, and/or replace electrical/electronically-operated components and circuits of secondary air injection systems; determine needed action.	P-2
01.51	Diagnose emissions and drive-ability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.	P-1
01.52	Diagnose emission and drive-ability concerns caused by catalytic converter system; determine needed action.	P-1
01.53	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.	P-1
01.54	Inspect and test electrical/electronically operated components and circuits of secondary air injection systems; determine needed action.	P-3
01.55	Adjust valves on engines with mechanical or hydraulic lifters; as applicable.	
01.56	Remove and replace timing belt; verify correct camshaft timing.	
01.57	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	
01.58	Inspect engine oil and/or filter for condition and determine necessary action.	
01.59	Identify hybrid electric vehicle internal combustion engine service precautions.	

Course Description: The Automatic Transmission and Transaxle Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics, repair, service, and operation of automatic transmission/transaxles.

Abbreviations:
AT = Automatic Transmission/Transaxle

For every task in Automatic Transmission and Transaxle Technician course, 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.

AT Task List:	
	P-1 = 13
	P-2 = 27
	P-3 = 0
Total	**40**

Course Number: AER0257 Occupational Completion Point: B Automatic Transmission and Transaxle Technician – 150 Hours		**Priority Number**
02.0	Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles.	

The student will be able to:	
General: Transmission and Transaxle Diagnosis	
02.01 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
02.02 Identify automatic transmission and transaxle components and configurations.	P-1
02.03 Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
02.04 Inspect transmission fluid condition; check level; inspect for leaks on transmission or transaxle equipped with a dipstick.	P-1
02.05 Inspect transmission fluid condition; check level; inspect for leaks on transmission or transaxle not equipped with a dipstick.	P-1
02.06 Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine needed action.	P-1
02.07 Diagnose noise and vibration concerns; determine needed action.	P-2
02.08 Perform stall test; determine needed action.	P-2
02.09 Perform lock-up converter system tests; determine needed action.	P-2
02.10 Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.	P-1
02.11 Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.	P-1
02.12 Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).	P-1
In-Vehicle Transmission/Transaxle Maintenance and Repair	
02.13 Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.	P-1
02.14 Inspect for leakage; replace external seals, gaskets, and bushings.	P-2
02.15 Perform relearn procedures.	P-2
02.16 Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits.	P-1
02.17 Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.	P-1
02.18 Inspect, replace and align powertrain mounts.	P-2
02.19 Diagnose electronic transmission control systems using a scan tool; determine necessary action.	
Off-Vehicle Transmission and Transaxle Repair	
02.20 Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear	P-2

	crankshaft seal, dowel pins, dowel pin holes, and mounting surfaces.	
02.21	Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings.	P-1
02.22	Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.	P-2
02.23	Describe the operational characteristics of a continuously variable transmission (CVT).	P-2
02.24	Describe the operational characteristics of a hybrid electric vehicle drive train.	P-2
02.25	Disassemble, clean, and inspect transmission/transaxle.	P-2
02.26	Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, switches, solenoids, sleeves, retainers, brackets, check valves/balls, screens, spacers, and gaskets).	P-2
02.27	Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine needed action.	P-2
02.28	Assemble transmission/transaxle.	P-2
02.29	Inspect, measure, and reseal oil pump assembly and components.	P-2
02.30	Measure transmission/transaxle end play and/or preload; determine needed action.	P-2
02.31	Inspect, measure, and/or replace thrust washers and bearings.	P-2
02.32	Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.	P-2
02.33	Inspect bushings; determine needed action.	P-2
02.34	Inspect and measure planetary gear assembly components; determine needed action.	P-2
02.35	Inspect case bores, passages, bushings, vents, and mating surfaces; determine needed action.	P-2
02.36	Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform needed action.	P-2
02.37	Inspect measure, repair, adjust or replace transaxle final drive components.	P-2
02.38	Inspect clutch drum, piston, check-balls, springs, retainers, seals, friction plates, pressure plates, and bands; determine needed action.	P-2
02.39	Measure clutch pack clearance; determine needed action.	P-2
02.40	Air test operation of clutch and servo assemblies.	P-2
02.41	Inspect one-way clutches, races, rollers, sprags, springs, cages, retainers; determine needed action.	P-2
02.42	Install and seat torque converter to engage drive/splines.	
02.43	Inspect bands and drums; determine necessary action.	

Course Description: The Manual Drivetrain and Axle Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of drive train, clutch, transmission, transaxle, half shaft universal, constant-velocity joint, rear axle, ring and pinion gears, differential case assemble, limited slip differential, drive shaft, and four wheel drive/all-wheel drive.

Abbreviations:
MD = Manual Drivetrain and Axles

For every task in Manual Drivetrain and Axle Technician course, 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.

MD Task List:	
P-1	**16**
P-2	**30**
P-3	**6**
Total	**52**

Course Number: AER0274 **Occupational Completion Point: C** **Manual Drivetrain and Axle Technician – 150 Hours**		**Priority Number**
03.0	Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive. The student will be able to:	
General: Drive Train Diagnosis		
03.01	Identify and interpret drive train concerns; determine needed action.	P-1
03.02	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
03.03	Check fluid condition; check for leaks; determine needed action.	P-1
03.04	Identify manual drive train and axle components and configurations.	P-1
03.05	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
03.06	Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification.	P-1
03.07	Diagnose fluid loss, level, and condition concerns; determine necessary action.	
Clutch Diagnosis and Repair		
03.08	Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action.	P-2
03.09	Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform needed action.	P-2

03.10	Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable).	P-2
03.11	Bleed clutch hydraulic system.	P-2
03.12	Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.	P-2
03.13	Inspect flywheel and ring gear for wear, cracks, and discoloration; determine needed action.	P-2
03.14	Measure flywheel runout and crankshaft end play; determine needed action.	P-2
03.15	Describe the operation and service of a system that uses a dual mass flywheel.	P-3
03.16	Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.	
03.17	Describe the operation and service of an electronically controlled dual clutch system.	
03.18	Inspect engine block, core plugs, rear main engine oil seal, clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action.	
Transmission/Transaxle Diagnosis and Repair		
03.19	Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers.	P-2
03.20	Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.	P-2
03.21	Diagnose noise concerns through the application of transmission/transaxle powerflow principles.	P-2
03.22	Diagnose hard shifting and jumping out of gear concerns; determine needed action.	P-2
03.23	Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action.	P-2
03.24	Disassemble, inspect clean, and reassemble internal transmission/transaxle components.	P-3
03.25	Remove and reinstall manual transmission/transaxle.	
03.26	Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action.	
03.27	Inspect, replace, and align powertrain mounts.	
03.28	Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.	
03.29	Remove and replace transaxle final drive.	
03.30	Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.	
03.31	Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action.	
03.32	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.	
03.33	Inspect lubrication devices (oil pump or slingers); perform necessary action.	
03.34	Inspect, test, and replace transmission/transaxle sensors and switches.	

Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair (Front, Rear, All-Wheel, and Four-Wheel drive)	
03.35 Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action.	P-1
03.36 Diagnose universal joint noise and vibration concerns; perform needed action.	P-1
03.37 Inspect, remove, and/or replace bearings, hubs, and seals.	P-1
03.38 Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.	P-1
03.39 Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles; determine needed action.	P-2
03.40 Inspect, service, and replace shaft center support bearings.	
Drive Axle Diagnosis and Repair – Ring and Pinion Gears and Differential Case Assembly	
03.41 Clean and inspect differential housing; check for leaks; inspect housing vent.	P-1
03.42 Check and adjust differential housing fluid level; use proper fluid type per manufacturer specification.	P-1
03.43 Drain and refill differential housing; use proper fluid type per manufacturer specifications.	P-1
03.44 Diagnose noise and vibration concerns; determine needed action.	P-2
03.45 Inspect and replace companion flange and/or pinion seal; measure companion flange runout.	P-2
03.46 Inspect ring gear and measure runout; determine needed action.	P-2
03.47 Remove, inspect, reinstall and/or drive pinion and ring gear, spacers, sleeves, and bearings.	P-2
03.48 Measure and adjust drive pinion depth.	P-2
03.49 Measure and adjust drive pinion bearing preload.	P-2
03.50 Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types).	P-2
03.51 Check ring and pinion tooth contact patterns; perform needed action.	P-2
03.52 Disassemble, inspect, measure, adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.	P-2
03.53 Reassemble and reinstall differential case assembly; measure runout; determine needed action.	P-2
03.54 Diagnose noise and vibration concerns; determine necessary action.	
Drive Axle Diagnosis and Repair – Limited Slip Differential	
03.55 Diagnose noise, slippage, and chatter concerns; determine needed action.	P-3
03.56 Measure rotating torque; determine needed action.	P-3
03.57 Inspect and reinstall limited slip differential components.	

03.58 Identify operational characteristics of electronic control differentials.	
Drive Axle Diagnosis and Repair – Drive Axles	
03.59 Inspect and replace drive axle wheel studs.	P-1
03.60 Remove and replace drive axle shafts.	P-1
03.61 Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2
03.62 Measure drive axle flange runout and shaft end play; determine needed action.	P-2
03.63 Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine needed action.	P-2
Four-Wheel Drive/All-Wheel Drive Component Diagnosis and Repair	
03.64 Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-2
03.65 Inspect locking mechanisms; determine needed action.	P-3
03.66 Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P-2
03.67 Identify concerns related to variations in tire circumference and/or final drive ratios.	P-1
03.68 Diagnose noise, vibration, and unusual steering concerns; determine needed action.	P-2
03.69 Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive/all-wheel drive systems.	P-2
03.70 Disassemble, service, and reassemble transfer case and components.	P-3
03.71 Remove and reinstall transfer case.	

Course Description: The Automotive Heating and Air Conditioning Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling.

Abbreviations:
HA = Heating and Air Conditioning

For every task in Automotive Heating and Air Conditioning Technician course, 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

HA Task List:	
P-1	**20**
P-2	**14**
P-3	**2**
Total	**36**

accordance with local, state, and federal safety and environmental regulations.

Course Number: AER0172 Occupational Completion Point: D Automotive Heating and Air Conditioning Technician – 150 Hours	**Priority Number**
04.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling. The student will be able to:	
General: A/C System Diagnosis and Repair	
04.01 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
04.02 Identify heating, ventilation, and air conditioning (HVAC) components and configurations.	P-1
04.03 Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
04.04 Identify and interpret heating and air conditioning problems; determine needed action.	P-1
04.05 Performance test A/C system; identify problems.	
04.06 Identify abnormal operating noises in the A/C system; determine needed action.	P-2
04.07 Identify refrigerant type; test for sealant; select and connect proper gauge set/test equipment; record temperature and pressure readings.	P-1
04.08 Leak test A/C system; determine needed action.	P-1
04.09 Inspect condition/quantity of refrigerant oil removed from A/C system; determine needed action.	P-2
04.10 Determine recommended oil and oil capacity for system application and component(s) replacement.	P-1
Refrigeration System Component Diagnosis and Repair	
04.11 Inspect, remove, and/or replace A/C compressor drive belts, pulleys, tensioners and visually inspect A/C components for signs of leaks; determine needed action.	P-1
04.12 Inspect, test, and/or service A/C compressor clutch components and mountings; determine needed action.	P-2
04.13 Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity.	P-2
04.14 Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	
04.15 Determine need for an additional A/C system filter; perform needed action.	P-3
04.16 Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform needed action.	P-2
04.17 Inspect for proper A/C condenser airflow; determine needed action.	P-1

04.18	Remove, inspect, and replace receiver/drier or accumulator/drier; determine recommended oil type and quantity.	P-2
04.19	Remove, inspect, and install expansion valve or orifice (expansion) tube.	P-1
04.20	Inspect evaporator housing water drain; perform needed action.	P-1
04.21	Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action.	P-1
04.22	Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.	P-2
04.23	Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action.	
Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair		
04.24	Inspect engine cooling and heater systems hoses and pipes; perform needed action.	P-1
04.25	Inspect and test heater control valve(s); perform needed action.	P-2
04.26	Diagnose temperature control problems in the HVAC system; determine needed action.	P-2
04.27	Determine procedure to remove, inspect, reinstall, and/or replace heater core.	P-2
04.28	Inspect, test, and replace thermostat and gasket/seal.	
04.29	Determine coolant condition and coolant type for vehicle application; drain and recover coolant.	
04.30	Flush system; refill system with recommended coolant; bleed system.	
04.31	Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.	
04.32	Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.	
Operating Systems and Related Controls Diagnosis and Repair		
04.33	Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.	P-1
04.34	Diagnose A/C compressor clutch control systems; determine needed action.	P-1
04.35	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
04.36	Inspect., test remove and/or replace HVAC system control panel; determine needed action.	P-2
04.37	Inspect and test HVAC system control cables, motors, and linkages; perform needed action.	P-3
04.38	Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; perform needed action.	P-1
04.39	Identify the source of HVAC system odors.	P-2
04.40	Check operation of automatic HVAC control systems; determine needed action.	P-2

Refrigerant Recovery, Recycling, and Handling	
04.41 Demonstrate awareness of the need to recover, recycle, and handle refrigerant using roper equipment and procedures.	P-1
04.42 Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.	P-1
04.43 Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.	P-1
04.44 Recycle, label, and store refrigerant.	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

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

It is recommended students complete Automotive Service Technology 1, or demonstrate mastery of the outcomes in that program, prior to enrollment in Automotive Service Technology 2.

It is recommended that the program be Automotive Service Excellence (ASE) Education Foundation Master Certified (MAST) and the instructors be A1-A8 ASE Master and Advanced Engine Performance (L1) ASE Certified.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting

the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.9, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program		
Program Number	T401300	
CIP Number	0647060306	
Grade Level	30, 31	
Program Length	1400 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 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 six occupational completion points.

NOTE: It is recommended that students complete **OCP-A (Automotive Collision Repair and Refinishing Helper/Assistant)** and/or demonstrate mastery of the outcomes in **OCP-A (Automotive Collision Repair and Refinishing Helper/Assistant)** prior to enrolling in additional Automotive Collision Technology Technician courses. **The sequence of OCP's, after completing and/or demonstrating mastery of OCP-A (Automotive Collision Repair and Refinishing Helper/Assistant), is at the discretion of the instructor.**

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

When offered at the postsecondary level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	ARR0140	Automotive Collision Repair and Refinishing Helper/Assistant	AUTO IND @7 %7%G AUTO BODY @7 7G	150 hours
B	ARR0141	Automotive Collision Refinishing Technician		450 hours
C	ARR0312	Non-Structural Damage Repair Technician		300 hours
D	ARR0022	Damage Analysis and Estimating		75 hours
E	ARR0112	Automotive Collision Welding, Cutting and Joining		75 hours
F	ARR0295	Structural Damage Repair Technician		350 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Automotive Collision Technology Technician program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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 routine pre/post maintenance and customer services.
04.0 Explain and apply safety precautions; surface preparation; spray gun and related equipment operation; paint mixing, matching and applying; paint defects (causes and cures); and final detailing.
05.0 Explain and apply safety precautions; preparation; outer body panel repairs, replacements, and adjustments; metal finishing and body filling; movable glass and hardware; plastics and adhesives; electrical; and brakes.
06.0 Explain and apply safety precautions; damage analysis; estimating; vehicle construction and parts identification; and customer relations and sales skills.
07.0 Explain and apply safety precautions; metal welding, cutting, and joining.
08.0 Explain and apply safety precautions; frame inspection and repair; unibody and unitized structure inspection, measurement, repair; fixed glass; steering and suspension; heating and air conditioning; cooling systems; drive train; fuel, intake and exhaust systems; and restraint systems.

Florida Department of Education
Student Performance Standards

Program Title: **Automotive Collision Technology Technician**
Career Certificate Program Number: **T401300**

Course Description: The Automotive Collision Repair and Refinishing Helper/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.

Abbreviations:
ASE = Supplemental Tasks

For every task in Automotive Collision Repair and Refinishing Helper/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.

Course Number: ARR0140 **Occupational Completion Point: A** **Automotive Collision Repair and Refinishing Helper/Assistant – 150 Hours**			**Priority Number**
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	Select and use proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (glove, suits, hoods, eye and ear protection, etc.); take necessary precautions with hazardous operations and materials according to federal, state, and local regulations.	ASE
	01.02	Identify safety and potential health hazards according to OSHA guidelines and the “Right to Know Law”.	
	01.03	Demonstrate knowledge of related Industry Certifications	
	01.04	Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.6H).	
	01.05	Identify and use appropriate emergency first aid procedures.	
	01.06	Utilize and demonstrate safe procedures for handling of hand tools, lifting tools, jack stands, and related equipment.	ASE

	01.07 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 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
	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.	
	03.13 Perform a visual inspection of a disc brake system.	
	03.14 Determine type of battery and charge appropriately.	
	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.	

Course Description: The Automotive Collision Refinishing Technician 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; paint defects (causes and cures); and final detailing.

Abbreviations:
PR = Painting and Refinishing

For every task in the Automotive Collision Refinishing Technician 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.

PR Task List:	
HP-I =	53
HP-G =	31
Total	84

Course Number: ARR0141 Occupational Completion Point: B Automotive Collision Refinishing Technician – 450 Hours		Priority Number
04.0	Explain and apply safety precautions; surface preparation; spray gun and related equipment operation; paint mixing, matching and applying; paint defects (causes and cures); and final detailing. 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
04.04	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
Surface Preparation		
04.05	Inspect, remove, store, and replace exterior trim and components for proper surface preparation.	HP-1
04.06	Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants.	HP-1
04.07	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
04.08	Remove paint finish as needed.	HP-I
04.09	Dry or wet sand areas to be refinished.	HP-I
04.10	Identify and select appropriate sandpaper to featheredge areas to be refinished.	HP-I

04.11 Apply suitable metal treatment or primer in accordance with total product systems.	HP-I
04.12 Mask and protect other areas that will not be refinished.	HP-I
04.13 Demonstrate different masking techniques (recess/back masking, foam, door type, etc.).	HP-G
04.14 Mix primer, primer-surfacer and primer-sealer following paint manufacturers technical data sheet instructions.	HP-I
04.15 Identify a complimentary color or shade of undercoat to improve coverage.	HP-G
04.16 Apply primer onto surface of repaired area; demonstrating control of primer application by keeping the areas small as possible.	HP-I
04.17 Apply two-component finishing filler to minor surface imperfections.	HP-I
04.18 Block sand area to which primer-surfacer has been applied.	HP-I
04.19 Dry sand area to which finishing filler has been applied.	HP-I
04.20 Remove dust from area to be refinished, including cracks or moldings of adjacent areas.	HP-I
04.21 Clean area to be refinished using a final cleaning solution.	HP-I
04.22 Remove, with a tack rag, any dust or lint particles from the area to be refinished.	HP-I
04.23 Apply suitable primer sealer to the area being refinished.	HP-I
04.24 Scuff sand to remove nibs or imperfections from a sealer.	HP-I
04.25 Apply stone chip resistant coating.	HP-G
04.26 Identify caulking and seam sealers that may need replacement.	HP-G
04.27 Prepare adjacent panels for blending using manufacturers procedures.	HP-I
04.28 Identify the types of rigid, semi-rigid or flexible plastic parts to be refinished; determine the materials needed, preparation, and refinishing procedures.	HP-I
04.29 Identify metal parts to be refinished; determine the materials needed, preparation, and refinishing procedures.	HP-I
04.30 Identify refinishing guidelines for stationary glass flange areas to be refinished.	
Spray Gun and Related Equipment Operation	
04.31 Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment).	HP-I
04.32 Select spray gun setup (fluid needle, nozzle, and cap) for product being applied.	HP-I
04.33 Test and adjust spray gun using fluid, air and pattern control valves.	HP-I
04.34 Demonstrate an understanding of the operation of pressure spray equipment.	HP-G
Paint Mixing, Matching, and Applying	

04.35 Identify color code by manufacturer's vehicle information label.	HP-I
04.36 Shake, stir, reduce, catalyze/activate, and strain refinish materials.	HP-I
04.37 Apply finish using appropriate spray techniques (gun arc, angle, distance, travel speed, and spray pattern overlap) for the finish being applied.	HP-I
04.38 Apply selected product on test or let-down panel; check for color match.	HP-I
04.39 Apply single stage topcoat.	HP-G
04.40 Apply basecoat/clearcoat for panel blending and panel refinishing.	HP-I
04.41 Apply basecoat/clearcoat for overall refinishing.	HP-G
04.42 Remove nibs or imperfections from basecoat.	HP-I
04.43 Identify product expiration dates as applicable.	HP-G
04.44 Refinish plastic parts.	HP-I
04.45 Apply multi-stage coats for panel blending and overall refinishing.	HP-G
04.46 Identify and mix paint using a formula.	HP-I
04.47 Identify poor hiding colors; determine necessary action.	HP-G
04.48 Tint color using formula to achieve a blend-able match.	HP-I
04.49 Identify alternative color formula to achieve a blend-able match.	HP-I
04.50 Identify the materials equipment, and preparation differences between solvent and waterborne technologies.	HP-G
Paint Defects – Causes and Cures	
04.51 Identify blistering (raising of the paint surface, air entrapment); correct the cause(s) and the condition.	HP-G
04.52 Identify a dry spray appearance in the paint surface; correct the cause(s) and the condition.	HP-I
04.53 Identify the presence of fish-eyes (crater-like openings) in the finish; correct the cause(s) and the condition.	HP-I
04.54 Identify lifting; correct the cause(s) and the condition.	HP-G
04.55 Identify clouding (mottling and streaking in metallic finishes); correct the cause(s) and the condition.	HP-I
04.56 Identify orange peel; correct the cause(s) and the condition.	HP-I
04.57 Identify overspray; correct the cause(s) and the condition.	HP-I
04.58 Identify solvent popping in freshly painted surface; correct the cause(s) and the condition.	HP-G
04.59 Identify sags and runs in paint surface; correct the cause(s) and the condition.	HP-I
04.60 Identify sanding marks or sand-scratch swelling; correct the cause(s) and the condition.	HP-I

04.61	Identify contour mapping/edge mapping; correct the cause(s) and the condition.	HP-G
04.62	Identify color difference (off-shade); correct the cause(s) and the condition.	HP-G
04.63	Identify tape tracking; correct the cause(s) and the condition.	HP-G
04.64	Identify low gloss condition; correct the cause(s) and the condition.	HP-G
04.65	Identify poor adhesion; determine the cause(s) and correct the condition.	HP-G
04.66	Identify paint cracking (shrinking, splitting, crows-feet or line-checking, micro-checking, etc.); correct the cause(s) and the condition.	HP-G
04.67	Identify corrosion; correct the cause(s) and the condition.	HP-G
04.68	Identify dirt or dust in the paint surface; correct the cause(s) and the condition.	HP-I
04.69	Identify water spotting; correct the cause(s) and the condition.	HP-G
04.70	Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition.	HP-G
04.71	Identify finish damage caused by airborne contaminants (acids, soot, rail dust, and other industrial-related causes); correct the condition.	HP-G
04.72	Identify die-back conditions (dulling of the paint film showing haziness); correct the cause(s) and the condition.	HP-G
04.73	Identify chalking (oxidation); correct the cause(s) and the condition.	HP-G
04.74	Identify bleed-through (staining); correct the cause(s) and the condition.	HP-G
04.75	Identify pin-holing; correct the cause(s) and the condition.	HP-G
04.76	Identify buffing-related imperfections (swirl marks, wheel burns); correct the condition.	HP-I
04.77	Identify pigment flotation (color change through film build); correct the cause(s) and the condition.	HP-G
Final Detail		
04.78	Apply decals, transfers, tapes, woodgrains, pinstripes (painted and taped), etc.	HP-G
04.79	Sand, buff and polish fresh finish to remove defects and texture as required.	HP-I
04.80	Sand, buff and polish existing finish to recondition defects as required to match existing finish.	HP-I
04.81	Clean interior, exterior, and glass.	HP-I
04.82	Clean body openings (door jambs and edges, etc.).	HP-I
04.83	Remove overspray.	HP-I
04.84	Perform vehicle clean-up; complete quality control using a checklist.	HP-I
04.85	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).	HP-I

04.86 Measure and record film thickness before and after buffing.	HP-I
04.87 Perform nib sanding to remove small imperfections as required.	HP-I

Course Description: The Non-Structural Damage Repair Technician course prepares students for entry into the Automotive Collision and Repair industry. Students study safety the preparation; outer body panel repairs, replacements, and adjustments; metal finishing and body filling; movable glass and hardware; plastics and adhesives; electrical; and brakes.

Abbreviations:
NAD = Non-Structural Analysis and Damage Repair

For every task in Non-Structural Damage Repair Technician 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	**= 50**
HP-G	**= 33**
Total	**83**

Course Number: ARR0312 Occupational Completion Point: C Non-Structural Damage Repair Technician – 300 Hours	**Priority Number**
05.0 Explain and apply safety precautions; preparation; outer body panel repairs, replacements, and adjustments; metal finishing and body filling; movable glass and hardware; plastics and adhesives; electrical; and brakes. 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 in accordance with federal, state, and local regulations.	HP-I
05.02 Locate OEM procedures to identify material and composition of the vehicle being repaired (mild steel, high strength steel, ultra-high strength steel, and aluminum, etc.).	HP-I
05.03 Locate procedures and precautions that may apply to the vehicle being repaired.	HP-I
05.04 Identify vehicle system precautions and/or inspections to include but not limited to supplemental restraint system (SRS), advanced driver assistance systems (ADAS), hybrid/alternate fuel vehicles, locations and recommended procedures before inspecting or replacing components.	HP-I
Preparation	
05.05 Review damage report and analyze damage to determine appropriate methods for overall repair; develop and document a repair plan.	HP-I

05.06	Inspect, remove, store, protect, and replace exterior trim and components necessary for proper surface preparation.	HP-I
05.07	Inspect, remove, label, store, and reinstall necessary trim and moldings.	HP-I
05.08	Inspect, remove, label, store, and reinstall body panels and components that may interfere with or be damaged during repair.	HP-I
05.09	Inspect, remove, protect label, store, and reinstall vehicle mechanical and electrical components that may interfere with or be damaged during repair.	HP-G
05.10	Protect panels, glass, interior parts, and other vehicles adjacent to the repair area.	HP-I
05.11	Soap and water wash entire vehicle; complete pre-repair inspection checklist.	HP-I
05.12	Prepare damaged area using water-based and solvent-based cleaners.	HP-I
05.13	Remove corrosion protection, under-coatings, sealers, and other protective coatings as necessary to perform repairs.	HP-I
05.14	Determine the presence of a Tire Pressure Monitoring System (TPMS).	
05.15	Determine the presence of wheel locks.	HP-G
05.16	Determine the presence of an air suspension system.	HP-G
05.17	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)	HP-I
05.18	Identify procedures to reset maintenance indicators.	HP-G
05.19	Verify status of instrument panel warning lights and gauges.	HP-G
05.20	Test and replace fuses; confirm proper circuit operation.	HP-G
05.21	Inspect and replace exterior and courtesy lamps.	HP-G
05.22	Document damage, unusual conditions, and concerns.	HP-G
Outer Body Panel Repairs, Replacements, and Adjustments		
05.23	Inspect/locate direct, indirect, or hidden damage and direction of impact.	HP-I
05.24	Inspect, remove and replace mechanically fastened welded steel panel or panel assemblies.	HP-G
05.25	Determine the extent of damage to aluminum body panels; repair or replace.	HP-G
05.26	Inspect, remove, replace, and align hood, hood hinges, and hood latch. (when available)	HP-I
05.27	Inspect, remove, replace, and align deck lid, lid hinges, and lid latch.	HP-I
05.28	Inspect, remove, replace, and align doors, latches, hinges, and related hardware. (when available)	HP-I
05.29	Inspect, remove, replace and align tailgates, hatches, lift-gates and sliding doors. (when available)	HP-G

05.30 Inspect, remove, replace, and align bumper bars, covers, reinforcements, guards, impact absorbers, and mounting hardware.	HP-I
05.31 Inspect, remove, replace and align fenders, and related panels.	HP-I
05.32 Restore corrosion protection during and after the repair.	HP-I
05.33 Identify procedures to replace door skins.	HP-G
05.34 Identify procedures to restore sound deadeners and foam materials.	HP-G
05.35 Identify procedures to perform panel bonding and weld bonding.	HP-G
05.36 Identify procedures to diagnose and repair water leaks, dust leaks, and wind noise.	HP-G
05.37 Identify one-time use fasteners.	HP-G
05.38 Identify procedures to weld damaged or torn steel body panels; repaired broken welds.	HP-G
05.39 Inspect, identify labels/decals and replace as necessary.	HP-G
Metal Finishing and Body Filling	
05.40 Prepare a panel for body filler by abrading or removing the coatings; featheredge and refine scratches before the application of body filler.	HP-I
05.41 Locate and repair surface irregularities on a damaged body panel using power tools, hand tools, and weld-on pulling attachments.	HP-I
05.42 Demonstrate hammer and dolly techniques.	HP-I
05.43 Identify procedures to Hot or cold shrink stretched panel areas to proper contour.	HP-I
05.44 Identify body filler defects; correct the cause and condition. (Pin-holing, ghosting, staining, over catalyzing, etc.)	HP-I
05.45 Identify different types of body fillers.	HP-G
05.46 Shape body filler to contour; finish sand.	HP-I
05.47 Identify the processes to perform proper metal finishing techniques for ferrous and non-ferrous metals.	HP-G
05.48 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
05.49 Perform proper metal finishing techniques for aluminum.	HP-G
05.50 Perform proper application of body filler to Aluminum.	HP-G
05.51 Locate and repair surface irregularities and straighten contours on a damaged panel using Glue-Pulling Dent Repair (GDPR).	HP_G
05.52 Mix and apply body filler.	HP-I
Moveable Glass and Hardware	

05.53	Inspect, adjust, repair or replace window regulators, run channels, glass, power mechanisms, and related controls.	HP-I
05.54	Inspect, adjust, repair, remove, reinstall or replace weather-stripping.	HP-I
05.55	Inspect, repair or replace, and adjust removable power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs.	HP-G
05.56	Inspect, remove, reinstall, and align convertible top and related mechanisms.	HP-G
05.57	Identify procedures to initialize electrical components as needed.	HP-G
Plastics and Adhesives		
05.58	Identify the types of plastics; determine repair-ability.	HP-I
05.59	Clean and prepare the surface of plastic parts; identify the types of plastic repair procedures.	HP-I
05.60	Repair rigid, semi-rigid, or flexible plastic panels.	HP-I
05.61	Replace bonded rigid exterior composite panels; straighten or align panel supports.	HP-G
05.62	Repair plastic parts by welding (nitrogen, airless).	HP-G
05.63	Perform a single-sided adhesively bonded cosmetic repair.	HP-I
05.64	Perform a double-sided adhesively bonded repair.	HP-I
05.65	Perform an adhesively bonded or welded tab repair.	HP-I
05.66	Shape or reform damaged plastic.	HP-G
Electrical		
05.67	Demonstrate an understanding of Ohm’s Law.	HP-I
05.68	Check for available voltage, voltage drop and current, and resistance in electrical wiring circuits and components with a digital multimeter (DMM).	HP-I
05.69	Identify processes and procedures to repair wiring and connectors.	HP-I
05.70	Identify processes and procedures to inspect, test, and replace fusible links, circuit breakers, and fuses.	HP-I
05.71	Identify processes and procedures to perform battery state-of-charge test and slow/fast battery charge.	HP-I
05.72	Identify processes and procedures to inspect, clean, repair or replace battery, battery cables, connectors and clamps.	HP-I
05.73	Dispose of batteries according to local, state, and federal requirements.	HP-G
05.74	Identify programmable electrical/electronic components and check for malfunction indicator lamp (MIL) and fault codes; record data for reprogramming before disconnecting battery.	HP-I
05.75	Identify processes and procedures to inspect alignment, adjust, remove and replace alternator (generator), drive belts, pulleys, and fans.	HP-I

05.76	Check operation and aim headlamp assemblies and fog/driving lamps; determine needed repairs.	HP-I
05.77	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
05.78	Identify processes and procedures to remove and replace horn(s); check operation.	HP-I
05.79	Identify processes and procedures to check operation of wiper/washer systems; determine needed repairs.	HP-I
05.80	Identify processes and procedures to check operation of power side and tailgate window; determine needed repairs.	HP-I
05.81	Identify processes and procedures to inspect, remove and replace power seat, motors, linkages, cables, etc.	HP-G
05.82	Identify processes and procedures to inspect, remove and replace components of electric door and hatch/trunk lock.	HP-G
05.83	Identify processes and procedures to inspect, remove and replace components of keyless lock/unlock devices and alarm systems.	HP-G
05.84	Identify processes and procedures to inspect, remove and replace components of electrical sunroof and convertible/retractable hard top.	HP-G
05.85	Identify processes and procedures to identify processes and procedures to check operation of electrically heated mirrors, windshields, back lights, panels, etc.; determine needed repairs.	HP-I
05.86	Identify processes and procedures to demonstrate the proper self-grounding procedures (anti-static) for handling electronic components.	HP-I
05.87	Identify processes and procedures to check for module communication errors using a scan tool.	HP-G
05.88	Identify processes and procedures to use wiring diagrams, component location, and diagnostic flow charts during diagnosis of electrical circuit problems.	HP-G
05.89	Identify processes and procedures to identify safe disabling techniques of high voltage systems on hybrid/electric vehicles.	HP-G
05.90	Identify processes and procedures to identify potential safety and material handling concerns associated with high voltage hybrid/electric vehicle battery systems.	HP-G
Brakes		
05.91	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
05.92	Identify processes and procedures to replace hoses, fittings, seals, and supports.	HP-G
05.93	Identify processes and procedures to identify, handle, store, and fill with appropriate brake fluids.	HP-G
05.94	Identify processes and procedures to bleed (manual, pressure, or vacuum) hydraulic brake system.	HP-I
05.95	Identify processes and procedures to pressure test brake hydraulic system; determine necessary action.	HP-G
05.96	Identify processes and procedures to adjust brake shoes or pads; remove and reinstall brake drums or drum/hub assemblies.	HP-G
05.97	Identify processes and procedures to remove, clean and inspect caliper and rotor assembly and mountings for	HP-G

	wear and damage; reinstall.	
05.98	Identify processes and procedures to inspect parking brake system operation; repair or adjust as necessary; verify operation.	HP-G
05.99	Identify processes and procedures to identify the proper procedures for handling brake dust.	HP-G
05.100	Identify processes and procedures to check for bent or damaged brake system components.	HP-G
05.101	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
05.102	Perform vehicle clean-up; complete quality control using a checklist on operations performed.	HP-I

Course Description: The Damage Analysis and Estimating course prepares students for entry into the Automotive Collision and Repair industry. Students study damage analysis; estimating; vehicle construction and parts identification; and customer relations and sales skills.

Abbreviations:
DEC = Damage Analysis, Estimating and Customer Service

For every task in Damage Analysis and Estimating 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.

DEC Task List:	
HP-I =	**30**
HP-G =	**35**
Total	**65**

Course Number: ARR0022 Occupational Completion Point: D Damage Analysis and Estimating – 75 Hours		**Priority Number**
06.0	Explain and apply safety precautions; damage analysis; estimating; vehicle construction and parts identification; and customer relations and sales skills. 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 in accordance with federal, state, and local regulations.	HP-I
06.02	Locate OEM procedures to identify material and composition of the vehicle being repaired (mild steel, high strength, ultra-high strength steel, and aluminum, etc.).	HP-I
06.03	Locate procedures and precautions that may apply to the vehicle being repaired.	HP-I
06.04	Identify vehicle systems precautions and/or inspections to include but not limited to supplemental restraint system (SRS), advanced driver assistance systems (ADAS), hybrid/alternate fuel vehicles, locations and recommended procedures before inspecting of replacing components.	HP-I

Damage Analysis		
06.05	Position the vehicle for inspection under proper lighting; take phots to identify the vehicle and document damage.	HP-I
06.06	Identify vehicle for inspection by providing access to damaged areas.	HP-G
06.07	Analyze damage to determine appropriate methods for overall repairs.	HP-I
06.08	Determine the direction, point(s) of impact, and extent of direct, indirect, and inertia damage.	HP-G
06.09	Gather details of the incident/accident necessary to determine the full extent of vehicle damage.	HP-G
06.10	Identify and record pre-existing damage.	HP-I
06.11	Identify and record prior repairs.	HP-G
06.12	Perform visual inspection of structural components.	HP-G
06.13	Identify structural damage using measuring tools and equipment.	HP-I
06.14	Perform visual inspection of non-structural components.	HP-I
06.15	Determine parts, components, material type(s) and procedures necessary for a proper repair.	HP-I
06.16	Identify type and condition of finish; determine if refinishing is required.	HP-I
06.17	Identify suspension, electrical, and mechanical component physical damage.	HP-G
06.18	Identify safety systems physical damage.	HP-G
06.19	Identify interior component damage.	HP-I
06.20	Identify damage to add-on accessories and modifications.	HP-G
06.21	Identify single (one time) use components.	HP-G
06.22	Inspect under-hood area for leaks, damage, and unusual conditions.	
06.23	Determine fluid type requirements and identify fluid.	
06.24	Identify and document illuminated malfunction indicator lamp(s) (MIL).	HP-I
06.25	Perform a pre-repair inspection of the vehicle with the customer. Record fit and finish concerns (color mismatch, factory gaps, unrelated prior damage and prior repairs).	HP-G
Estimating		
06.26	Determine telematic/connectivity of the vehicle and place in service mode.	HP-G
06.27	Determine and record customer/vehicle owner information.	HP-I
06.28	Identify and record vehicle identification number (VIN) information, including nation of origin, make, model, restraint system, body type, production date, engine type, and assembly plant.	HP-I
06.29	Identify and record vehicle options, including trim level, paint code, transmission, accessories, and modifications.	HP-I

06.30	Identify safety systems; determine replacement items.	HP-G
06.31	Apply appropriate estimating and parts nomenclature (terminology).	HP-I
06.32	Determine and apply appropriate estimating sequence.	HP-I
06.33	Utilize estimating guide procedure pages.	HP-I
06.34	Apply estimating guide footnotes and headnotes as needed.	HP-I
06.35	Identify operations requiring labor value judgment.	HP-G
06.36	Select appropriate labor value for each operation (structural, non-structural, mechanical, and refinish).	HP-I
06.37	Select and price OEM parts, optional OEM parts, aftermarket parts, recyclable/used parts, remanufactured, rebuilt, and reconditioned parts; verify availability, compatibility, and condition.	HP-G
06.38	Locate and use technical service bulletins (TSBs).	HP-G
06.39	Utilize flat rate manuals, service manuals, service bulletins, parts manuals and electronic service information.	HP-G
06.40	Determine price and source of necessary sublet operations.	HP-G
06.41	Determine labor value, prices, charges, allowances, or fees for non-included operations and miscellaneous items.	HP-G
06.42	Recognize and apply overlap deductions, included operations, and additions.	HP-I
06.43	Determine additional material and charges.	HP-G
06.44	Determine refinishing material and charges.	HP-I
06.45	Apply math skills to establish charges and totals.	HP-I
06.46	Identify procedural differences between computer generated and manually written estimates.	HP-G
06.47	Identify procedures to restore corrosion protection; establish labor values, and material charges.	HP-G
06.48	Determine the cost effectiveness of the repair and determine the approximate vehicle retail, and repair value.	HP-G
06.49	Recognize the differences in estimation procedures when using different information provider systems.	HP-G
06.50	Verify accuracy of estimate compared to the actual repair and replacement operations.	HP-G
06.51	Document observed damage, unusual conditions, and concerns.	HP-G
Vehicle Construction and Parts Identification		
06.52	Identify type of vehicle construction (unibody, body-over-frame).	HP-G
06.53	Recognize the different damage characteristics of a unibody and body-over-frame vehicles.	HP-G
06.54	Identify impact energy absorbing components.	HP-G
06.55	Identify steel types; determine repair-ability.	HP-G
06.56	Identify different types of substrates (steel types, aluminum, magnesium, plastic, composites, etc.); determine	HP-G

	repairability.	
06.57	Identify add-on accessories.	HP-G
Customer Relations and Sales Skills		
06.58	Introduce yourself, acknowledge and greet customer/client/visitor; offer assistance.	HP-G
06.59	Listen to customer/client; collect information and identify customers/client's concerns, needs and expectations.	HP-G
06.60	Establish cooperative attitude with customer/client.	HP-G
06.61	Deal with dissatisfied customer/client, seek resolution.	HP-G
06.62	Identify customer/client preferred communication method; follow up to keep customer/client informed about parts and the repair process.	HP-G
06.63	Recognize basic claims handling procedures; explain to customer/client.	HP-G
06.64	Project positive attitude and professional appearance.	HP-I
06.65	Provide and review warranty information.	HP-G
06.66	Provide and review technical and consumer protection information.	HP-G
06.67	Estimate and explain duration of out-of-service time.	HP-G
06.68	Demonstrate negotiation skills to obtain a mutual agreement.	HP-G
06.69	Interpret and explain manual or computer-assisted estimate to customer/client.	HP-G
06.70	Perform vehicle clean-up; complete quality control using a checklist on operations performed.	HP-I

Course Description: The Automotive Collision Welding, Cutting and Joining course prepares students for entry into the Automotive Collision and Repair industry. Students study basic welding skills specifically related to automotive collision and repair; safety precautions; metal welding, cutting, and joining.

Abbreviations:
WCJ = Welding, Cutting and Joining

For every task in Automotive Collision Welding, Cutting and Joining 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.

WCJ Task List:	
	HP-I = 17
	HP-G = 04
Total	**21**

Course Number: ARR0112 Occupational Completion Point: E Automotive Collision Welding, Cutting and Joining – 75 Hours	Priority Number
07.0 Explain and apply safety precautions; metal welding, cutting, and joining. 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 OEM procedures to identify materials and composites of the vehicle being repaired (mild steel, high strength steel, ultra-high strength steel, aluminum, etc.).	HP-I
07.03 Locate procedures and precautions that may apply to the vehicle being repaired.	HP-I
07.04 Identify vehicle systems precautions and/or inspections to include but not limited to supplemental restraint system (SRS), advanced driver assistance systems (ADAS), hybrid/alternative fuel vehicles, locations and recommended procedures before inspecting or replacing components.	HP-I
07.05 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
Metal Welding, Cutting, and Joining	
07.06 Identify the considerations for cutting, removing, and welding various types of steel, aluminum, and other metals.	HP-G
07.07 Determine the correct GMAW welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation.	HP-I
07.08 Set up, attach work clamp (ground), and adjust the GMAW welder to "tune" for proper electrode stick-out, voltage, polarity, flow rate, and wire-feed speed required for the substrate being welded.	HP-I
07.09 Store, handle, and install high-pressure gas cylinders; test for leaks.	HP-I
07.10 Determine the proper angle of the gun to the joint and direction of gun travel for the type of weld being made.	HP-G
07.11 Protect adjacent panels, glass, vehicle interior, etc., from welding and cutting operations.	HP-I
07.12 Identify hazards; foam coatings and flammable materials prior to welding/cutting procedures.	HP-G
07.13 Protect computers and other electronics/wires during welding procedures.	HP-I
07.14 Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, and clamp or tack as required.	HP-I
07.15 Determine the joint type (butt weld with backing, lap, etc.) for weld being made.	HP-I
07.16 Determine the type of weld (continuous, stitch weld, plug, etc.) for each specific welding operation.	HP-I
07.17 Perform the following welds: plug, butt weld with and without backing, and fillet, etc., in the flat, horizontal, vertical, and overhead positions.	HP-I
07.18 Perform visual evaluation and destructive test on each weld type.	HP-I

07.19	Identify the causes of various welding defects; make necessary adjustments.	HP-I
07.20	Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments.	HP-I
07.21	Identify cutting process for different substrates and locations; perform cutting operation	HP-I
07.22	Identify different methods of attaching structural components (squeeze type resistance spot welding (STRSW), riveting, structural adhesive, MIG bronze, rivet bonding, weld bonding, etc.).	HP-G
07.23	Perform vehicle clean-up; complete quality control using a checklist on operations performed.	HP-I

Course Description: The Structural Damage Repair Technician course prepares students for entry into the Automotive Collision and Repair industry. Students study frame inspection and repair; unibody and unitized structure inspection, measurement, and repair; fixed glass; steering and suspension; heating and air conditioning; cooling systems; drive train; fuel, intake and exhaust systems; and restraint systems.

Abbreviations:
SAD = Structural Analysis and Damage Repair
ASE = Supplemental Tasks

For every task in Structural Damage Repair Technician 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.

SAD Task List:	
HP-I	**= 30**
HP-G	**= 83**
Total	**113**

Course Number: ARR0295 Occupational Completion Point: F Structural Damage Repair Technician – 350 Hours		**Priority Number**
08.0	Explain and apply safety precautions; frame inspection and repair; unibody and unitized structure inspection, measurement, repair; fixed glass; steering and suspension; heating and air conditioning; cooling systems; drive train; fuel, intake and exhaust systems; and restraint systems. 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 OEM procedures to identify material and composition of the vehicle being repaired (mild steel, high strength steel, ultra-high strength steel, aluminum, etc.).	
08.03	Locate procedures and precautions that may apply to the vehicle being repaired.	HP-I
08.04	Identify vehicle systems precautions and/or inspections to include but not limited to supplemental restraint	HP-I

	system (SRS), driver assistance system (ADAS), hybrid/alternative fuel vehicles, locations and recommended procedures before inspecting or replacing components.	
08.05	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
Frame Inspection and Repair		
08.06	Measure and diagnose structural damage using a tram gauge.	HP-I
08.07	Identify processes and procedures to Attach vehicle to anchoring devices.	HP-G
08.08	Identify processes and procedures to Analyze, straighten and align mash (collapse) damage.	HP-G
08.09	Identify processes and procedures to Analyze, straighten and align sag damage.	HP-G
08.10	Identify processes and procedures to Analyze, straighten and align side sway damage.	HP-G
08.11	Identify processes and procedures to Analyze, straighten and align twist damage.	HP-G
08.12	Identify processes and procedures to Analyze, straighten and align diamond frame damage.	HP-G
08.13	Identify processes and procedures to Remove and replace damaged structural components.	HP-G
08.14	Identify processes and procedures to Replace protective coatings, restore corrosion protection to repaired or replaced frame areas and anchoring locations.	HP-G
08.15	Identify processes and procedures to Analyze and identify misaligned or damaged steering, suspension, and powertrain mounting points.	HP-G
08.16	Identify processes and procedures to Align or replace misaligned or damaged steering, suspension, and powertrain mounting points that can cause vibration, steering, and wheel alignment problems.	HP-G
08.17	Identify heat limitations and monitoring procedures for structural components.	HP-G
08.18	Demonstrate an understanding of foam applications.	HP-G
08.19	Measure and diagnose structural damage using a measuring system (mechanical, electronic, laser), etc.	HP-G
08.20	Determine the extent of the direct and indirect damage and the direction of impact; document the methods and sequence of repair.	HP-I
08.21	Analyze and identify crush/collapse zones.	HP-I
Unibody and Unitized Structure Inspection, Measurement, and Repair		
08.22	Analyze and identify misaligned or damaged steering, suspension, and powertrain mounting points that can cause vibration,, steering and chassis alignment problems.	HP-G
08.23	Measure and diagnose unibody damage using a metric tape and tram gauge.	HP-I
08.24	Measure and diagnose unibody vehicles using a dedicated (fixture) measuring system.	HP-G
08.25	Diagnose and measure unibody vehicles using a three-dimensional measuring system (mechanical, electronic, and laser, etc.).	HP-G

08.26 Determine the extent of the direct and indirect damage and the direction of impact; plan and document the methods and sequence of repair.	HP-I
08.27 Attach anchoring devices to vehicle; remove or reposition components as necessary.	HP-G
08.28 Identify processes and procedures to straighten and align roof rails/headers and roof panels.	HP-G
08.29 Straighten and align rocker panels and pillars.	HP-G
08.30 Straighten and align vehicle openings, and floor pans.	HP-G
08.31 Straighten and align quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/powertrain mounting points).	HP-G
08.32 Straighten and align front-end sections (aprons, strut towers, upper and lower rails, steering, and suspension/powertrain mounting points).	HP-G
08.33 Identify substrate and repair or replacement recommendations.	HP-I
08.34 Identify proper cold stress relief methods.	HP-I
08.35 Repair damage using power tools and hand tools to restore proper contours and dimensions.	HP-I
08.36 Determine sectioning procedures of a steel body structure.	HP-I
08.37 Identify processes and procedures to restore corrosion protection to repaired or replaced structural areas, and anchoring locations.	HP-G
08.38 Determine the extent of damage to aluminum structural components; repair, weld, or replace.	HP-I
08.39 Analyze and identify crush/collapse zones.	HP-I
Stationary Glass	
08.40 Identify considerations for removal, handling, one time use parts, and installation of advanced glass systems (comfort and safety features).	HP-G
08.41 Identify processes and procedures to remove and reinstall or replace modular glass using recommended materials.	HP-G
08.42 Check for water leaks, dust leaks, and wind noise.	HP-I
08.43 Identify considerations for pre-scan, post-scan, and recalibration procedures.	HP-G
Suspension and Steering	
08.44 Perform visual inspection and measuring checks to identify steering and suspension collision damage.	HP-G
08.45 Identify one–time use fasteners.	HP-I
08.46 Clean, inspect, and prepare reusable fasteners.	HP-I
08.47 Identify processes and procedures to remove, replace, inspect or adjust power steering pump, pulleys, belts, hoses, fittings and pump mounts.	HP-G
08.48 Identify processes and procedures to remove and replace power steering gear (non-rack and pinion type).	HP-G

08.49	Identify processes and procedures to inspect, remove, and replace power rack and pinion steering gear and related components.	HP-G
08.50	Identify processes and procedures to inspect and replace parallelogram steering linkage components.	HP-G
08.51	Identify processes and procedures to inspect, remove and replace upper and lower control arms and related components.	HP-G
08.52	Identify processes and procedures to inspect, remove and replace steering knuckle/spindle/hub assemblies (including bearings, races, seals, etc.).	HP-G
08.53	Identify processes and procedures to inspect, remove and replace front suspension system coil springs and spring insulators (silencers).	HP-G
08.54	Identify processes and procedures to inspect, remove, replace, and adjust suspension system torsion bars, and mounts.	HP-G
08.55	Identify processes and procedures to inspect, remove and replace stabilizer bar bushings, brackets, and links.	HP-G
08.56	Identify processes and procedures to inspect, remove and replace MacPherson strut or assembly, upper bearing, and mount.	HP-G
08.57	Identify processes and procedures to inspect, remove, and replace rear suspension system transverse links, control arms, stabilizer bars, bushings, and mounts.	HP-G
08.58	Identify processes and procedures to inspect, remove, and replace suspension system leaf spring(s) and related components.	HP-G
08.59	Identify processes and procedures to inspect axle assembly for damage and misalignment.	HP-G
08.60	Identify processes and procedures to inspect, remove and replace shock absorbers.	HP-G
08.61	Identify processes and procedures to diagnose, inspect, adjust, repair or replace active suspension systems and associated lines and fittings.	HP-G
08.62	Identify processes and procedures to measure vehicle ride height and wheel base; determine necessary action.	HP-I
08.63	Identify processes and procedures to inspect, remove, replace, and align front and rear frame (cradles/sub).	HP-G
08.64	Identify processes and procedures to diagnose and inspect steering wheel, steering column, and components.	HP-G
08.65	Identify processes and procedures to verify proper operation of steering systems including electronically controlled, hydraulic and electronically assisted steering systems.	HP-G
08.66	Identify processes and procedures to diagnose front and rear suspension system noises and body sway problems; determine necessary action.	HP-G
08.67	Diagnose vehicle wandering, pulling, hard steering, bump steer, memory steering, torque steering, and steering return problems; determine necessary action.	HP-G
08.68	Demonstrate an understanding of wheel suspension and steering alignments (caster, camber, toe, SAI etc.).	HP-G
08.69	Diagnose tire wear patterns; determine cause.	HP-G
08.70	Identify processes and procedures to inspect tires; identify direction of rotation and location; check tire size, tire pressure monitoring system (TPM) and adjust air pressure.	HP-G

08.71 Identify processes and procedures to diagnose wheel/tire vibration, shimmy, tire pull (lead), wheel hop problems; determine needed repairs.	HP-G
08.72 Measure wheel, tire, axle, and hub runout; determine needed repairs.	HP-G
08.73 Reinstall wheels and torque lug nuts.	HP-I
08.74 Identify processes and procedures to perform initialization or calibration procedures following suspension and/or steering system repairs.	HP-G
08.75 Perform a tire pressure monitoring system (TPMS) calibration.	HP-G
08.76 Lift the vehicle for inspection, service and repair by properly raising and supporting the vehicle.	HP-G
Heating and Air Conditioning	
08.77 Identify processes and procedures to comply with environmental regulations relating to refrigerants and coolants.	HP-G
08.78 Maintain and verify correct operation of certified refrigerant recovery and recharging equipment.	HP-G
08.79 Locate and identify A/C system service ports.	HP-I
08.80 Identify processes and procedures to identify refrigerant contamination, recover, label, store, and recycle refrigerant from an A/C system.	HP-G
08.81 Identify processes and procedures to select refrigerant, evacuate, and recharge an A/C system; check for leaks.	HP-I
08.82 Identify processes and procedures to select oil type and install correct amount in A/C system.	HP-I
08.83 Identify processes and procedures to inspect, adjust, and replace A/C compressor drive belts; check pulley alignment.	HP-G
08.84 Identify processes and procedures to remove and replace A/C compressor; inspect, repair or replace A/C compressor mount.	HP-G
08.85 Identify processes and procedures to inspect, repair or replace A/C system mufflers, hoses, lines, fittings, orifice tube, expansion valve, and seals.	HP-G
08.86 Identify processes and procedures to inspect, test, and replace A/C system condenser and mounts.	HP-G
08.87 Identify processes and procedures to inspect and replace receiver/drier or accumulator/drier.	HP-G
08.88 Identify processes and procedures to inspect and repair A/C component wiring.	HP-G
08.89 Demonstrate an understanding of safe handling procedures associated with high voltage A/C compressors and wiring.	HP-G
08.90 Identify processes and procedures to inspect and protect open A/C system components from contaminants during repairs.	HP-G
Cooling Systems	
08.91 Check engine cooling and heater system hoses and belts; determine necessary action.	HP-I

08.92 Identify processes and procedures to inspect, test, remove, and replace radiator, pressure cap, coolant system components, and water pump.	HP-G
08.93 Identify processes and procedures to recover, refill, and bleed system with proper coolant and check level of protection; leak test system and dispose of materials in accordance with EPA regulations.	HP-I
08.94 Identify processes and procedures to remove, inspect and replace fan (both electrical and mechanical), fan sensors, fan pulley, fan clutch, and fan shroud; check operation.	HP-G
08.95 Identify processes and procedures to inspect, remove, and replace auxiliary oil/fluid coolers; check oil levels.	HP-G
08.96 Demonstrate an understanding of hybrid/electric cooling systems.	HP-G
Drive Train	
08.97 Identify processes and procedures to remove, replace, and adjust shift or clutch linkage as required.	HP-G
08.98 Identify processes and procedures to remove and replace electronic sensors, wires, and connectors.	HP-G
08.99 Identify processes and procedures to remove and reinstall powertrain assembly; inspect, replace, and align powertrain mounts.	HP-G
08.100 Identify processes and procedures to remove and replace drive axle assembly.	HP-G
08.101 Identify processes and procedures to inspect, remove and replace half shafts and axle constant velocity (CV) joints.	HP-G
08.102 Identify processes and procedures to inspect, remove and replace drive shafts and universal joints.	HP-G
08.103 Demonstrate an understanding of safe handling procedures associated with high voltage powertrain components.	HP-G
Fuel, Intake and Exhaust Systems	
08.104 Identify processes and procedures to inspect, remove and replace exhaust pipes, mufflers, converters, resonators, tail pipes, and heat shields.	HP-G
08.105 Identify processes and procedures to inspect, remove and replace fuel/DEF tank, tank filter, cap, filler hose, pump/sending unit and inertia switch; inspect and replace fuel lines and hoses.	HP-G
08.106 Identify processes and procedures to identify processes and procedures to inspect, remove and replace engine components of air intake systems.	HP-G
08.107 Identify processes and procedures to inspect, remove and replace canister, filter, vent, and purge lines of fuel vapor (EVAP) control systems.	HP-G
Restraint Systems	
08.108 Identify processes and procedures to inspect, remove, and replace seatbelt and shoulder harness assembly and components.	HP-G
08.109 Identify processes and procedures to inspect restraint system mounting areas for damage; repair as needed.	HP-G
08.110 Identify processes and procedures to inspect the operation of the seatbelt system.	HP-I
08.111 Identify processes and procedures to disable and enable Supplemental Restraint System (SRS).	HP-G

08.112 Identify processes and procedures to inspect, protect, remove and replace Supplemental Restraint Systems (SRS) sensors and wiring; ensure sensor orientation.	HP-G
08.113 Identify processes and procedures to verify that Supplemental Restraint System (SRS) is operational.	HP-I
08.114 Identify processes and procedures to inspect, remove, replace and dispose of deployed and non-deployed airbag(s) and pre-tensioners.	HP-G
08.115 Identify processes and procedures to use Diagnostic Trouble Codes (DTC) to diagnose and repair the Supplemental Restraint System (SRS).	HP-G
08.116 Demonstrate an understanding of advanced restraint systems.	HP-G
08.117 Identify components of Supplemental Restraint Systems (SRS).	HP-G
08.118 Demonstrate an understanding of advanced restraint and occupant classification systems (OCS).	HP-G
08.119 Identify processes and procedures to disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.	HP-I
08.120 Perform vehicle clean-up; complete quality control checklist on operations performed	HP-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

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan

with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program		
Program Number	T404100	
CIP Number	0647060422	
Grade Level	30, 31	
Program Length	600 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 one occupational completion point. It is **strongly recommended** that the scope, sequence, and course recommendations be followed.

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
	AER0025	Maintenance and Light Repair Technician 1		150 hours
	AER0026	Maintenance and Light Repair Technician 2	AUTO IND @7 %7 %G	150 hours
	AER0027	Maintenance and Light Repair Technician 3	AUTO MECH @7 7G	150 hours
A	AER0028	Maintenance and Light Repair Technician 4		150 hours

National Standards

Programs identified as having Industry or National Standards to the corresponding standards and/or benchmarks for the Automotive Maintenance and Light Repair Technician program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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.

Florida Department of Education
Student Performance Standards

Program Title: **Automotive Maintenance and Light Repair Technician**
Career Certificate Program Number: **T404100**

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

Course Description: The Maintenance and Light Repair Technician 1 course prepare students for entry into Maintenance and Light Repair Technician 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.

Abbreviations:
ASE = Required Supplemental Tasks
ER = Engine Repair

For every task in Maintenance and Light Repair Technician 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.

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

Course Number: AER0025 Occupational Completion Point: A (1 of 4) Maintenance and Light Repair Technician 1 – 150 Hours		Priority Number
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
01.02	Demonstrate knowledge of appropriate automotive industry certifications.	
01.03	Identify and define career opportunities in the automotive service industry.	
01.04	Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).	
01.05	Identify appropriate emergency first aid procedures.	
01.06	Utilize and demonstrate safe procedures for handling of tools and equipment.	ASE
01.07	Identify and use proper placement of floor jacks and jack stands.	ASE

	01.08 Identify and use proper procedures for safe lift operation.	ASE
	01.09 Utilize proper ventilation procedures for working within the lab/shop area.	ASE
	01.10 Identify proper procedures for safe pit usage.	
	01.11 Identify marked safety areas.	ASE
	01.12 Identify the location and the types of fire extinguishers and other fire safety equipment.	ASE
	01.13 Demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.	ASE
	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.	
	01.20 Identify and describe typical automotive lubricants and lubricant properties.	
	01.21 Identify and describe typical automotive seals and gaskets.	
	01.22 Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	ASE
	01.23 Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.	
	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
	01.25 Locate and demonstrate knowledge of Safety Data Sheets (SDS).	ASE
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
	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
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

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	Demonstrate use of the three C's (Concern, Cause, and Correction).	ASE
03.05	Review vehicle service history.	ASE
03.06	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	ASE
03.07	Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.	
03.08	Determine the presence of a Tire Pressure Monitoring System (TPMS).	
03.09	Determine the presence of wheel locks.	
03.10	Determine the presence of an air suspension system or hydraulic 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.	
03.13	Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.	
03.14	Use proper chemicals for cleaning and lubrication.	
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.	
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.	
03.28	Check manual transmission fluid level; note unusual conditions; service as required.	
03.29	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.	
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.	
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.	
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.	
03.50	Check wheel bearings for play and other signs of wear.	
03.51	Perform a visual inspection of a brake drum system.	
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.	
03.57	Identify the type of battery and perform slow or fast battery charge.	
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
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.	
04.07	Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.	P-2
04.08	Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.	
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
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
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

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

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

Abbreviations:
EE = Electrical/Electronic Systems

For every task in Maintenance and Light Repair Technician 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.

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

Course Number: AER0026 Occupational Completion Point: A (2 of 4) Maintenance and Light Repair Technician 2 – 150 Hours		**Priority Number**
05.0	Explain and apply proficiently the diagnosis, service and repair of electrical/electronic system components, battery, starting, charging, lighting, security, infotainment, and accessory 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
05.02	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	
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

05.05 Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1
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-2
05.09 Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.	P-1
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.	P-1
Battery Service	
05.13 Perform battery state-of-charge test; determine necessary action.	P-1
05.14 Confirm size, type and 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
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
05.23 Perform starter circuit voltage drop tests; determine necessary action.	P-1
05.24 Inspect and test starter relays and solenoids; determine necessary action.	P-2
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
05.27 Demonstrate knowledge of an automatic idle-stop/start-stop system.	P-3

Charging System	
05.28 Confirm proper manufacture battery capacity for vehicle application; perform charging system output test; determine necessary action.	P-1
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
Lighting, Instrument Cluster, Driver Information, Security, Infotainment, 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
05.38 Verify operation of instrument panel gauges and warning /indicator lights; reset maintenance indicators.	P-1
05.39 Verify windshield wiper and washer operation, replace wiper blades.	P-1
05.40 Describe the operation of Infotainment systems i.e., audio video and recording operations.	
05.41 Describe the various security systems both on-car and remote operational type systems.	

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

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

Abbreviations:
SS = Suspension and Steering
BR = Brakes

For every task in Maintenance and Light Repair Technician 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

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**

disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Course Number: AER0027 Occupational Completion Point: A (3 of 4) Maintenance and Light Repair Technician 3 – 150 Hours	**Priority Number**
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
06.02 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1
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.	
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
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
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
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
06.27 Describe the function of suspension and steering control systems and components, (i.e., active suspension, and stability control).	P-3
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
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.	
06.33 Measure caster; adjust as needed.	
06.34 Measure front wheel toe; adjust as needed.	
06.35 Center the steering wheel using mechanical methods.	
06.36 Measure rear wheel toe, adjust as needed.	
06.37 Measure thrust angle.	
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
06.40 Rotate tires according to manufacturer’s recommendations including vehicles equipped with tire pressure monitoring systems (TPMS).	P-1
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
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 miscellaneous (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
07.02	Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).	P-1
07.03	Install wheel and torque lug nuts.	P-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.	
Hydraulic System		
07.06	Describe proper brake pedal height, travel, and feel.	P-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
07.10	Identify components of hydraulic brake warning light system.	P-3
07.11	Bleed and/or flush brake system.	P-1
07.12	Test brake fluid for contamination.	P-1
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
07.15	Refinish brake drum and measure final drum diameter; compare with specification.	P-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
07.20	Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.	P-1
07.21	Remove, inspect, and/or replace brake pads and retaining hardware; determine necessary action.	P-1
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
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
07.26	Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-1
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
07.29	Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendation.	P-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, both mechanical and electronic type systems and parking brake indicator light system operation; determine necessary action.	P-1
07.35	Check operation of brake stop light system.	P-1
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

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

Course Description: The Maintenance and Light Repair Technician 4 prepare students for entry into the automotive workforce. Student's study and service automotive HVAC systems, engine performance systems, automatic and manual transmission/transaxle systems, as well as practice workplace soft skills.

Abbreviations:
HA = Heating and Air Conditioning
EP = Engine Performance
AT = Automatic Transmission/Transaxle
MD = Manual Drive Train and Axles

For every task in Maintenance and Light Repair Technician 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.

HA Task List:	EP Task List:	AT Task List:	MD Task List:
P-1 = 6	P-1 = 8	P-1 = 6	P-1 = 9
P-2 = 2	P-2 = 7	P-2 = 3	P-2 = 5
P-3 = 0	P-3 = 0	P-3 = 2	P-3 = 1
Total 8	Total 15	Total 11	Total 15

Course Number: AER0028 Occupational Completion Point: A (4 of 4) Maintenance and Light Repair Technician 4 – 150 Hours	**Priority Number**
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
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.	
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

08.05 Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	P-2
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
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
09.02 Perform engine absolute manifold pressure tests (vacuum/boost); document results.	P-2
09.03 Perform cylinder power balance test; document results.	P-2
09.04 Perform cylinder cranking and running compression tests; document results.	P-2
09.05 Perform cylinder leakage test; document results.	P-2
09.06 Verify engine operating temperature.	P-1
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
09.09 Describe the use of the OBD monitors for repair verification.	P-1
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

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
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
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
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.	
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
10.12 Describe the operational characteristics of a hybrid vehicle drive train.	P-3
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
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

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.	
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
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
11.15 Drain and refill differential housing.	P-1
11.16 Inspect and replace drive axle wheel studs.	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

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan

with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program		
Program Number	T410300	
CIP Number	0647060604	
Grade Level	30,31	
Program Length	900 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 8	Communications (Reading and Language Arts): 8

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.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	SER0080	Power Equipment Service Technician 1	GASENG RPR @7 7G AUTO MECH @ 7 7G	300 hours
B	SER0081	Power Equipment Service Technician 2		300 hours
C	SER0082	Power Equipment Service Technician 3		300 hours

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

Program Title: **Power and Equipment Technology**
Career Certificate Program Number: **T410300**

Course Description: The Power Equipment Service Technician 1 course prepares students for entry into Power Equipment Service Technician 2. 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 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; basic tune-up; transfer systems and engine controls; lubrication; electrical systems; cooling and exhaust systems; starting and ignition systems; and basic two-stroke and four-stroke engines.

For every task in Power Equipment Service Technician 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.

Course Number: SER0080 **Occupational Completion Point: A** **Power Equipment Service Technician 1 – 300 Hours**	
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.
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.
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:
	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 because 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.
	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.
	09.04 Adjust ignition systems timing.
	09.05 Inspect and service power transfer system.
	09.06 Adjust valves.
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.
	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:
	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.
	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.

Course Description: The Power Equipment Service Technician 2 course prepares students for entry into Power Equipment Service Technician 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 two-stroke and four-stroke cycle engines; engine interior components; power transfer systems; industry-related power and equipment; employability skills; acceptable employee behavior; and entrepreneurship.

For every task in Power Equipment Service Technician 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.

Course Number: SER0081 **Occupational Completion Point: B** **Power Equipment Service Technician 2 – 300 Hours**
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.
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.
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.
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:
	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.
	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.

Course Description: The Power Equipment Service Technician 3 course prepares students for entry into the outdoor and power equipment technology industry. 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 portable generators; and basic principles of electronic fuel management systems.

For every task in Power Equipment Service Technician 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.

Course Number: SER0082 Occupational Completion Point: C Power Equipment Service Technician 3 – 300 Hours	
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.
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.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Heavy Equipment Service Technician**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T440100	
CIP Number	0647030201	
Grade Level	30, 31	
Program Length	1800 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communication (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 maintaining and repairing diesel engines and electrical systems; reconditioning diesel fuel injection systems; overhauling diesel engines; and performing diesel engine preventive maintenance.

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 nine occupational completion points.

When offered at the postsecondary level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	DIM0101	Diesel Engine Mechanic/Technician Helper	DIESEL MECH @7 7G	150 hours
B	DIM0102	Diesel Electrical and Electronics Technician		300 hours
C	DIM0103	Diesel Engine Preventative Maintenance Technician		150 hours
D	DIM0104	Diesel Engine Technician		300 hours
E	DIM0130	Diesel Brakes/Fluid Technician		300 hours
F	DIM0106	Diesel Heating and Air Conditioning Technician		150 hours
G	DIM0107	Diesel Steering and Suspension Technician		150 hours
H	DIM0108	Diesel Drivetrain Technician		150 hours
I	DIM0110	Diesel Power Train Technician		150 hours

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 engine systems to include emission, principles of operation, and assemblies.
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 general electrical systems to include CAN Bus systems.
08.0 Diagnose and repair battery systems.
09.0 Diagnose and repair starting systems.
10.0 Diagnose and repair charging systems.
11.0 Diagnose and repair lighting systems.
12.0 Diagnose and repair gauges and warning devices.
13.0 Diagnose and repair related electrical systems.
14.0 Diagnose and repair engine systems.
15.0 Diagnose and repair fuel system.
16.0 Diagnose and repair air induction and exhaust system.
17.0 Diagnose and repair cooling system.
18.0 Diagnose and repair lubrication system.
19.0 Diagnose and repair instruments and controls.
20.0 Diagnose and repair safety equipment.
21.0 Diagnose and repair hardware.
22.0 Diagnose and repair heating, ventilation, and air conditioning (HVAC)
23.0 Diagnose and repair air brake systems.
24.0 Diagnose and repair hydraulic brake systems.
25.0 Diagnose and repair drive train systems.
26.0 Diagnose and repair suspension and steering systems.
27.0 Diagnose and repair tires and wheels.
28.0 General engine diagnosis and repair.
29.0 Cylinder head and valve train diagnosis and repair.
30.0 Engine block diagnosis and repair.
31.0 Lubrication systems diagnosis and repair.
32.0 Cooling system diagnosis and repair.
33.0 Air induction and exhaust systems diagnosis and repair.
34.0 Fuel system diagnosis and repair.
35.0 Diagnose and repair engine brakes.
36.0 Diagnose and repair air supply and service systems.

37.0 Diagnose and repair mechanical/foundation air brake systems.
38.0 Diagnose and repair parking brakes.
39.0 Diagnose and repair hydraulic systems.
40.0 Diagnose and repair power assist units.
41.0 Diagnose and repair wheel bearings.
42.0 General hydraulic system diagnosis and repair.
43.0 Diagnose and repair hydraulic pumps.
44.0 Diagnose and repair hydraulic filtration/reservoirs (tanks).
45.0 Diagnose and repair hydraulic hoses, fittings, and connections.
46.0 Diagnose and repair hydraulic control valves.
47.0 Diagnose and repair hydraulic actuators.
48.0 HVAC systems diagnosis, service, and repair.
49.0 A/C system and component diagnosis, service, and repair.
50.0 Diagnose and repair compressor and clutch.
51.0 Diagnose and repair evaporator, condenser, and related components.
52.0 Heating and engine cooling systems diagnosis, service, and repair.
53.0 Electrical system diagnosis, service, and repair.
54.0 Air/vacuum/mechanical diagnosis, service, and repair.
55.0 Refrigerant recovery, recycling, and handling.
56.0 Steering column diagnosis, service, and repair.
57.0 Steering units' diagnosis, service, and repair.
58.0 Steering linkage diagnosis, service, and repair.
59.0 Suspension systems diagnosis and repair.
60.0 Wheels, tires, tracks (rubber and steel) diagnosis, service, and repair.
61.0 Clutch diagnosis and repair.
62.0 Transmission diagnosis and repair.
63.0 Driveshaft and universal joint diagnosis and repair.
64.0 Drive axle diagnosis and repair.
65.0 Demonstrate shop and occupational safety procedures.
66.0 Identify the requirements for maintaining and repairing track systems.
67.0 Maintain and repair power train systems and components.
68.0 Troubleshoot and repair differentials, final drives and drive lines.
69.0 Demonstrate the qualifications for employment.

Florida Department of Education
Student Performance Standards

Program Title: **Heavy Equipment Service Technician**
Career Certificate Program Number: **T440100**

Course Description: The Diesel Engine Mechanic/Technician Helper course prepares students for entry into the Heavy Equipment industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study shop safety, infectious control, basic diesel components, tools and equipment, communication skills, math skills, scientific principles, employability skills, entrepreneurship, engine operation, and employment qualifications.

Course Number: DIM0101 **Occupational Completion Point: A** **Diesel Engine Mechanic/Technician Helper – 150 Hours**	
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.
01.03	Utilize safe procedures for handling of tools and equipment.
01.04	Identify proper load capacity and placement of floor jacks and jack stands.
01.05	Identify and use proper procedures for safe lift operation.
01.06	Utilize proper ventilation procedures for working within the lab/shop area.
01.07	Identify marked safety areas.
01.08	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.
01.09	Identify the location and use of eye wash stations.
01.10	Identify the location of the posted evacuation routes.
01.11	Comply with the required use of safety glasses, ear protection, gloves, aerial lifts, and shoes during lab/shop activities.
01.12	Identify and wear appropriate clothing for lab/shop activities.
01.13	Secure hair and jewelry for lab/shop activities.
01.14	Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
01.15	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HDD) lamps, ignition systems, injection systems, etc.).

01.16	Locate and demonstrate knowledge of Safety Data Sheets (SDS).
01.17	Assist in activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
01.18	Identify and comply with personal and environmental safety practices associated with the handling, storage, and disposal of chemicals and hazardous materials.
01.19	Understand safe procedures for lifting, blocking, and cribbing equipment, along with use of overhead lifting devices.
02.0	Identify the basic diesel components and functions. The student will be able to:
02.01	Identify types of bearings and their uses.
02.02	Identify seals, gaskets, and fasteners.
02.03	Identify drive power train components and functions.
02.04	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 their usage in heavy equipment applications.
03.02	Demonstrate the ability to convert between different units of measurement.
03.03	Demonstrate safe handling and use of appropriate tools.
03.04	Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
03.05	Demonstrate proper use of precision measuring tools (i.e., micrometer, dial-indicator, dial-caliper, etc.).
04.0	Identify engine systems to include emission, principles of operation, and assemblies. 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 (e.g., cooling, fuel, and emission systems).
04.03	Identify the equipment 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.
05.02	Identify purpose and demonstrate use of wheel chocks, frame locks, and other machine maintenance safety devices.
05.03	Demonstrate use of the three C’s (Concern, Cause, and Correction).
05.04	Review vehicle service history.
05.05	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, detailed description of diagnostics and corrective action.

05.06	Ensure equipment is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.)
05.07	Demonstrate accurate, complete, and concise verbal communication throughout the repair process with Service Department/Customer.
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.
06.02	Dresses appropriately and uses language and manners suitable for the workplace.
06.03	Maintains appropriate personal hygiene.
06.04	Meets and maintains employment eligibility criteria, such as drug/alcohol-free status, clean driving record, etc.
06.05	Demonstrates honesty, integrity, and reliability.
06.06	Complies with workplace policies/laws
06.07	Contributes to the success of the team, assists others and requests help when needed.
06.08	Works well with all customers and coworkers.
06.09	Negotiates solutions to interpersonal and workplace conflicts.
06.10	Contributes ideas and initiative.
06.11	Follows directions.
06.12	Communicates (written and verbal) effectively with customers and coworkers.
06.13	Reads and interprets workplace documents; writes clearly and concisely.
06.14	Analyzes and resolves problems that arise in completing assigned tasks.
06.15	Organizes and implements a productive plan of work.
06.16	Uses scientific, technical, engineering and mathematics principles and reasoning to accomplish assigned tasks.
06.17	Identifies and address the needs of all customers, providing helpful, courteous, and knowledgeable service and advice as needed.

Course Description: The Diesel Electrical and Electronics Technician course is designed to build on the skills and knowledge students learned in the Diesel Engine Mechanic/Technician Helper course for entry into the Heavy Equipment industry. Content emphasizes beginning skills and concepts. Students study electrical systems diagnosis, battery systems, starting systems, charging systems, lighting systems, gauges and warning devices, and related electrical systems.

Course Number: DIM0102 **Occupational Completion Point: B** **Diesel Electrical and Electronics Technician – 300 Hours**	
07.0	Diagnose and repair general electrical systems to include CAN Bus systems. The student will be able to:

	07.01 Read and interpret electrical/electronic circuits using wiring diagrams.
	07.02 Check continuity in electrical/electronic circuits using appropriate test equipment.
	07.03 Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment.
	07.04 Check current flow in electrical/electronic circuits and components using appropriate test equipment.
	07.05 Check resistance in electrical/electronic circuits and components using appropriate test equipment.
	07.06 Locate shorts, grounds, and opens in electrical/electronic circuits.
	07.07 Diagnose parasitic (key-off) battery drain problems; perform tests; determine needed action.
	07.08 Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed.
	07.09 Inspect and test spike suppression devices; replace as needed.
	07.10 Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment.
08.0	Diagnose and repair battery systems. The student will be able to:
	08.01 Identify battery type; perform appropriate battery load test; determine needed action.
	08.02 Determine 12- or 24-volt system, then verify battery state of charge using an open circuit voltage test.
	08.03 Inspect, clean, and service battery; replace as needed.
	08.04 Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed.
	08.05 Charge battery using appropriate method for battery type.
	08.06 Inspect, test, and clean battery cables and connectors; repair or replace as needed.
	08.07 Jump start a vehicle using jumper cables and a booster battery or auxiliary power supply using proper safety procedures.
	08.08 Perform battery capacitance test; determine needed action.
	08.09 Identify and test low voltage disconnect (LVD) systems; determine needed repair.
09.0	Diagnose and repair starting systems. The student will be able to:
	09.01 Perform starter circuit cranking voltage and voltage drop tests; determine needed action.
	09.02 Inspect and test components (key switch, push button, relays, safety devices, and/or magnetic switch) and wires and harnesses in the starter control circuit; replace as needed
	09.03 Inspect and test starter relays and solenoids/switches; replace as needed.
	09.04 Remove and replace starter; inspect flywheel ring gear or flex plate.
10.0	Diagnose and repair charging systems. The student will be able to:
	10.01 Test instrument panel mounted volt meters and/or indicator lamps; determine needed action.

10.02	Identify causes of a no charge, low charge, or overcharge problems; determine needed action.
10.03	Inspect and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets; adjust drive belts and check alignment.
10.04	Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action.
10.05	Perform charging circuit voltage drop tests; determine needed action.
10.06	Remove and replace alternator.
10.07	Inspect, repair, or replace cables, wires, and connectors in the charging circuit.
11.0	Diagnose and repair lighting systems. The student will be able to:
11.01	Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.
11.02	Identify causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation.
11.03	Identify the requirements of systems
11.04	Test, aim, and replace headlights.
11.05	Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components/modules; repair or replace as needed.
11.06	Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays, and control components/modules of parking, clearance, and taillight circuits; repair or replace as needed.
11.07	Inspect and test instrument panel light circuit switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires, and printed circuits/control modules; repair or replace as needed.
11.08	Inspect and test interior cab light circuit switches, bulbs/LEDs, sockets, low voltage disconnect (LVD), connectors, terminals, wires, and control components/modules; repair or replace as needed.
11.09	Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed.
11.10	Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.
11.11	Inspect and test turn signal and hazard circuit flasher(s), switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.
11.12	Inspect and test reverse lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, wires, and control components/modules; repair or replace as needed.
12.0	Diagnose and repair gauges and warning devices. The student will be able to:
12.01	Interface with vehicle's on-board computer; perform diagnostic procedure, verify instrument cluster operations using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.
12.02	Identify causes of intermittent, high, low, or no gauge readings; determine needed action.
12.03	Identify causes of data bus-driven gauge malfunctions; determine needed action.
12.04	Inspect and test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires; repair or replace as needed.

12.05	Inspect and test warning devices (lights and audible) circuit sensor/sending units, bulbs/LEDs, sockets, connectors, wires, and control components/modules; repair or replace as needed.
12.06	Inspect, test, replace, and calibrate (if applicable) system monitoring units (e.g., electronic speedometer, odometer, and tachometer systems).
13.0	Diagnose and repair related electrical systems. The student will be able to:
13.01	Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.
13.02	Identify causes of constant, intermittent, or no horn operation; determine needed action.
13.03	Inspect and test horn circuit relays, horns, switches, connectors, wires, clock springs, and control components/modules; repair or replace as needed.
13.04	Identify causes of constant, intermittent, or no wiper operation; diagnose the cause of wiper speed control and/or park problems; determine needed action.
13.05	Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, wires, and control components/modules; repair or replace as needed.
13.06	Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed.
13.07	Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.
13.08	Inspect and test heater and A/C electrical components including A/C clutches, motors, resistors, relays, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.
13.09	Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repair or replace as needed.
13.10	Inspect and test block heaters; determine needed repairs.
13.11	Inspect and test engine cooling fan electrical control components/modules, wiring; repair or replace as needed.
13.12	Identify causes of data bus communication problems; determine needed action.

Course Description: The Diesel Engine Preventative Maintenance Technician course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engine system, cab and hood systems, electrical/electronic systems, frame and chassis systems diagnostics, service, and repair.

For every task in Diesel Engine Preventative Maintenance Technician, 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 Engine Preventative Maintenance Technician area are entry-level technician inspection tasks designed to introduce the student to correct procedures and practices of vehicle inspection in a teaching/learning

PM Task List:
P-1 = 132
P-2 = 11
P-3 = 0
Total 143

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.

The first task in Diesel Engine Preventative Maintenance Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

Course Number: DIM0103 Occupational Completion Point: C Diesel Engine Preventative Maintenance Technician – 150 Hours	**Priority Number**
12.0 Inspect and service engine systems record findings as needed. 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
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
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
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
	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
21.0	Diagnose and repair electrical/electronic battery and starting systems. The student will be able to:	
	21.01 Inspect battery box(es), 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 (capacitance).	P-1

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 gladhands.	P-1
24.12 Check brake chambers and air lines for secure mounting and damage.	P-1
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.	
26.0	Inspect, service and record 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, driveshafts, 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 interaxle 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
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
	28.08 Check tire matching (diameter and tread) on single and dual tire applications.	P-1
	28.09 Retorque 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

Course Description: The Diesel Engine Technician course is designed to build on the skills and knowledge students learned in the Diesel Engine Preventative Maintenance Technician course for entry into the Heavy Equipment industry. Content emphasizes beginning skills. Students study engine diagnostics, cylinder head, valve train, engine block, lubrication, cooling, air induction, exhaust, fuel system diagnostics, and engine brakes.

Course Number: DIM0104 Occupational Completion Point: D Diesel Engine Technician – 300 Hours	
32.0	General engine diagnosis and repair. The student will be able to:
	32.01 Inspect fuel, oil, Diesel Exhaust Fluid (DEF) and coolant levels, and condition; determine needed action.
	32.02 Identify and diagnose the causes of engine fuel, oil, coolant, air, and other leaks; determine needed action.
	32.03 Listen and interpret engine noises; determine needed action.
	32.04 Observe engine exhaust smoke color and quantity; determine needed action.
	32.05 Check and diagnose no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action.
	32.06 Identify and diagnose causes of engine surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action.

	32.07 Identify and diagnose engine vibration problems; determine needed action.
	32.08 Check, record, and clear electronic diagnostic (fault) codes; monitor electronic data; determine needed action.
	32.09 Perform air intake system restriction and leakage tests, CAC leak and Diff test; determine needed action.
	32.10 Perform intake manifold pressure (boost) test; determine needed action.
	32.11 Perform exhaust back pressure test; determine needed action.
	32.12 Perform cylinder compression test, interrupt the blowby measurement and determine needed action.
33.0	Cylinder head and valve train diagnosis and repair. The student will be able to:
	33.01 Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.
	33.02 Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action.
	33.03 Measure valve head height relative to deck, valve face-to-seat contact; determine needed action.
	33.04 Inspect injector sleeves and seals; measure injector tip or nozzle protrusion; perform needed action.
	33.05 Inspect valve train components; determine needed action.
	33.06 Reassemble cylinder head.
	33.07 Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash.
	33.08 Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness; determine needed action.
	33.09 Inspect and adjust valve bridges (crossheads); adjust valve clearances and injector settings.
	33.10 Remove, clean, inspect for visible damage, and replace cylinder head(s) assembly.
	33.11 Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action.
	33.12 Inspect pushrods, rocker arms, rocker arm shafts, and blocked oil passages; perform needed action.
	33.13 Inspect cam followers; perform needed action.
34.0	Engine block diagnosis and repair. The student will be able to:
	34.01 Perform crankcase pressure test; determine needed action
	34.02 Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.
	34.03 Disassemble, clean, and inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action.
	34.04 Inspect cylinder sleeve counter bore and lower bore; check bore distortion; determine needed action.
	34.05 Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.

34.06	Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion).
34.07	Inspect in-block camshaft bearings for wear and damage; determine needed action.
34.08	Inspect, measure, and replace/reinstall in-block camshaft; measure/adjust end play.
34.09	Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action.
34.10	Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play.
34.11	Inspect, install, and time gear train; measure gear backlash; determine needed action.
34.12	Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action.
34.13	Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons.
34.14	Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.
34.15	Check condition of piston cooling jets (nozzles); determine needed action.
34.16	Inspect and measure crankshaft vibration damper; determine needed action.
34.17	Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.
34.18	Inspect flywheel/flex-plate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.
35.0	Lubrication systems diagnosis and repair. The student will be able to:
35.01	Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit, test engine oil temperature and check operation of temperature sensor; determine needed action.
35.02	Check engine oil level, condition, and consumption; determine needed action.
35.03	Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action.
35.04	Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.
35.05	Inspect, clean, and test oil cooler and components; determine needed action.
35.06	Inspect turbocharger lubrication system; determine needed action.
35.07	Determine proper lubricant and perform oil and filter change.
36.0	Cooling system diagnosis and repair. The student will be able to:
36.01	Check engine coolant type, level, condition, and consumption; test coolant for freeze protection and additive package concentration; determine needed action.
36.02	Test coolant temperature and check operation of temperature and level sensors, gauge, and/or sending unit; determine needed action.

36.03	Perform radiator temperature drop differential test.
36.04	Diagnose overheat conditions, (e.g., faulty water pumps and restricted radiators.).
36.05	Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment.
36.06	Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.
36.07	Recover coolant, flush, and refill with recommended coolant/additive package; bleed cooling system.
36.08	Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.
36.09	Inspect water pump and hoses; replace as needed.
36.10	Inspect, clean, and pressure test radiator. Pressure test cap, tank(s), and recovery systems; determine needed action.
36.11	Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.
36.12	Inspect turbo charger cooling systems; determine needed action.
37.0	Air induction and exhaust systems diagnosis and repair. The student will be able to:
37.01	Perform air intake system restriction and leakage test; determine needed action.
37.02	Perform intake manifold pressure (boost) test; determine needed action.
37.03	Check exhaust back pressure; determine needed action.
37.04	Inspect turbocharger(s), wastegate, and piping systems; determine needed action.
37.05	Inspect turbocharger(s) (variable ratio/geometry VGT), pneumatic, hydraulic, electronic controls, and actuators.
37.06	Check air induction system: piping, hoses, clamps, and mounting; service or replace air filter as needed.
37.07	Remove and reinstall turbocharger/wastegate assembly.
37.08	Inspect intake manifold, gaskets, and connections; replace as needed.
37.09	Inspect, clean, and test charge air cooler assemblies; replace as needed.
37.10	Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed.
37.11	Inspect exhaust after treatment devices, perform after-treatment regeneration tests; determine necessary action.
37.12	Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed action.
37.13	Inspect exhaust gas recirculation (EGR) system including EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action.
38.0	Fuel system diagnosis and repair. The student will be able to:
38.01	Fuel supply system
	• Check fuel level, and condition; determine needed action.

• Perform fuel supply and return system tests; determine needed action.
• Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action.
• Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine needed action.
• Inspect and test pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action.
• Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump.
• Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time a distributor (rotary) type injection pump; determine needed action.
• Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time an in-line type injection pump; determine needed action.
• Inspect and adjust throttle control linkage; determine needed action.
• Inspect air/fuel ratio control systems; determine needed action.
• Inspect, test, and adjust engine fuel shut-down devices and controls; determine needed action.
38.02 Electronic fuel management system
• Inspect and test power and ground circuits and connections; measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multi-meter (DMM); determine needed action.
• Interface with vehicle's on-board computer; perform diagnostic procedures using electronic service tool(s) (to include PC based software and/or data scan tools); determine needed action.
• Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; clear codes; determine further diagnosis.
• Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).
• Inspect and replace electrical connector terminals, seals, and locks.
• Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed.
• Using electronic service tool(s) access and interpret customer programmable parameters.
• Perform on-engine inspections, test, and adjustments on electronic unit injectors (EUI); determine needed action
• Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable).
• Perform cylinder contribution test utilizing electronic service tool(s).
• Perform on-engine inspections and tests on hydraulic electronic unit injectors (HEUI) and system electronic controls; determine needed action.
• Perform on-engine inspections and tests on hydraulic electronic unit injector (HEUI) high pressure oil supply and control systems; determine needed action.

	• Perform on-engine inspections and tests on high pressure common rail (HPCR) type injection systems; determine needed action.
	• Inspect high pressure injection lines, hold downs, fittings, and seals; determine needed action.
	• Perform engine timing sensor calibration (if applicable).
	• Perform on-engine inspections and tests on distributor-type injection pump electronic controls; determine needed action.
	• Perform on-engine inspections and tests on in-line type injection pump electronic controls; determine needed action.
39.0	Diagnose and repair engine brakes. The student will be able to:
39.01	Inspect and adjust engine compression/exhaust brakes; determine needed action.
39.02	Inspect, test, and adjust engine compression/exhaust brake control circuits, switches, and solenoids; determine needed action.
39.03	Inspect engine compression/exhaust brake housing, valves, seals, lines, and fittings; repair or replace as needed.

Course Description: The Diesel Brakes/Fluid Technician course is designed to build on the skills and knowledge students learned for entry into the Heavy Equipment industry. Content emphasizes beginning skills and concepts. Students study air and hydraulic brakes/fluid systems.

Course Number: DIM0130 Occupational Completion Point: E Diesel Brakes/Fluid Technician – 300 Hours	
36.0	Diagnose and repair air supply and service systems. The student will be able to:
36.01	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.
36.02	Drain air reservoir/tanks; check for oil, water, and foreign material; determine needed action.
37.0	Diagnose and repair mechanical/foundation air brake systems. The student will be able to:
37.01	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.
37.02	Inspect and measure brake shoes or pads; perform needed action.
37.03	Inspect and measure brake drums or rotors; perform needed action.
38.0	Diagnose and repair parking brakes. The student will be able to**:**
38.01	Inspect and test parking (spring) brake chamber diaphragm and seals; replace parking (spring) brake chamber; dispose of removed chambers in accordance with local regulations.
38.02	Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed.
38.03	Inspect and test parking (spring) brake application and release valve; replace as needed.
38.04	Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers' recommendations.

	38.05 Identify and test anti compounding brake function.
39.0	Diagnose and repair hydraulic systems. The student will be able to:
	39.01 Inspect and test master cylinder for internal/external leaks and damage; replace as needed.
	39.02 Inspect hydraulic system brake lines for leaks and damage, flexible hoses, and fittings for leaks and damage; replace as needed.
	39.03 Inspect and test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; replace as needed.
	39.04 Inspect and test brake pressure differential valve and warning light circuit switch, bulbs/LEDs, wiring, and connectors; repair or replace as needed.
	39.05 Inspect/test/interpret fluid analysis; bleed and/or flush system; determine proper fluid type.
	39.06 Perform brake accumulator performance test.
	39.07 Identify and diagnose poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems caused by mechanical components; determine needed action.
	39.08 Inspect and measure rotors; perform needed action.
	39.09 Inspect and measure disc brake pads; inspect mounting hardware; perform needed action.
	39.10 Check parking brake operation; inspect parking brake application and holding devices; adjust and replace as needed.
	39.11 Inspect and measure drum brake shoes and linings; inspect mounting hardware, adjuster mechanisms, and backing plates; perform needed action.
40.0	Diagnose and repair power assist units. The student will be able to:
	40.01 Identify and diagnose stopping problems caused by the brake assist (booster) system; determine needed action.
	40.02 Inspect, test, repair, or replace hydraulic brake assist (booster), hoses, and control valves; determine proper fluid type.
	40.03 Check emergency (back-up, reserve, and accumulators) brake assist system.
41.0	Diagnose and repair wheel bearings. The student will be able to:
	41.01 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.
42.0	General hydraulic system diagnosis and repair. The student will be able to:
	42.01 Identify system type (closed and open) and verify proper operation.
	42.02 Read and interpret system diagrams and schematics.
	42.03 Perform system temperature, pressure, flow, and cycle time tests; determine needed action.
	42.04 Verify placement of equipment /component safety labels and placards; determine needed action.
43.0	Diagnose and repair hydraulic pumps. The student will be able to:
	43.01 Identify system fluid type.

	43.02 Identify causes of pump failure, unusual pump noises, temperature flow, and leakage problems; determine needed action.
	43.03 Determine pump type, rotation, and drive system.
	43.04 Remove and install pump; prime and/or bleed system.
	43.05 Inspect pump inlet for restrictions and leaks; determine needed action.
	43.06 Inspect pump outlet for restrictions and leaks; determine needed action.
44.0	Diagnose and repair hydraulic filtration/reservoirs (tanks). The student will be able to:
	44.01 Identify type of filtration system; verify filter application and flow direction.
	44.02 Service filters and breathers.
	44.03 Identify causes of system contamination; determine needed action.
	44.04 Take a hydraulic oil sample for analysis.
	44.05 Check reservoir fluid level and condition; determine needed action.
	44.06 Inspect and repair or replace reservoir, sight glass, vents, caps, mounts, valves, screens, supply and return lines.
45.0	Diagnose and repair hydraulic hoses, fittings, and connections. The student will be able to:
	45.01 Diagnose causes of component leakage, damage, and restriction; determine needed action.
	45.02 Inspect hoses and connections (length, size, routing, bend radii, and protection); repair or replace as needed.
	45.03 Assemble hoses, tubes, connectors, and fittings in accordance with manufacturers' specifications; use proper procedures to avoid contamination.
	45.04 Inspect and replace fitting seals and sealants.
46.0	Diagnose and repair hydraulic control valves. The student will be able to:
	46.01 Pressure test system safety relief valve; determine needed action.
	46.02 Perform control valve operating pressure and flow tests; determine needed action.
	46.03 Inspect, test, and adjust valve controls (electrical/electronic, mechanical, and pneumatic).
	46.04 Identify causes of control valve leakage problems (internal/external); determine needed action.
	46.05 Inspect pilot control valve linkages, cables, and PTO controls; adjust, repair, or replace as needed.
47.0	Diagnose and repair hydraulic actuators. The student will be able to:
Comply with manufacturers' and industry accepted safety practices associated with equipment lock out/tag out; pressure line release; implement/support (blocked or resting on ground); and articulated cylinder devices/machinery safety locks.	
	47.01 Identify actuator type (single/double acting, multi-stage/telescopic, and motors).
	47.02 Identify the cause of seal failure; determine needed repairs.

47.03	Identify the cause of incorrect actuator movement and leakage (internal and external); determine needed repairs.
47.04	Inspect actuator mounting, frame components, and hardware for looseness, cracks, and damage; determine needed action.
47.05	Remove, repair, and/or replace actuators in accordance with manufacturers' recommended procedures.
47.06	Inspect actuators for dents, cracks, damage, and leakage; determine needed action.
47.07	Purge and/or bleed system in accordance with manufacturers' recommended procedures.

Course Description: The Diesel Heating and Air Conditioning Technician 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 HVAC, and A/C systems.

For every task in Diesel Heating and Air Conditioning Technician, 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 first task in Diesel Heating and Air Conditioning Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

HV Task List:	
P-1	**31**
P-2	**17**
P-3	**10**
Total	**58**

Course Number: DIM0106 Occupational Completion Point: F Diesel Heating and Air Conditioning Technician – 150 Hours		**Priority Number**
42.0	HVAC systems diagnosis, service, and repair. The student will be able to:	
42.01	Verify the need for service or repair of HVAC systems based on unusual operating noises; determine needed action.	P-1
42.02	Verify the need for service or repair of HVAC systems based on unusual visual, smell, and touch conditions; determine needed action.	P-1
42.03	Identify system type and components (cycling clutch orifice tube - CCOT, expansion valve) and conduct performance test(s) on HVAC systems; determine needed action.	P-1
42.04	Retrieve diagnostic codes; determine needed action.	P-3
43.0	A/C system and component diagnosis, service, and repair. The student will be able to:	
43.01	Identify causes of temperature control problems in the A/C system; determine needed action.	P-1
43.02	Identify refrigerant and lubricant types; check for contamination; determine needed action.	P-1
43.03	Identify A/C system problems indicated by pressure gauge and temperature readings; determine needed	P-1

	action.	
43.04	Identify A/C system problems indicated by visual, audible, smell, and touch procedures; determine needed action.	P-1
43.05	Perform A/C system leak test; determine needed action.	P-1
43.06	Recover, evacuate, and recharge A/C system using appropriate equipment.	P-1
43.07	Identify contamination in the A/C system components; determine needed action.	P-3
43.08	Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-2
44.0	Diagnose and repair compressor and clutch. The student will be able to:	
44.01	Identify and diagnose A/C system problems that cause protection devices (pressure, thermal, and electronic) to interrupt system operation; determine needed action.	P-1
44.02	Inspect, test, and replace A/C system pressure, thermal, and electronic protection devices.	P-2
44.03	Inspect, and replace A/C compressor drive belts, pulleys, and tensioners; adjust belt tension and check alignment.	P-1
44.04	Inspect, test, adjust, service, or replace A/C compressor clutch components or assembly.	P-2
44.05	Inspect and correct A/C compressor lubricant level (if applicable).	P-2
44.06	Inspect, test, or replace A/C compressor.	P-1
44.07	Inspect, repair, or replace A/C compressor mountings and hardware.	P-2
45.0	Diagnose and repair evaporator, condenser, and related components. The student will be able to:	
45.01	Correct system lubricant level when replacing the evaporator, condenser, receiver/drier or accumulator/drier, and hoses.	P-1
45.02	Inspect A/C system hoses, lines, filters, fittings, and seals; determine needed action.	P-1
45.03	Inspect and test A/C system condenser. Check for proper airflow and mountings; determine needed action.	P-1
45.04	Inspect and replace receiver/drier or accumulator/drier.	P-1
45.05	Inspect and test cab/sleeper refrigerant solenoid, expansion valve(s); check placement of thermal bulb (capillary tube); determine needed action.	P-3
45.06	Remove and replace orifice tube.	P-1
45.07	Inspect and test cab/sleeper evaporator core; determine needed action.	P-3
45.08	Inspect, clean, and repair evaporator housing and water drain; inspect and service/replace evaporator air filter.	P-1
45.09	Identify and inspect A/C system service ports (gauge connections); determine needed action.	P-1

	45.10 Identify the cause of system failures resulting in refrigerant loss from the A/C system high pressure relief device; determine needed action.	P-2
46.0	Heating and engine cooling systems diagnosis, service, and repair. The student will be able to:	
	46.01 Identify causes of outlet air temperature control problems in the HVAC system; determine needed action.	P-1
	46.02 Diagnose window fogging problems; determine needed action.	P-2
	46.03 Perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration; determine needed action.	P-1
	46.04 Inspect engine cooling and heating system hoses, lines, and clamps; determine needed action.	P-1
	46.05 Inspect and test radiator, pressure cap, and coolant recovery system (surge tank); determine needed action.	P-1
	46.06 Inspect water pump; determine needed action.	P-1
	46.07 Inspect and test thermostats, by-passes, housings, and seals; determine needed repairs.	P-2
	46.08 Recover, flush and refill with recommended coolant/additive package; bleed cooling system.	P-1
	46.09 Inspect thermostatic cooling fan system (pneumatic and electronic) and fan shroud; replace as needed.	P-2
	46.10 Inspect and test heating system coolant control valve(s) and manual shut-off valves; determine needed action.	P-2
	46.11 Inspect and flush heater core; determine needed action.	P-3
47.0	Electrical system diagnosis, service, and repair. The student will be able to:	
	47.01 Identify causes of HVAC electrical control system problems; determine needed action.	P-1
	47.02 Inspect and test A/C heater blower motors, resistors, switches, relays, modules, wiring, and protection devices; determine needed action.	P-2
	47.03 Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action.	P-2
	47.04 Inspect and test A/C related electronic engine control systems; determine needed action.	P-2
	47.05 Inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices; determine needed action.	P-2
	47.06 Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action.	P-2
	47.07 Inspect and test HVAC system electrical/electronic control panel assemblies; determine needed action.	P-2
	47.08 Interface with vehicle’s on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-2
48.0	Air/vacuum/mechanical diagnostics, service, and repair. The student will be able to:	
	48.01 Identify causes of HVAC air and mechanical control problems; determine needed action.	P-3

	48.02 Inspect and test HVAC system air and mechanical control panel assemblies; determine needed action.	P-3
	48.03 Inspect, test, and adjust HVAC system air and mechanical control cables and linkages; determine needed action.	P-3
	48.04 Inspect and test HVAC system actuators and hoses; determine needed action.	P-3
	48.05 Inspect, test, and adjust HVAC system ducts, doors, and outlets; determine needed action.	P-3
NOTE: Tasks 1 through 5 should be accomplished in accordance with appropriate EPA regulations and SAE "J" standards.		
49.0	Refrigerant recovery, recycling, and handling. The student will be able to:	
	49.01 Maintain and verify correct operation of certified equipment.	P-1
	49.02 Identify and recover A/C system refrigerant.	P-1
	49.03 Recycle or properly dispose of refrigerant.	P-1
	49.04 Handle, label, and store refrigerant.	P-1
	49.05 Test recycled refrigerant for non-condensable gases.	P-1
	49.06 Demonstrate knowledge of federal requirements for the handling of refrigerants.	

Course Description: The Diesel Steering and Suspension Technician 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 steering, suspension, wheel alignment, wheels, tires, and frame systems.

For every task in Diesel Steering and Suspension Technician, 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 first task in Diesel Steering and Suspension Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

SS Task List:
P-1 = 23
P-2 = 14
P-3 = 8
Total 45

Course Number: DIM0107 Occupational Completion Point: G Diesel Steering and Suspension Technician – 150 Hours		**Priority Number**
50.0	Steering column diagnosis, service, and repair. The student will be able to:	
	50.01 Identify and diagnose fixed and driver adjustable steering column and shaft noise, looseness, and binding problems; determine needed action.	P-1
	50.02 Inspect and service steering shaft U-joint(s), slip joints, bearings, bushings, and seals; phase shaft.	P-1

	50.03 Check cab mounting and adjust ride height.	P-2
	50.04 Remove the steering wheel (includes steering wheels equipped with electrical/electronic controls and components); install and center the steering wheel. Inspect, test, replace and calibrate steering angle sensor.	P-1
	50.05 Disable and enable supplemental restraint system (SRS) in accordance with manufacturers' procedures.	P-1
51.0	Steering units diagnosis, service, and repair. The student will be able to:	
	51.01 Identify and diagnose power steering system noise, steering binding, darting/oversteer, reduced wheel cut, steering wheel kick, pulling, non-recovery, turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems; determine needed action.	P-1
	51.02 Determine recommended type of power steering fluid; check level and condition; determine needed action.	P-1
	51.03 Flush and refill power steering system; purge air from system.	P-2
	51.04 Perform power steering system pressure, temperature, and flow tests; determine needed action.	P-3
	51.05 Inspect, service, or replace power steering reservoir including filter, seals, and gaskets.	P-2
	51.06 Inspect power steering pump drive gear and coupling; replace as needed.	P-3
	51.07 Inspect, adjust, or replace power steering pump, mountings, and brackets.	P-3
	51.08 Inspect and replace power steering system cooler, lines, hoses, clamps/mountings, hose routings, and fittings.	P-2
	51.09 Inspect, adjust, repair, or replace integral type power steering gear(s) (single and/or dual) and mountings.	P-2
52.0	Steering linkage diagnosis, service, and repair. The student will be able to:	
	52.01 Inspect and align pitman arm; replace as needed.	P-1
	52.02 Check and adjust steering (wheel) stops; verify relief pressures.	P-1
	52.03 Inspect and lubricate steering components.	P-1
	52.04 Inspect drag link (relay rod) and tie rod ends; adjust or replace as needed.	
	52.05 Inspect steering arm and levers, and linkage pivot joints; replace as needed.	
	52.06 Inspect clamps and retainers on cross tube/relay rod/centerline/tie rod; position or replace as needed.	
53.0	Suspension systems diagnosis, service, and repair. The student will be able to:	
	53.01 Inspect front axles and attaching hardware; determine needed action.	P-1
	53.02 Inspect and service kingpins, steering knuckle bushings, locks, bearings, seals, and covers; determine needed action.	P-1
	53.03 Inspect shock absorbers, bushings, brackets, and mounts; replace as needed.	P-1

	53.04 Inspect leaf springs, center bolts, clips, pins and bushings, shackles, U-bolts, insulators, brackets, and mounts; determine needed action.	P-1
	53.05 Inspect axle aligning devices such as radius rods, track bars, stabilizer bars, torque arms, related bushings, mounts, shims, and cams; determine needed action.	P-1
	53.06 Inspect tandem suspension equalizer components; determine needed action.	P-3
	53.07 Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; adjust, repair or replace as needed.	P-1
	53.08 Inspect air springs, mounting plates, springs, suspension arms, and bushings; replace as needed.	P-1
	53.09 Measure and adjust vehicle ride height; determine needed action.	P-1
	53.10 Identify rough ride problems; determine needed action.	P-3
	53.11 Inspect walking beams, center (cross) tube, bushings, mounts, load pads, and saddles/caps; replace as needed.	
54.0	Wheel alignment diagnosis, adjustment, and repair. The student will be able to:	
	54.01 Identify and diagnose vehicle wandering, pulling, shimmy, hard steering and off-center steering wheel problems; adjust or repair as needed.	P-1
	54.02 Check camber; determine needed action.	P-2
	54.03 Check caster; adjust as needed.	P-2
	54.04 Check and adjust toe settings.	P-1
	54.05 Check rear axle(s) alignment (thrust line/centerline) and tracking; adjust or repair as needed.	P-2
	54.06 Diagnose turning/Ackerman angle (toe-out-on-turns) problems; determine needed action.	P-3
	54.07 Check front axle alignment (centerline); adjust or repair as needed.	P-2
55.0	Wheels and tires diagnosis, service, and repair. The student will be able to:	
	55.01 Identify and diagnose tire wear patterns; check tread depth and pressure; determine needed action.	P-1
	55.02 Identify and diagnose wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action.	P-2
	55.03 Remove and install steering and drive axle wheel/tire assemblies; torque mounting hardware to specifications with a torque wrench.	P-1
	55.04 Inspect tire for proper application, (size, load range, position, and tread design); determine needed action.	P-2
	55.05 Inspect wheel/rims for flaws, proper application, load range and design; ensure dual rims are properly clocked to access valve stems; determine needed action.	P-2
	55.06 Check operation of tire pressure monitoring system (TPMS); determine needed action if applicable.	P-3
56.0	Frame and coupling diagnosis, service, and repair. The student will be able to:	

56.01	Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, and mounting hardware.	P-1
56.02	Inspect and service sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls.	P-2
56.03	Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed repairs.	P-1
56.04	Inspect, install, or repair frame hangers, brackets, and cross members in accordance with manufacturers' recommended procedures.	P-3
56.05	Inspect, repair or replace pintle hooks and draw bars, if applicable.	P-2

Course Description: The Diesel Drivetrain Technician 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 clutch, transmission, driveshaft, universal joint, and drive axle systems.

For every task in Diesel Drivetrain Technician, 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 first task in Diesel Drivetrain Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

DT Task List:
P-1 = 27
P-2 = 18
P-3 = 12
Total 57

Course Number: DIM0108 Occupational Completion Point: H Diesel Drivetrain Technician – 150 Hours		**Priority Number**
57.0	Clutch diagnosis and repair. The student will be able to:	
57.01	Identify causes of clutch noise, binding, slippage, pulsation, vibration, grabbing, dragging, and chatter problems; determine needed action.	P-1
57.02	Inspect and adjust clutch linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push and pull-type assemblies); check pedal height and travel; perform needed action.	P-1
57.03	Inspect, adjust, repair, and replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system.	P-2
57.04	Inspect, adjust, lubricate or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals.	P-1
57.05	Inspect, adjust, and replace single-disc clutch pressure plate and clutch disc.	P-1
57.06	Inspect, adjust, and replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs.	P-1

57.07	Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; perform needed action.	P-1
57.08	Inspect, adjust, and replace self-adjusting/continuous-adjusting clutch mechanisms.	P-1
57.09	Inspect and replace pilot bearing.	P-1
57.10	Remove and reinstall flywheel, inspect mounting area on crankshaft, rear main oil seal, and measure crankshaft end play; determine needed action.	P-1
57.11	Inspect flywheel, starter ring gear and measure flywheel face and pilot bore runout; determine needed action.	P-1
57.12	Inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.	P-2
58.0	Transmission diagnosis and repair. The student will be able to:	
58.01	Identify causes of transmission noise, shifting concerns, lockup, jumping-out-of-gear, overheating, and vibration problems; determine needed action.	P-1
58.02	Inspect, test, repair, or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies.	P-2
58.03	Inspect and replace transmission mounts, insulators, and mounting bolts.	P-1
58.04	Inspect for leakage and replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; repair as needed.	P-1
58.05	Check transmission fluid level and condition; determine needed service; add proper type of lubricant.	P-1
58.06	Inspect, adjust, and replace transmission shift lever, cover, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires.	P-2
58.07	Remove and reinstall transmission.	P-1
58.08	Inspect input shaft, gear, spacers, bearings, retainers, and slingers; determine needed action.	P-3
58.09	Inspect transmission oil filters and coolers and related components; replace as needed.	P-2
58.10	Inspect speedometer components; determine needed action.	P-2
58.11	Inspect and adjust power take-off (P.T.O.) assemblies, controls, and shafts; determine needed action.	P-3
58.12	Inspect and test function of reverse light, neutral start, and warning device circuits; determine needed action.	P-1
58.13	Inspect and test transmission temperature gauge, wiring harnesses and sensor/sending unit; determine needed action.	P-2
58.14	Inspect and test operation of automated mechanical transmission and manual electronic shift controls, shift, range and splitter solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU) neutral/in gear and reverse switches, and wiring harnesses; determine needed action.	P-2
58.15	Inspect and test operation of automated mechanical transmission electronic shift selectors, air and electrical switches, displays and indicators, wiring harnesses, and air lines; determine needed action.	P-2

	58.16 Use appropriate electronic service tool(s) and procedures to diagnose automated mechanical transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed action.	P-1
	58.17 Inspect and test operation of automatic transmission electronic shift controls, shift solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, and wiring harnesses.	P-2
	58.18 Inspect and test operation of automatic transmission electronic shift selectors, switches, displays and indicators, wiring harnesses.	P-2
	58.19 Use appropriate electronic service tool(s) and procedures to diagnose automatic transmission problems; check and record diagnostic codes, clear codes, and interpret digital multi-meter (DMM) readings; determine needed repairs.	P-3
	58.20 Diagnose transmission component failure cause, both before and during disassembly procedures; determine needed action.	
	58.21 Inspect, adjust, service, repair, or replace transmission remote shift linkages, brackets, bushings, pivots, and levers.	
	58.22 Inspect and adjust main shaft, gears, sliding clutches, washers, spacers, bushings, bearings, auxiliary drive assemblies, retainers, and keys; replace as needed.	
	58.23 Inspect countershafts, gears, bearings, retainers, and keys; adjust bearing preload and time multiple countershaft gears; replace as needed.	
	58.24 Inspect output shafts, gears, washers, spacers, bearings, retainers, and keys; replace as needed.	
	58.25 Inspect and/or replace reverse idler shafts, gears, bushings, bearings, thrust washers, and retainers; check reverse idler gear end play (where applicable).	
	58.26 Inspect synchronizer hub, sleeve, keys (inserts), springs, blocking rings, synchronizer plates, blocker pins, and sliding clutches; replace as needed.	
	58.27 Inspect transmission cases including surfaces, bores, bushings, pins, studs, and magnets; replace as needed.	
	58.28 Inspect transmission lubrication system pumps, troughs, collectors, and slingers; service or replace as needed.	
59.0	Driveshaft and universal joint diagnosis and repair. The student will be able to:	
	59.01 Identify causes of driveshaft and universal joint noise and vibration problems; determine needed action.	P-1
	59.02 Inspect, service, or replace driveshaft, slip joints, yokes, drive flanges, and universal joints; driveshaft boots and seals, and retaining hardware; check phasing of all shafts.	P-1
	59.03 Inspect driveshaft center support bearings and mounts; determine needed action.	P-1
	59.04 Measure drive line angles; determine needed action.	P-1
60.0	Drive axle diagnosis and repair. The student will be able to:	
	60.01 Identify causes of drive axle(s) drive unit noise and overheating problems; determine needed action.	P-2

60.02	Check and repair fluid leaks; inspect and replace drive axle housing cover plates, gaskets, sealants, vents, magnetic plugs, and seals.	P-1
60.03	Check drive axle fluid level and condition; determine needed service; add proper type of lubricant.	P-1
60.04	Remove and replace differential carrier assembly.	P-2
60.05	Inspect and replace differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearings.	P-3
60.06	Inspect and replace components of locking differential case assembly.	P-3
60.07	Inspect differential carrier housing and caps, side bearing bores, and pilot (spigot, pocket) bearing bore; determine needed action.	P-3
60.08	Measure ring gear runout; determine needed action.	P-2
60.09	Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cages, and bearings.	P-3
60.10	Measure and adjust drive pinion bearing preload.	P-3
60.11	Measure and adjust drive pinion depth.	P-3
60.12	Measure and adjust side bearing preload and ring gear backlash.	P-2
60.13	Check and interpret ring gear and pinion tooth contact pattern; determine needed action.	P-2
60.14	Inspect, adjust, or replace ring gear thrust block/bolt.	P-3
60.15	Inspect power divider (inter-axle differential) assembly; determine needed action.	P-3
60.16	Inspect, adjust, repair, or replace air operated power divider (inter-axle differential) lockout assembly including diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls.	P-2
60.17	Inspect, repair, or replace drive axle lubrication system: pump, troughs, collectors, slingers, tubes, and filters.	P-3
60.18	Inspect and replace drive axle shafts.	P-1
60.19	Remove and replace wheel assembly; check rear wheel seal and axle flange gasket for leaks; perform needed action.	P-1
60.20	Identify causes of drive axle wheel bearing noise and check for damage; perform needed action.	P-1
60.21	Inspect and test drive axle temperature gauge, wiring harnesses, and sending unit/sensor; determine needed action.	P-2
60.22	Clean, inspect, lubricate and replace wheel bearings; replace seals and wear rings; inspect and replace retaining hardware; adjust drive axle wheel bearings. Verify end play with dial indicator method	P-1

Course Description: The Diesel Power Train Technician course is designed to build on the skills and knowledge students learned in the Diesel Drivetrain Technician course for entry into the Heavy Equipment industry. Content emphasizes beginning skills. Students study shop safety procedures, track systems, power trains, components, and qualifications for employment.

Course Number: DIM0110 **Occupational Completion Point: I** **Diesel Power Train Technician – 150 Hours**	
65.0	Demonstrate shop and occupational safety procedures. The student will be able to:
65.01	For all track system and power train technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
65.02	Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
66.0	Identify the requirements for maintenance and repairing track systems.--The student will be able to:
66.01	Identify types of track system components.
66.02	Describe common problems with track systems and components.
66.03	Explain methods for removing, installing, and aligning track assemblies.
66.04	Demonstrate methods for maintaining and repairing track systems.
66.05	Demonstrate methods for maintaining track assemblies, sprockets, bottom rollers, top rollers, and idler.
66.06	Perform undercarriage measurements and specification comparison for wear life percentage.
67.0	Maintain and repair power train systems and components. The student will be able to:
67.01	Troubleshoot and repair components and assemblies of winches, clutches, and transmissions.
67.02	Describe common problems of operation of winches, clutches, and transmissions.
67.03	Remove, replace or rebuild, and adjust transmissions.
67.04	Remove, replace, and adjust push- and pull-type clutches.
67.05	Inspect flywheel surface for wear or cracks.
68.0	Maintain and repair differentials, final drives, and drivetrains. The student will be able to:
68.01	Describe procedures to troubleshoot and repair final drive assemblies; remove and replace as needed.
68.02	Inspect drive shaft for correct timing.
68.03	Replace universal joints.

	68.04 Rebuild differential assembly.
	68.05 Overhaul differential.
69.0	Demonstrate the qualifications for employment. The student will be able to:
	69.01 Demonstrate shop organization, management, and safety requirements for a diesel power train technician.
	69.02 Demonstrate the use of tools and equipment required for an electrical and electronics technician.
	69.03 Demonstrate workplace communication skills required by a diesel power train technician.
	69.04 Demonstrate the application of math and science principles required for a diesel power train technician's job tasks.
	69.05 Demonstrate employability skills as a diesel power train technician.

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Heavy Equipment Operations Technician**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T440200	
CIP Number	0649020201	
Grade Level	30, 31	
Program Length	1200 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 8	Communications (Reading and Language Arts): 8

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, and skills to operate and maintain a variety of heavy equipment such as crawler tractors, motor graders, scrapers and shovels or cranes. Students training on one machine must complete all related program content.

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

Program Structure

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

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	TRA0070	Heavy Equipment Maintenance Technician	OPER ENGR @7 7G	150 hours
B	TRA0086	Tractor Operator		150 hours
C	TRA0087	Off-road Equipment Operator 1		300 hours
D	TRA0088	Off-road Equipment Operator 2		300 hours
E	TRA0049	Crane Operator		300 hours

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 understanding of safety procedures.
02.0 Demonstrate understanding of operation and maintenance of mechanical systems and engines.
03.0 Operate pneumatic and crawler-type tractor with attachments.
04.0 Operate a backhoe.
05.0 Operate a motor grader.
06.0 Utilize utility construction equipment as applicable.
07.0 Operate crane or alternative equipment (operating engineer).

Florida Department of Education
Student Performance Standards

Program Title: **Heavy Equipment Operations Technician**
Career Certificate Program Number: **T440200**

Course Description: The Heavy Equipment Maintenance Technician course prepares students for entry into the Heavy Equipment Operations industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study shop safety, mechanical systems, and engines.

Course Number: TRA0070 **Occupational Completion Point: A** **Heavy Equipment Maintenance Technician – 150 Hours**	
01.0	Demonstrate understanding of safety procedures. The student will be able to:
01.01	Apply safety practices during operation of heavy equipment.
01.02	Discuss function of each piece of heavy equipment as appropriate.
01.03	Turn and back-up equipment safely.
01.04	Operate equipment on roadway safely.
02.0	Demonstrate understanding of operation and maintenance of mechanical systems and engines. The student will be able to:
02.01	Perform preventive maintenance on equipment including greasing, changing oil, and replacing filters.
02.02	Perform additional maintenance based on specific equipment needs.
02.03	Safety check equipment prior to operation.

Course Description: The Tractor Operator course is designed to build on the skills and knowledge students learned in the Heavy Equipment Maintenance Technician course for entry into the Heavy Equipment Operations industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students' study pneumatic, and crawler-type tractor operations.

Course Number: TRA0086 **Occupational Completion Point: B** **Tractor Operator – 150 Hours**	
03.0	Operate pneumatic and crawler-type tractor with attachments. The student will be able to:
03.01	Move, level, and spread top soil.
03.02	Remove stumps.

03.03	Pile debris for burning.
03.04	Remove and replace dozer blade.
03.05	Remove and replace bucket.
03.06	Attach cutting teeth as needed.
03.07	Safely load dump trucks.

Course Description: The Off-road Equipment Operator 1 course is designed to build on the skills and knowledge students learned in the Tractor Operator course for entry into the Heavy Equipment Operations industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study back hoe, and motor grader operations.

Course Number: TRA0087 Occupational Completion Point: C Off-road Equipment Operator 1 – 300 Hours	
04.0	Operate a backhoe. The student will be able to:
04.01	Dig pit to specified grade.
04.02	Observe for cables, pipes, and underground utilities.
04.03	Dig ditches for drainage and pipes.
04.04	Install bucket teeth to backhoe
05.0	Operate a motor grader. The student will be able to:
05.01	Grade to specific levels.
05.02	Apply use of grading stakes when operating motor grade.
05.03	Build a roadbed.
05.04	Perform blue-top grade (finish).
05.05	Change blade and scarifier teeth on motor grader.

Course Description: The Off-road Equipment Operator 2 course is designed to build on the skills and knowledge students learned in the Off-road Equipment Operator 1 course for entry into the Heavy Equipment Operations industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study utility construction equipment operation.

Course Number: TRA0088 **Occupational Completion Point: D** **Off-road Equipment Operator 2 – 300 Hours**	
06.0	Utilize utility construction equipment as applicable. The student will be able to:
06.01	Operate scraper.
06.02	Operate trencher.
06.03	Operate tar kettle.
06.04	Operate rollers.
06.05	Operate concrete mixer.

Course Description: The Crane Operator course is designed to build on the skills and knowledge students learned in the Off-road Equipment Operator 1 & 2 courses for entry into the Heavy Equipment Operations industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study crane or alternative equipment operation.

Course Number: TRA0049 **Occupational Completion Point: E** **Crane Operator – 300 Hours**	
07.0	Operate a crane or alternative equipment (operating engineer). The student will be able to:
07.01	Apply safety procedures.
07.02	Review “Construction Industry Manufactures Association” safety manuals.
07.03	Operate crane with drag bucket, clamshell, and hook. (Optional)
07.04	Load dump truck with crane. (Optional)
07.05	Operate alternative equipment

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 initial employment with occupational titles as operating engineers. **Schools may elect to train on heavy equipment unique to their Local employment area in OCP C, D, and E as an instructional option.**

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

Many areas of the state do not have the need to train crane operators. To assist business and industry and provide solutions for students needing training on alternative pieces of equipment; requiring the same number of hours (300), alternative equipment to meet the requirements of Occupational Completion Point E may be used.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program		
Program Number	T440400	
CIP Number	0647060515	
Grade Level	30, 31	
Program Length	600 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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. The courses after core (OCP-A) may be taken in any sequence.

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

When offered at the postsecondary level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	DIM0101	Diesel Engine Mechanic/Technician Helper	DIESEL MECH @7 7G	150 hours
B	DIM0131	Diesel Air Brakes Technician		150 hours
C	DIM0153	Diesel Preventive Maintenance Technician		300 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Medium and Heavy Duty Bus and Truck / Diesel Systems Technician program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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 Inspect and Service Engine systems.
13.0 Inspect and Service Fuel system.
14.0 Inspect and service Air induction and exhaust system.
15.0 Inspect and Service Cooling system.
16.0 Inspect and Service Lubrication system.
17.0 Inspect and Service Instruments and controls.
18.0 Inspect and Service Safety equipment.
19.0 Inspect and Service Cab.
20.0 Inspect and Service Heating, ventilation, and air conditioning (HVAC).
21.0 Inspect and Service Battery and starting systems.
22.0 Inspect and Service Electrical/Electronic charging systems.
23.0 Inspect and Service Lighting systems.
24.0 Inspect and Service Air brake systems.
25.0 Inspect and Service Hydraulic brake systems.
26.0 Inspect and Service Drive Train systems.
27.0 Inspect and Service Suspension and steering systems.
28.0 Inspect and Service Tires and wheels.
29.0 Inspect and Service Frame and fifth wheel.

Florida Department of Education
Student Performance Standards

Program Title: **Diesel Preventative Maintenance Technology**
Career Certificate Program Number: **T440400**

Course Description: The Diesel Engine Mechanic/Technician Helper 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 Mechanic/Technician Helper, 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.

ASE = Required Supplemental Tasks

Course Number: DIM0101 **Occupational Completion Point: A** **Diesel Engine Mechanic/Technician Helper – 150 Hours**		**Priority Number**
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
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 Personal Protection Equipment (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) and electronic brake	ASE

	control systems.	
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 and demonstrate tools and 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
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 systems and subsystems.	
04.03	Identify the components of and explain the operating principles of a four-stroke-cycle engine.	
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, verify customer concern, complete cause and correction, verify repair and list all diagnosis steps taken.	ASE
05.05	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.)	ASE

	05.06 Describe a Federal Dept. of Transportation inspection requirement.	
	05.07 Demonstrate proper preventive maintenance (PM).	
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
	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

Course Description: The Diesel Air Brakes Technician 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 Air Brakes Technician, 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.

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

Course Number: DIM0131 Occupational Completion Point: B Diesel Air Brakes Technician – 150 Hours	**Priority Number**
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, unloader assembly valves, filters, lines, hoses, and fittings; replace as needed.	P-1
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, manual and automatic drain valves; replace as needed.	P-1
07.09 Inspect and service 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; replace as needed.	P-1
	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
	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

Course Description: The Diesel Engine Preventative Maintenance Technician 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, air conditioning systems, 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 Preventative Maintenance Technician, 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 Preventative Maintenance Technician 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.

PM Task List:	
P-1 =	**132**
P-2 =	**11**
P-3 =	**0**
Total	**143**

Course Number: DIM0153 Occupational Completion Point: C Diesel Preventative Maintenance Technician – 300 Hours		Priority Number
12.0	Inspect and service Engine Systems record findings -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
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	Inspect and Service 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	Inspect and Service 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, quality, 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

15.0	Inspect and Service 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	Identify type of coolant and check 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	Inspect and Service 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; inspect gasket and replace as needed.	P-1
16.02	Take an engine oil sample for analysis.	P-1
17.0	Inspect and Service 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 engagement of 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
17.08	Check mechanical and electronic speed controls (if equipped).	
18.0	Inspect and Service 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	Inspect and Service Cab. 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
20.0	Inspect and Service 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
	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
21.0	Inspect and Service Electrical/Electronic battery and starting systems. The student will be able to:	
	21.01 Inspect battery box(es), cover(s), and mountings.	P-1
	21.02 Inspect battery hold-downs, connections, cables, and cable routing; service as needed.	P-1
	21.03 Identify type of battery; flooded cell, AGM, etc.).	
	21.04 Check/record battery state-of-charge (open circuit voltage) and condition.	P-1
	21.05 Perform battery test (load and/or capacitance).	P-1
	21.06 Inspect starter, mounting, and connections.	P-1
	21.07 Engage starter; check for unusual noises, starter drag, and starting difficulty.	P-1
22.0	Inspect and Service Electrical/Electronic charging systems. The student will be able to:	

	22.01 Inspect alternator, mounting, wiring, and routing; correct as indicated.	P-1
	22.02 Perform alternator output tests.	P-1
23.0	Inspect and Service Electrical/Electronic lighting systems. The student will be able to:	
	23.01 Check operation of interior lights; correct as indicated.	P-1
	23.02 Check all exterior lights, lenses, reflectors, and conspicuity tape; check headlight alignment; correct as indicated.	P-1
	23.03 Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s); correct as indicated.	P-1
24.0	Inspect and Service 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; drain air tanks and check for contamination.	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
	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 Check condition of pressure relief (safety) valves.	P-1
25.0	Inspect and Service 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.	
26.0	Inspect and Service 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 and condition; correct as indicated.	P-1
	26.09 Inspect U-joints, yokes, driveshafts, 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; correct as indicated.	P-1
	26.14 Check transmission wiring, connectors, seals, and harnesses for damage and proper routing.	P-1

	26.15 Change transmission oil and filter, if applicable; check and clean magnetic plugs.	P-2
	26.16 Check inter-axle differential lock operation.	P-1
	26.17 Check transmission range shift operation.	P-1
27.0	Inspect and Service Suspension and steering systems. The student will be able to:	
	27.01 Check steering wheel operation for free play and binding.	P-1
	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; correct as indicated	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	Inspect and Service 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; correct as indicated.	P-1
	28.04 Measure and record tread depth; probe for imbedded debris. Check tire matching (diameter and tread) on single and dual tire applications.	P-1
	28.05 Check and record air pressure; adjust air pressure in accordance with manufacturers' specifications.	P-1
	28.06 Check wheel studs and lug nuts; re-torque in accordance with manufacturer specifications.	P-1
	28.07 Inspect wheel/rims for proper application, load range and design; ensure dual rims are properly clocked to access valve stems; correct as indicated.	P-1

29.0	Inspect and Service 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

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

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 Automotive Service Excellence (ASE) Education Foundation.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Manufacturer Specific Automotive Service Technology 1**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T600100	
CIP Number	0647060413	
Grade Level	30, 31	
Program Length	700 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in 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.

NOTE: It is recommended that students complete **OCP-A (Automotive Maintenance Technician)** and/or demonstrate mastery of the outcomes in **OCP-A (Automotive Maintenance Technician)** prior to enrolling in additional Advanced Automotive Service Technology courses. **The sequence of OCP's, after completing and/or demonstrating mastery of OCP-A (Automotive Maintenance Technician), is at the discretion of the instructor.**

Benchmarks identified with a designation of P-1, P-2, or P-3 are ASE tasks. P-4 tasks are additional tasks that may be required by the manufacturer partner. P-4 tasks can be either instructor led or performed by the student as determined by the manufacturer's curriculum.

When offered at the postsecondary adult career and technical level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	AER0011	Automotive Maintenance Technician	AUTO IND @7 %7 %G AUTO MECH @7 7G	200 hours
B	AER0319	Advanced Automotive Electrical/Electronic System Technician		500 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Advanced Automotive Service Technology program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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 Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services.
03.0 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.

Florida Department of Education
Student Performance Standards

Program Title: **Manufacturer Specific Automotive Service Technology 1**
Career Certificate Program Number: **T600100**

Course Description: The Automotive Maintenance Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study shop and personal safety skills, tools and equipment, pre/post maintenance, and customer service.

Abbreviations:
ASE = Supplemental Tasks

For every task in Automotive Maintenance Technician course, 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.

Course Number: AER0011 **Occupational Completion Point: A** **Automotive Maintenance Technician – 200 Hours**		**Priority Number**
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 general shop safety rules and procedures.	P-4
01.02	Utilize safe procedures for handling of tools and equipment.	P-4
01.03	Identify and use proper placement of floor jacks and jack stands.	P-4
01.04	Identify and use proper procedures for safe lift operation.	P-4
01.05	Utilize proper ventilation procedures for working within the lab/shop area.	P-4
01.06	Identify marked safety areas.	P-4
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.	P-4
01.08	Identify the location and use of eye wash stations.	P-4
01.09	Identify the location of the posted evacuation routes.	P-4
01.10	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.	P-4

01.11	Identify and wear appropriate clothing for lab/shop activities.	P-4
01.12	Secure hair and jewelry for lab/shop activities.	P-4
01.13	Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	P-4
01.14	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).	P-4
01.15	Locate and demonstrate knowledge of safety data sheets (SDS).	P-4
01.16	Identify tools and their usage in automotive applications.	P-4
01.17	Identify standard and metric designation.	P-4
01.18	Demonstrate safe handling and use of appropriate tools.	P-4
01.19	Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	P-4
01.20	Demonstrate proper use of precision measuring tools (i.e., micrometer, dial-indicator, dial-caliper).	P-4
01.21	Identify information needed and the service requested on a repair order.	P-4
01.22	Identify purpose and demonstrate proper use of fender covers, mats.	P-4
01.23	Demonstrate use of the three C’s (concern, cause, and correction).	P-4
01.24	Review vehicle service history.	P-4
01.25	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P-4
01.26	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).	P-4
01.27	Identify appropriate emergency first aid procedures.	P-4
01.28	Identify proper procedures for safe pit usage.	P-4
01.29	Use proper handling procedures for automotive fluids.	P-4
01.30	Identify and describe typical automotive lubricants and lubricant properties.	P-4
01.31	Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).	P-4
01.32	Identify and describe typical automotive seals and gaskets.	P-4
01.33	Explain the effects of chemical/substance abuse.	P-4
01.34	Identify principles of stress management.	P-4
01.35	Identify and define career opportunities in the automotive service industry.	P-4
01.36	Demonstrate knowledge of appropriate automotive industry certifications.	P-4

	01.37 Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.	P-4
02.0	Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services. The student will be able to:	
	02.01 Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.	P-4
	02.02 Locate and use Vehicle identification Number (VIN) vehicle information placards, decals, tags, as required.	P-4
	02.03 Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.	P-4
	02.04 Demonstrate retrieving stored diagnostic trouble codes.	P-4
	02.05 Reset product specific service indicator.	P-4
	02.06 Identify acceptable customer relations.	P-4
	02.07 Identify and demonstrate proper customer relations skills.	P-4
	02.08 Identify and define payroll deductions (taxes, insurance, and social security) employee benefits and pay systems.	P-4
	02.09 Identify principles of time management.	P-4
	02.10 Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.	P-4
	02.11 Use proper chemicals for cleaning and lubrication.	P-4
	02.12 Determine the presence of a Tire Pressure Monitoring System (TPMS).	P-4
	02.13 Identify service considerations when equipped with a Tire Pressure Monitoring System (TPMS).	P-4
	02.14 Determine the presence of wheel locks.	P-4
	02.15 Determine the presence of an air suspension system.	P-4
	02.16 Check operation and status of instrument panel warning lights and gauges.	P-4
	02.17 Inspect under hood area for leaks, damage, and unusual conditions.	P-4
	02.18 Inspect undercar area for leaks, damage, and unusual conditions.	P-4
	02.19 Inspect engine assembly for fuel, oil, coolant, and other leaks.	P-4
	02.20 Determine fluid type requirements and identify fluid.	P-4
	02.21 Check engine oil level and condition; service as required.	P-4
	02.22 Check engine coolant level and condition; service as required.	P-4
	02.23 Inspect cooling system pipes and hoses for wear, damage, and proper routing.	P-4
	02.24 Check power steering fluid level and condition; service as required.	P-4

02.25	Lubricate driveline, suspension and steering systems as applicable.	P-4
02.26	Inspect and replace power steering hoses and fittings.	P-4
02.27	Inspect struts, springs, and related components; service as required.	P-4
02.28	Inspect stabilizer bar, bushings, brackets, and links; service as required.	P-4
02.29	Inspect springs, torsion bars, and related components; service as required.	P-4
02.30	Inspect shock absorbers and related components.	P-4
02.31	Check windshield washer fluid level and condition; service as required.	P-4
02.32	Check automatic transmission fluid level and condition; service as required.	P-4
02.33	Check differential/transfer case fluid level; note unusual conditions; service as required.	P-4
02.34	Check manual transmission fluid level; note unusual conditions; service as required.	P-4
02.35	Service transmission; perform visual inspection; replace fluids and filters.	P-4
02.36	Check hydraulic clutch fluid and condition; service as required.	P-4
02.37	Check rear axle drive assembly seals and vents; check lube level.	P-4
02.38	Inspect constant velocity (CV) axle shaft boots; service as required.	P-4
02.39	Remove, inspect, and service front and rear wheel bearings on non-drive axles.	P-4
02.40	Check wheel bearings for play and other signs of wear.	P-4
02.41	Inspect, replace, and adjust drive belts; inspect tensioners and pulleys.	P-4
02.42	Inspect and replace air filter.	P-4
02.43	Inspect and replace cabin air filter.	P-4
02.44	Inspect tires, diagnose tire wear patterns, inspect spare and mounting system; check and adjust tire pressure; where applicable.	P-4
02.45	Rotate tires according to manufacturer’s recommendations.	P-4
02.46	Balance wheel and tire assembly (static, dynamic and road force balance); where applicable.	P-4
02.47	Dismount, inspect, repair, and remount tire on wheel.	P-4
02.48	Repair tire according to industry standards.	P-4
02.49	Identify nitrogen-filled tires.	P-4
02.50	Reinstall wheel; torque wheel fasteners to specification.	P-4
02.51	Perform a visual inspection of a brake drum system.	P-4

02.52	Perform a visual inspection of a disc brake system.	P-4
02.53	Check parking brake operation; check parking brake components for unusual conditions.	P-4
02.54	Check master cylinder for internal and external leaks and proper operation.	P-4
02.55	Fill master cylinder with recommended fluid and seat pads.	P-4
02.56	Check brake fluid level and condition; service as required.	P-4
02.57	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.	P-4
02.58	Identify and use the proper procedures required for cutting tubing and double and ISO flaring.	P-4
02.59	Inspect flexible brake hoses for leaks, kinks, cracks, bulging or wear; tighten loose fittings and supports.	P-4
02.60	Inspect fuel tank, fuel cap and seal; inspect and replace fuel lines, fittings, and hoses; as applicable.	P-4
02.61	Inspect and replace fuel filters as applicable.	P-4
02.62	Inspect exhaust manifold, exhaust pipes, mufflers, resonators, tail pipes, and heat shields; repair or replace as needed.	P-4
02.63	Inspect, test head lamps, tail lamps and stop lamps. Aim headlights.	P-4
02.64	Inspect and replace exterior and courtesy lamps.	P-4
02.65	Check wiper blades, inserts, and arms; replace wiper blades or inserts.	P-4
02.66	Lubricate door latches and hinges.	P-4
02.67	Perform slow/fast battery charge.	P-4
02.68	Inspect, clean, fill, and replace battery.	P-4
02.69	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.	P-4
02.70	Perform battery, starting, and charging system tests using appropriate tester.	P-4
02.71	Perform battery test; determine needed service.	P-4
02.72	Start a vehicle using jumper cables or a battery auxiliary power supply (jump box).	P-4
02.73	Demonstrate knowledge of abnormal key-off battery drain.	P-4
02.74	Perform starter current draw and circuit voltage drop test; determine necessary action.	P-4
02.75	Remove and replace/reinstall starter.	P-4
02.76	Remove, inspect, and replace/reinstall alternator.	P-4
02.77	Observe dash warning lamps during bulb check.	P-4
02.78	Practice recommended precautions when handling static sensitive devices.	P-4

02.79	Check 12-volt non-computer electrical circuits with a test light; determine necessary action.	P-4
02.80	Check voltage and voltage drop in electrical circuits using a digital multi-meter (DMM).	P-4
02.81	Obtain and interpret digital multi-meter (DMM) readings.	P-4
02.82	Check current flow in electrical/electronic circuits and components using an ammeter.	P-4
02.83	Check electrical circuits using fused jumper wires.	P-4
02.84	Inspect and test fusible links, circuit breakers, and fuses; confirm proper circuit operation; replace as needed.	P-4
02.85	Maintain or restore electronic memory functions if required.	P-4
02.86	Inspect and test positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; service or replace as needed.	P-4
02.87	Remove and replace valve cover gaskets.	P-4
02.88	Return cores for rebuilt and exchange items.	P-4
02.89	Inspect driver and passenger restraint system.	P-4
02.90	Demonstrate knowledge of manufacturer policies and procedures.	P-4
02.91	Perform product specific service procedures.	P-4
02.92	Identify and maintain product specific engine systems.	P-4
02.93	Identify and maintain product specific automatic transmission systems.	P-4
02.94	Identify and maintain product specific manual transmission systems.	P-4
02.95	Identify and maintain product specific electrical and electronic systems.	P-4
02.96	Identify and maintain product specific heating and A/C systems.	P-4
02.97	Identify and maintain product specific steering and suspension systems.	P-4
02.98	Identify and maintain product specific brake systems.	P-4
02.99	Identify and maintain product specific audio systems.	P-4
02.100	Identify and maintain product specific safety systems.	P-4
02.101	Identify and maintain product specific accessories.	P-4
02.102	Identify product specific engine performance and emission related components	P-4
02.103	Use manufacturer specific scan tool to retrieve P, B, C and U type diagnostic trouble codes.	P-4

Course Description: The Advanced Automotive Electrical/Electronic System Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems diagnostics, service, and repair.

Abbreviations:
EE = Electrical/Electronic Systems

For every task in Advanced Automotive Electrical/Electronic System Technician course, 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.

EE Task List:	
P-1 =	29
P-2 =	16
P-3 =	1
Total	46

Course Number: AER0319 Occupational Completion Point: B Advanced Automotive Electrical/Electronic System Technician – 500 Hours		Priority Number
03.0	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		
03.01	Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.	P-1
03.02	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1
03.03	Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.	P-1
03.04	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1
03.05	Demonstrate proper use of a test light on an electrical circuit.	P-1
03.06	Use fused jumper wires to check operation of electrical circuits.	P-1
03.07	Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.	P-1
03.08	Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.	P-1
03.09	Inspect and test fusible links, circuit breakers, and fuses; determine needed action.	P-1
03.10	Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.	P-1

03.11 Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.	P-2
03.12 Repair data bus wiring harness.	P-1
Battery Diagnosis and Service	
03.13 Perform battery state-of-charge test; determine needed action.	P-1
03.14 Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action.	P-1
03.15 Maintain or restore electronic memory functions.	P-1
03.16 Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1
03.17 Perform slow/fast battery charge according to manufacturer's recommendations.	P-1
03.18 Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1
03.19 Identify safety precautions for high voltage systems on electric, hybrid, hybrid-electric, and diesel vehicles.	P-2
03.20 Identify electrical/electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.	P-1
03.21 Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.	P-2
Starting System Diagnosis and Repair	
03.22 Perform starter current draw tests; determine needed action.	P-1
03.23 Perform starter circuit voltage drop tests; determine needed action.	P-1
03.24 Inspect and test starter relays and solenoids; determine needed action.	P-2
03.25 Remove and install starter in a vehicle.	P-1
03.26 Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.	P-2
03.27 Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.	P-2
03.28 Demonstrate knowledge of an automatic idle-stop/start-stop system.	P-2
Charging System Diagnosis and Repair	
03.29 Perform charging system output test; determine needed action.	P-1
03.30 Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.	P-1
03.31 Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P-1
03.32 Remove, inspect, and/or replace generator (alternator).	P-1
03.33 Perform charging circuit voltage drop tests; determine needed action.	P-1

Lighting Systems Diagnosis and Repair	
03.34 Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action.	P-1
03.35 Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.	P-1
03.36 Aim headlights.	P-2
03.37 Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2
Instrument Cluster and Driver Information Systems Diagnosis and Repair	
03.38 Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action.	P-2
03.39 Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine needed action.	P-2
03.40 Reset maintenance indicators as required.	P-2
Body Electrical Systems Diagnosis and Repair	
03.41 Diagnose 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 shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, cruise control, and auto dimming headlamps); determine needed repairs.	P-2
03.42 Diagnose 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-2
03.43 Diagnose 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
03.44 Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back-up camera); determine needed repairs.	P-1
03.45 Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action.	P-2
03.46 Describe the process for software transfer, software updates, or reprogramming of electronic modules.	P-2
Manufacturer Specific Electrical and Electronic Related Tasks	
03.47 Service and repair product specific electrical/electronic systems.	P-4
03.48 Perform product specific diagnostic procedures.	P-4
03.49 Locate and interpret vehicle major electrical/electronic components and identification numbers.	P-4
03.50 Identify location of hybrid vehicle high voltage circuits disconnect (service plug) location and safety procedures.	P-4

03.51	Manufacturer specific battery test; determine necessary action.	P-4
03.52	Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.	P-4
03.53	Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action.	P-4
03.54	Perform product specific electrical/electronic relearning procedures	P-4
03.55	Diagnose 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-4
03.56	Diagnose operation of heated and cooled accessories and related circuits (such as: heated/cooled seats, heated steering wheel, heated mirror, heated glass, and heated/cooled cup holders); determine needed repairs.	P-4
03.57	Diagnose operation of safety systems and related circuits (such as: airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back up camera); determine needed repairs.	P-4
03.58	Diagnose operation of comfort and convenience accessories and related circuits (such as: power windows, power seats, pedal height, power locks, truck locks, remote start, moon roof, sun roof, sun shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, and auto dimming headlamps); determine needed repairs.	P-4

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 P-1, P-2, or P-3 are ASE tasks.

It is highly recommended that the program be ASEEF Master Certified and be approved by the appropriate industry manufacturer to provide manufacturer certification. Instructors must meet the specific manufacturer certification and be A1-A8 ASE Master certified, Advanced Engine Performance (L1) ASE Certification is also recommended. Program must meet the equipment and specialty tool requirement as specified by the manufacturer sponsor. The program must offer EPA section 609 recognized refrigerant-recycling certification training.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Manufacturer Specific Automotive Service Technology 2**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T600200	
CIP Number	0647060414	
Grade Level	30, 31	
Program Length	1700 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics) 10	Communications (Reading and Language Arts): 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in 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 seven occupational completion points.

NOTE: It is recommended that students complete **OCP-A (Automotive Maintenance Technician) of Advanced Automotive Service Technology 1** and/or demonstrate mastery of the outcomes in **OCP-A (Automotive Maintenance Technician) of Advanced Automotive Service Technology 1** prior to enrolling in additional Advanced Automotive Service Technology courses. **The sequence of OCP's, after completing and/or demonstrating mastery of OCP-A (Automotive Maintenance Technician) of Advanced Automotive Service Technology 1, is at the discretion of the instructor.**

Benchmarks identified with a designation of P-1, P-2, or P-3 are ASE tasks. P-4 tasks are additional tasks that may be required by the manufacturer partner. P-4 tasks can be either instructor led or performed by the student as determined by the manufacturer's curriculum.

When offered at the postsecondary adult career and technical level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	AER0118	Advanced Engine Repair Technician	AUTO IND @7 %7 %G AUTO MECH @7 7G	200 hours
B	AER0258	Advanced Automatic Transmission and Transaxle Technician		200 hours
C	AER0275	Advanced Manual Drivetrain and Axle Technician		200 hours
D	AER0459	Advanced Automotive Suspension and Steering Technician		200 hours
E	AER0419	Advanced Automotive Brake System Technician		200 hours
F	AER0173	Advanced Automotive Heating and Air Conditioning Technician		200 hours
G	AER0506	Advanced Automotive Engine Performance Technician		500 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Advanced Automotive Service Technology program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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 Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, engine block, lubrication and cooling systems.
02.0 Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles.
03.0 Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive.
04.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions systems, wheel alignment, and wheels and tires.
05.0 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.
06.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling.
07.0 Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems.

Florida Department of Education
Student Performance Standards

Program Title: **Manufacturer Specific Automotive Service Technology 2**
Career Certificate Program Number: **T600200**

Course Description: The Advanced Engine Repair Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engine theory and repair, cylinder heads, valve trains, engine blocks, lubrication, and cooling systems.

Abbreviations:
ER = Engine Repair

For every task in Advanced Engine Repair Technician course, 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.

ER Task List:	
P-1 =	24
P-2 =	16
P-3 =	11
Total	51

Course Number: AER0018 Occupational Completion Point: A Advanced Engine Repair Technician – 200 Hours	Priority Number
01.0 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)	
01.01 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P-1
01.02 Research vehicle service information including fluid type, internal engine operation, vehicle service history, service precautions, and technical service bulletins.	P-1
01.03 Verify operation of the instrument panel engine warning indicators.	P-1
01.04 Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action.	P-1
01.05 Install engine covers using gaskets, seals, and sealers as required.	P-1
01.06 Verify engine mechanical timing.	P-1
01.07 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

01.08	Inspect, remove and/or replace engine mounts.	P-2
01.09	Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.	P-2
01.10	Remove and reinstall engine on a newer vehicle equipped with OBD; reconnect all attaching components and restore the vehicle to running condition.	P-3
Cylinder Head and Valve Train Diagnosis and Repair		
01.11	Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure.	P-1
01.12	Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1
01.13	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-2
01.14	Adjust valves (mechanical or hydraulic lifters).	P-1
01.15	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
01.16	Establish camshaft position sensor indexing.	P-1
01.17	Inspect valve springs for squareness and free height comparison; determine needed action.	P-3
01.18	Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action.	P-3
01.19	Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action.	P-3
01.20	Inspect valves and valve seats; determine needed action.	P-3
01.21	Check valve spring assembled height and valve stem height; determine needed action.	P-3
01.22	Inspect valve lifters; determine needed action.	P-2
01.23	Inspect and/or measure camshaft for runout, journal wear and lobe wear.	P-3
01.24	Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action.	P-3
Engine Block Assembly Diagnosis and Repair		
01.25	Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-1
01.26	Disassemble engine block; clean and prepare components for inspection and reassembly.	P-1
01.27	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.	P-2
01.28	Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.	P-2
01.29	Deglaze and clean cylinder walls.	P-2

01.30 Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.	P-3
01.31 Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine needed action.	P-1
01.32 Inspect main and connecting rod bearings for damage and wear; determine needed action.	P-2
01.33 Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.	P-3
01.34 Inspect and measure piston skirts and ring lands; determine needed action.	P-2
01.35 Determine piston-to-bore clearance.	P-2
01.36 Inspect, measure, and install piston rings.	P-2
01.37 Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance and/or silencer); inspect shaft(s) and support bearings for damage and wear; determine needed action; reinstall and time.	P-2
01.38 Assemble engine block.	P-1
Lubrication and Cooling Systems Diagnosis and Repair	
01.39 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 needed action.	P-1
01.40 Identify causes of engine overheating.	P-1
01.41 Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
01.42 Inspect and/or test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.	P-1
01.43 Inspect, remove, and replace water pump.	P-2
01.44 Remove and replace radiator.	P-2
01.45 Remove, inspect, and replace thermostat and gasket/seal.	P-1
01.46 Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.	P-1
01.47 Perform oil pressure tests; determine needed action.	P-1
01.48 Perform engine oil and filter change; use proper fluid type per manufacturer specification.	P-1
01.49 Inspect auxiliary coolers; determine needed action.	P-3
01.50 Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
01.51 Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.	P-2
Manufacturer Specific Engine Repair Tasks	

01.52 Inspect and replace engine cooling and heater system hoses.	P-4
01.53 Service product specific water pumps.	P-4
01.54 Service product specific belt drive and tensioner systems.	P-4
01.55 Service product specific engine systems.	P-4
01.56 Diagnose engine noises and vibrations; determine necessary action.	P-4
01.57 Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.	P-4
01.58 Perform engine vacuum tests; determine necessary action.	P-4
01.59 Service product specific cam drive systems.	P-4
01.60 Perform product specific valve adjustments.	P-4
01.61 Perform cylinder power balance tests; determine necessary action.	P-4
01.62 Perform cylinder cranking and running compression tests; determine necessary action.	P-4
01.63 Perform cylinder leakage tests; determine necessary action.	P-4
01.64 Remove and replace piston pin; where applicable.	P-4
01.65 Service product specific engines	P-4
01.66 Perform product specific relearn procedure	P-4

Course Description: The Advanced Automatic Transmission and Transaxle Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study automatic transmission/transaxle diagnosis, service, and repair.

Abbreviations:
AT = Automatic Transmission/Transaxle

For every task in Advanced Automatic Transmission and Transaxle Technician course, 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.

AT Task List:	
P-1 =	**17**
P-2 =	**19**
P-3 =	**3**
Total	**39**

Course Number: AER0258 Occupational Completion Point: B Advanced Automatic Transmission and Transaxle Technician – 200 Hours	Priority Number
02.0 Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles. The student will be able to:	
General: Transmission and Transaxle Diagnosis	
02.01 Identify and interpret transmission/transaxle concerns, differentiate between engine performance and transmission/transaxle concerns; determine needed action.	P-1
02.02 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
02.03 Diagnose fluid loss and condition concerns; determine needed action.	P-1
02.04 Check fluid level in a transmission or a transaxle equipped with a dip-stick.	P-1
02.05 Check fluid level in a transmission or a transaxle not equipped with a dip-stick.	P-1
02.06 Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine needed action.	P-1
02.07 Diagnose noise and vibration concerns; determine needed action.	P-2
02.08 Perform stall test; determine needed action.	P-2
02.09 Perform lock-up converter system tests; determine needed action.	P-3
02.10 Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.	P-1
02.11 Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.	P-1
02.12 Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).	P-2
In-Vehicle Transmission/Transaxle Maintenance Repair	
02.13 Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.	P-1
02.14 Inspect for leakage; replace external seals, gaskets, and bushings.	P-2
02.15 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 the relearn procedure.	P-1
02.16 Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.	P-1
02.17 Inspect, replace and align powertrain mounts.	P-2
Off-Vehicle Transmission and Transaxle Repair	

02.18	Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mounting surfaces.	P-2
02.19	Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings.	P-1
02.20	Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.	P-2
02.21	Describe the operational characteristics of a continuously variable transmission (CVT).	P-3
02.22	Describe the operational characteristics of a hybrid vehicle drive train.	P-3
02.23	Disassemble, clean, and inspect transmission/transaxle.	P-1
02.24	Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, switches, solenoids, sleeves, retainers, brackets, check valves/balls, screens, spacers, and gaskets).	P-2
02.25	Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine needed action.	P-2
02.26	Assemble transmission/transaxle.	P-1
02.27	Inspect, measure, and reseal oil pump assembly and components.	P-2
02.28	Measure transmission/transaxle end play and/or preload; determine needed action.	P-1
02.29	Inspect, measure, and/or replace thrust washers and bearings.	P-2
02.30	Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.	P-2
02.31	Inspect bushings; determine needed action.	P-2
02.32	Inspect and measure planetary gear assembly components; determine needed action.	P-2
02.33	Inspect case bores, passages, bushings, vents, and mating surfaces; determine needed action.	P-2
02.34	Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform needed action.	P-2
02.35	Inspect measure, repair, adjust or replace transaxle final drive components.	P-2
02.36	Inspect clutch drum, piston, check-balls, springs, retainers, seals, friction plates, pressure plates, and bands; determine needed action.	P-2
02.37	Measure clutch pack clearance; determine needed action.	P-1
02.38	Air test operation of clutch and servo assemblies.	P-1
02.39	Inspect one-way clutches, races, rollers, sprags, springs, cages, retainers; determine needed action.	P-2
Manufacturer Specific Automatic Transmission Tasks		
02.40	Install and seat torque converter to engage drive/splines.	P-4
02.41	Inspect bands and drums; determine necessary action.	P-4

02.42	Service product specific automatic transmissions/transaxles.	P-4
02.43	Perform product specific relearn procedure.	P-4
02.44	Diagnose electronic transmission control systems using appropriate test equipment, service information, technical service bulletins, and schematics; diagnose shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.	P-4
02.45	Differentiate between engine performance, or other vehicle systems, and transmission/transaxle related problems; determine necessary action.	P-4
02.46	Diagnose shift quality concerns resulting from problems in the electronic transmission control system; determine necessary action.	P-4

Course Description: The Advanced Manual Drivetrain and Axle Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study manual drivetrain, clutch, transmission/transaxle, drive and half-shaft universals, constant velocity joints, rear axle differential, limited slip, four-wheel drive, all-wheel drive operation, assembly, diagnosis, service and repair.

Abbreviations:
MD = Manual Drivetrain and Axles

For every task in Advanced Manual Drivetrain and Axle Technician course, 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.

MD Task List:	
	P-1 = 18
	P-2 = 16
	P-3 = 16
Total	**50**

Course Number: AER0275 Occupational Completion Point: C Advanced Manual Drivetrain and Axle Technician – 200 Hours		**Priority Number**
03.0	Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive. The student will be able to:	
General: Drive Train Diagnosis		
03.01	Identify and interpret drive train concerns; determine needed action.	P-1
03.02	Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
03.03	Check fluid condition; check for leaks; determine needed action.	P-1
03.04	Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification.	P-1

Clutch Diagnosis and Repair	
03.05 Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action.	P-1
03.06 Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform needed action.	P-1
03.07 Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable).	P-1
03.08 Bleed clutch hydraulic system.	P-1
03.09 Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.	P-1
03.10 Inspect flywheel and ring gear for wear, cracks, and discoloration; determine needed action.	P-1
03.11 Measure flywheel runout and crankshaft end play; determine needed action.	P-2
03.12 Describe the operation and service of a system that uses a dual mass flywheel.	P-3
Transmission/Transaxle Diagnosis and Repair	
03.13 Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers.	P-2
03.14 Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.	P-2
03.15 Diagnose noise concerns through the application of transmission/transaxle power-flow principles.	P-2
03.16 Diagnose hard shifting and jumping out of gear concerns; determine needed action.	P-2
03.17 Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action.	P-3
03.18 Disassemble, inspect clean, and reassemble internal transmission/transaxle components.	P-2
Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair (Front, Rear, All-Wheel, and Four-Wheel drive)	
03.19 Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action.	P-1
03.20 Diagnose universal joint noise and vibration concerns; perform needed action.	P-2
03.21 Inspect, remove, and/or replace bearings, hubs, and seals.	P-1
03.22 Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.	P-1
03.23 Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.	P-2
Drive Axle Diagnosis and Repair – Ring and Pinion Gears and Differential Case Assembly	
03.24 Clean and inspect differential case; check for leaks; inspect housing vent.	P-1
03.25 Check and adjust differential case fluid level; use proper fluid type per manufacturer specifications.	P-1
03.26 Drain and refill differential case; use proper fluid type per manufacturer specifications.	P-1

03.27 Diagnose noise and vibration concerns; determine needed action.	P-2
03.28 Inspect and replace companion flange and/or pinion seal; measure companion flange runout.	P-2
03.29 Inspect ring gear and measure runout; determine needed action.	P-3
03.30 Remove, inspect, reinstall and/or drive pinion and ring gear, spacers, sleeves, and bearings.	P-3
03.31 Measure and adjust drive pinion depth.	P-3
03.32 Measure and adjust drive pinion bearing preload.	P-3
03.33 Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types).	P-3
03.34 Check ring and pinion tooth contact patterns; perform needed action.	P-3
03.35 Disassemble, inspect, measure, adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.	P-3
03.36 Reassemble and reinstall differential case assembly; measure runout; determine needed action.	P-3
Drive Axle Diagnosis and Repair – Limited Slip Differential	
03.37 Diagnose noise, slippage, and chatter concerns; determine needed action.	P-3
03.38 Measure rotating torque; determine needed action.	P-3
Drive Axle Diagnosis and Repair – Drive Axles	
03.39 Inspect and replace drive axle wheel studs.	P-1
03.40 Remove and replace drive axle shafts.	P-1
03.41 Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2
03.42 Measure drive axle flange runout and shaft end play; determine needed action.	P-2
03.43 Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine needed action.	P-2
Four-Wheel Drive/All-Wheel Drive Component Diagnosis and Repair	
03.44 Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-3
03.45 Inspect locking hubs; determine needed action.	P-3
03.46 Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P-3
03.47 Identify concerns related to variations in tire circumference and/or final drive ratios.	P-2
03.48 Diagnose noise, vibration, and unusual steering concerns; determine needed action.	P-3

03.49	Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive/all-wheel drive systems.	P-2
03.50	Disassemble, service, and reassemble transfer case and components.	P-2
Manufacturer Specific Manual Drivetrain and Axle Tasks		
03.51	Locate and interpret vehicle major drivetrain components and identification numbers.	P-4
03.52	Diagnose fluid loss, level, and condition concerns; determine necessary action.	P-4
03.53	Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.	P-4
03.54	Inspect engine block, core plugs, rear main engine oil seal, clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action.	P-4
03.55	Remove and reinstall manual transmission/transaxle.	P-4
03.56	Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action.	P-4
03.57	Inspect, replace, and align powertrain mounts.	P-4
03.58	Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.	P-4
03.59	Remove and replace transaxle final drive.	P-4
03.60	Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.	P-4
03.61	Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action.	P-4
03.62	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.	P-4
03.63	Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly.	P-4
03.64	Inspect lubrication devices (oil pump or slingers); perform necessary action.	P-4
03.65	Inspect, test, and replace transmission/transaxle sensors and switches.	P-4
03.66	Inspect, service, and replace shaft center support bearings.	P-4
03.67	Diagnose noise and vibration concerns; determine necessary action.	P-4
03.68	Inspect and reinstall limited slip differential components.	P-4
03.69	Remove and reinstall transfer case.	P-4
03.70	Service product specific clutch assembly	P-4
03.71	Service product specific manual transmission/transaxles	P-4
03.72	Service product specific driveaxles/driveshafts	P-4

03.73 Service product specific transfer cases	P-4

Course Description: The Advanced Automotive Suspension and Steering Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study front and rear suspension systems, wheel alignment, wheels and tire, diagnosis, service, and repair.

Abbreviations:
SS = Suspension and Steering

For every task in Advanced Automotive Suspension and Steering Technician course, 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.

SS Task List:	
P-1	**27**
P-2	**20**
P-3	**10**
Total	**57**

Course Number: AER0459 **Occupational Completion Point: D** **Advanced Automotive Suspension and Steering Technician – 200 Hours**	**Priority Number**
04.0 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: Suspension and Steering Systems	
04.01 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
04.02 Identify and interpret suspension and steering system concerns; determine needed action.	P-1
Steering Systems Diagnosis and Repair	
04.03 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1
04.04 Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).	P-1
04.05 Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action.	P-2
04.06 Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2
04.07 Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2
04.08 Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.	P-2

04.09	Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.	P-2
04.10	Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.	P-1
04.11	Inspect power steering fluid level and condition.	P-1
04.12	Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.	P-2
04.13	Inspect for power steering fluid leakage; determine needed action.	P-1
04.14	Remove, inspect, replace, and/or adjust power steering pump drive belt.	P-1
04.15	Remove and reinstall power steering pump.	P-2
04.16	Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.	P-2
04.17	Inspect, remove and/or replace power steering hoses and fittings.	P-2
04.18	Inspect, remove and/or replace pitman arm, relay (center-link/intermediate) rod, idler arm, mountings, and steering linkage damper.	P-2
04.19	Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps.	P-1
04.20	Inspect, test and diagnose electrically- assisted power steering systems (including using a scan tool); determine needed action.	P-2
04.21	Identify hybrid vehicle power steering system electrical circuits and safety precautions.	P-2
04.22	Test power steering system pressure; determine needed action.	P-2
Suspension Systems Diagnosis and Repair		
04.23	Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
04.24	Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
04.25	Inspect, remove, and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.	P-3
04.26	Inspect, remove, and/or replace strut rods and bushings.	P-3
04.27	Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators).	P-2
04.28	Inspect, remove, and/or replace steering knuckle assemblies.	P-3
04.29	Inspect, remove and/or replace short and long arm suspension system coil springs and spring insulators.	P-3
04.30	Inspect, remove, and/or replace torsion bars and mounts	P-3
04.31	Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.	P-3
04.32	Inspect, remove, and/or replace strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.	P-3

04.33 Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings.	P-3
04.34 Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.	P-1
Related Suspension and Steering Service	
04.35 Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.	P-1
04.36 Remove, inspect, service and/or replace front and rear wheel bearings.	P-1
04.37 Describe the function of suspension and steering control systems and components, (i.e. active suspension and stability control).	P-3
Wheel Alignment Diagnosis, Adjustment, and Repair	
04.38 Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action.	P-1
04.39 Perform pre-alignment inspection; measure vehicle ride height; determine needed action.	P-1
04.40 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
04.41 Check toe-out-on-turns (turning radius); determine needed action.	P-2
04.42 Check steering axis inclination (SAI) and included angle; determine needed action.	P-2
04.43 Check rear wheel thrust angle; determine needed action.	P-1
04.44 Check for front wheel setback; determine needed action.	P-2
04.45 Check front and/or rear cradle (sub-frame) alignment; determine needed action.	P-3
04.46 Reset steering angle sensor.	P-2
Wheels and Tires Diagnosis and Repair	
04.47 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
04.48 Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.	P-2
04.49 Rotate tires according to manufacturer’s recommendation including vehicles equipped with tire pressure monitoring systems (TPMS)	P-1
04.50 Measure wheel, tire, axle flange, and hub runout; determine needed action.	P-2
04.51 Diagnose tire pull problems; determine needed action.	P-1
04.52 Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.	P-1
04.53 Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-1
04.54 Inspect tire and wheel assembly for air loss; perform needed action.	P-1
04.55 Repair tire following vehicle manufacturer approved procedure.	P-1

04.56 Identify indirect and direct tire pressure monitoring system (TPMS); calibrate system; verify operation of instrument panel lamps.	P-1
04.57 Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure	P-1
Manufacturer Specific Steering and Suspension Tasks	
04.58 Service product specific suspension systems.	P-4
04.59 Service product specific ride height control systems.	P-4
04.60 Locate and interpret vehicle major suspension components and identification numbers.	P-4
04.61 Adjust non-rack and pinion worm bearing preload and sector lash.	P-4
04.62 Reinstall wheel; torque lug nuts.	P-4
04.63 Service product specific tire pressure monitoring systems	P-4
04.64 Service product specific electric power steering systems	P-4
04.65 Reset product specific steering wheel sensors	P-4
04.66 Interpret diagnostic trouble codes (DTCs) and scan tool data related to the steering and suspension control systems; determine necessary action.	P-4
04.67 Perform multiplex check to determine that all steering and suspension components are communicating and are performing within specifications.	P-4

Course Description: The Advanced Automotive Brake System Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study drum/disc brakes, hydraulics, power assist units, electronic brakes, traction control, stability control, and miscellaneous diagnostics, service, and repair.

Abbreviations:
BR = Brakes

For every task in Advanced Automotive Brake System Technician course, 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.

BR Task List:	
P-1	**= 40**
P-2	**= 11**
P-3	**= 5**
Total	**56**

Course Number: AER0419 Occupational Completion Point: E Advanced Automotive Brake System Technician – 200 Hours	**Priority Number**
05.0 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	
05.01 Identify and interpret brake system concerns; determine needed action.	P-1
05.02 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
05.03 Describe procedure for performing a road test to check brake system operation including an anti-lock brake system (ABS).	P-1
05.04 Install wheel and torque lug nuts.	P-1
Hydraulic System Diagnosis and Repair	
05.05 Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).	P-1
05.06 Measure brake pedal height, travel, and free play (as applicable); determine needed action.	P-1
05.07 Check master cylinder for internal/external leaks and proper operation; determine needed action.	P-1
05.08 Remove, bench bleed, and reinstall master cylinder.	P-1
05.09 Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.	P-1
05.10 Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear; and loose fittings/supports; determine needed action.	P-1
05.11 Replace brake lines, hoses, fittings, and supports.	P-2
05.12 Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).	P-2
05.13 Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P-1
05.14 Inspect, test, and/or replace components of brake warning light system.	P-3
05.15 Identify components of hydraulic brake warning light system.	P-2
05.16 Bleed and/or flush brake system.	P-1
05.17 Test brake fluid for contamination.	P-1
Drum Brake Diagnosis and Repair	
05.18 Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.	P-1
05.19 Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P-1
05.20 Refinish brake drum and measure final drum diameter; compare with specification.	P-1
05.21 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

05.22	Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2
05.23	Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	P-1
Disc Brake Diagnosis and Repair		
05.24	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.	P-1
05.25	Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action.	P-1
05.26	Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action.	P-1
05.27	Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action.	P-1
05.28	Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks.	P-1
05.29	Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.	P-1
05.30	Remove and reinstall/replace rotor.	P-1
05.31	Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P-1
05.32	Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-1
05.33	Retract and re-adjust caliper piston on an integrated parking brake system.	P-2
05.34	Check brake pad wear indicator; determine needed action.	P-1
05.35	Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.	P-1
Power-Assist Units Diagnosis and Repair		
05.36	Check brake pedal travel with and without engine running to verify proper power booster operation.	P-2
05.37	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
05.38	Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine needed action.	P-1
05.39	Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine needed action.	P-3
05.40	Measure and adjust master cylinder pushrod length.	P-3
Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair		
05.41	Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action.	P-1
05.42	Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.	P-2
05.43	Check parking brake system and components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.	P-1

05.44 Check parking brake operation and parking brake indicator light system operation; determine needed action.	P-1
05.45 Check operation of brake stop light system.	P-1
05.46 Replace wheel bearing and race.	P-3
05.47 Remove, reinstall, and/or replace sealed wheel bearing assembly.	P-1
05.48 Inspect and replace wheel studs.	P-1
Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) Systems Diagnosis and Repair	
05.49 Identify and inspect electronic brake control system components (ABS, TCS, ESC); determine needed action.	P-1
05.50 Describe the operation of a regenerative braking system.	P-3
05.51 Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action.	P-2
05.52 Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action.	P-2
05.53 Depressurize high-pressure components of an electronic brake control system.	P-2
05.54 Bleed the electronic brake control system hydraulic circuits.	P-1
05.55 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).	P-2
05.56 8. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).	P-1
Manufacturer Specific Brake, Traction Control and Vehicle Stability Control Tasks	
05.57 Service product specific anti-lock brake systems	P-4
05.58 Service product specific traction control systems.	P-4
05.59 Locate and interpret vehicle major brake component and identification numbers (VIN, vehicle certification labels, calibration decals).	P-4
05.60 Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.	P-4
05.61 Install wheel, torque lug nuts, and make final checks and adjustments associated with drum brakes.	P-4
05.62 Install wheel, torque lug nuts, and make final checks and adjustments associated with disc brakes.	P-4
05.63 Remove and install electronic brake control system electrical/electronic and hydraulic components.	P-4
05.64 Service product specific braking systems.	P-4
05.65 Perform product specific brakes relearn procedures	P-4

05.66	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the brake, traction control and vehicle stability control systems; determine necessary action.	P-4
05.67	Perform multiplex check to determine that all brake, traction control and vehicle stability control components are communicating and are performing within specifications.	P-4

Course Description: The Advanced Automotive Heating and Air Conditioning Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, recycling and handling, diagnostics, service, and repair.

Abbreviations:
HA = Heating and Air Conditioning

For every task in Advanced Automotive Heating and Air Conditioning Technician course, 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.

HA Task List:	
P-1 =	**16**
P-2 =	**16**
P-3 =	**4**
Total	**36**

Course Number: AER0173 Occupational Completion Point: F Advanced Automotive Heating and Air Conditioning Technician – 200 Hours		**Priority Number**
06.0	Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling. The student will be able to:	
General: A/C System Diagnosis and Repair		
06.01	Identify and interpret heating and air conditioning problems; determine needed action.	P-1
06.02	Research vehicle service information including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.	P-1
06.03	Performance test A/C system; identify problems.	P-1
06.04	Identify abnormal operating noises in the A/C system; determine needed action.	P-2
06.05	Identify refrigerant type; select and connect proper gauge set/test equipment; record temperature and pressure readings.	P-1
06.06	Leak test A/C system; determine needed action.	P-1
06.07	Inspect condition of refrigerant oil removed from A/C system; determine needed action.	P-2
06.08	Determine recommended oil and oil capacity for system application.	P-1

06.09 Using a scan tool, observe and record related HVAC data and trouble codes.	P-3
Refrigeration System Component Diagnosis and Repair	
06.10 Inspect, remove, and/or replace A/C compressor drive belts, pulleys, tensioners and visually inspect A/C components for signs of leaks; determine needed action.	P-1
06.11 Inspect, test, service and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.	P-2
06.12 Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity.	P-2
06.13 Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	P-2
06.14 Determine need for an additional A/C system filter; perform needed action.	P-3
06.15 Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform needed action.	P-2
06.16 Inspect for proper A/C condenser airflow; determine needed action.	P-1
06.17 Remove, inspect, and replace receiver/drier or accumulator/drier; determine recommended oil type and quantity.	P-2
06.18 Remove, inspect, and install expansion valve or orifice (expansion) tube.	P-1
06.19 Inspect evaporator housing water drain; perform needed action.	P-1
06.20 Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action.	P-2
06.21 Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.	P-2
Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair	
06.22 Inspect engine cooling and heater systems hoses and pipes; perform needed action.	P-1
06.23 Inspect and test heater control valve(s); perform needed action.	P-2
06.24 Diagnose temperature control problems in the HVAC system; determine needed action.	P-2
06.25 Determine procedure to remove, inspect, reinstall, and/or replace heater core.	P-2
Operating Systems and Related Controls Diagnosis and Repair	
06.26 Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.	P-1
06.27 Diagnose A/C compressor clutch control systems; determine needed action.	P-2
06.28 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
06.29 Inspect and test HVAC system control panel assembly; determine needed action.	P-3

06.30 Inspect and test HVAC system control cables, motors, and linkages; perform needed action.	P-3
06.31 Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; perform needed action.	P-1
06.32 Identify the source of HVAC system odors.	P-2
06.33 Check operation of automatic or semi-automatic HVAC control systems; determine needed action.	P-2
Refrigerant Recovery, Recycling, and Handling	
06.34 Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.	P-1
06.35 Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.	P-1
06.36 Recycle, label, and store refrigerant.	P-1
Manufacturer Specific Heating and Air Conditioning Related Tasks	
06.37 Service product specific climate control systems.	P-4
06.38 Locate and interpret vehicle heating and air conditioning major components and identification numbers.	P-4
06.39 Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action.	P-4
06.40 Inspect, test, and replace thermostat and gasket/seal.	P-4
06.41 Determine coolant condition and coolant type for vehicle application; drain and recover coolant.	P-4
06.42 Flush system; refill system with recommended coolant; bleed system.	P-4
06.43 Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.	P-4
06.44 Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.	P-4
06.45 Service product specific hybrid heating and A/C systems.	P-4
06.46 Perform product specific heating and A/C relearn procedure	P-4
06.47 Interpret diagnostic trouble codes (DTCs) and scan tool data related to the Heating and Air Conditioning systems; determine necessary action.	P-4
06.48 Perform multiplex check to determine that Heating and Air Conditioning components are communicating and are performing within specifications.	P-4
06.49 Identify proper service precautions and procedures for R1234yf systems.	P-4

Course Description: The Advanced Automotive Engine Performance Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engines, ignition, fuel, air induction, exhaust, computer, engine and emission control systems diagnostics, service, and repair.

Abbreviations:
EP = Engine Performance

For every task in Advanced Automotive Engine Performance Technician course, the following safety requirement MUST be strictly enforced:

EP Task List:	
	P-1 = 21
	P-2 = 20
	P-3 = 2
Total	**43**

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.

Course Number: AER0506 **Occupational Completion Point: G** **Advanced Automotive Engine Performance Technician – 500 Hours**	**Priority Number**
07.0 Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems. The student will be able to:	
General: Engine Diagnosis	
07.01 Identify and interpret engine performance concerns; determine needed action.	P-1
07.02 Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.	P-1
07.03 Diagnose abnormal engine noises or vibration concerns; determine needed action.	P-3
07.04 Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.	P-2
07.05 Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action.	P-1
07.06 Perform cylinder power balance test; determine needed action.	P-2
07.07 Perform cylinder cranking and running compression tests; determine needed action.	P-1
07.08 Perform cylinder leakage test; determine needed action.	P-1
07.09 Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.	P-2
07.10 Verify engine operating temperature; determine needed action.	P-1
07.11 Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT).	P-1
Computerized Controls Diagnosis and Repair	
07.12 Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear	P-1

	codes when applicable.	
07.13	Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1
07.14	Perform active tests of actuators using a scan tool; determine needed action.	P-1
07.15	Describe the use of OBD monitors for repair verification.	P-1
07.16	Diagnose the causes of emissions or drive-ability concerns with stored or active diagnostic trouble codes (DTC); obtain, graph, and interpret scan tool data.	P-1
07.17	Diagnose emissions or drive-ability concerns without stored or active diagnostic trouble codes; determine needed action.	P-1
07.18	Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO); perform needed action.	P-2
07.19	Diagnose drive-ability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, HVAC, automatic transmissions, non-OEM installed accessories, or similar systems); determine needed action.	P-2
Ignition System Diagnosis and Repair		
07.20	Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor drive-ability, spark knock, power loss, poor mileage, and emissions concerns; determine needed action.	P-2
07.21	Inspect and test crankshaft and camshaft position sensor(s); determine needed action.	P-1
07.22	Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as needed.	P-3
07.23	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair		
07.24	Diagnose (troubleshoot) 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; determine needed action.	P-2
07.25	Check fuel for contaminants; determine needed action.	P-2
07.26	Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; perform needed action.	P-1
07.27	Replace fuel filter(s) where applicable.	P-2
07.28	Inspect, service, or replace air filters, filter housings, and intake duct work.	P-1
07.29	Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2
07.30	Inspect, test, and/or replace fuel injectors.	P-2
07.31	Verify idle control operation.	P-1

07.32	Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform needed action.	P-1
07.33	Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.	P-1
07.34	Perform exhaust system back-pressure test; determine needed action.	P-2
07.35	Check and refill diesel exhaust fluid (DEF).	P-2
07.36	Test the operation of turbocharger/supercharger systems; determine needed action.	P-2
Emissions Control Systems Diagnosis and Repair		
07.37	Diagnose oil leaks, emissions, and drive-ability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.	P-3
07.38	Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform needed action.	P-2
07.39	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) systems; determine needed action.	P-2
07.40	Diagnose emissions and drive-ability concerns caused by the secondary air injection system; inspect, test, repair, and/or replace electrical/electronically-operated components and circuits of secondary air injection systems; determine needed action.	P-2
07.41	Diagnose emissions and drive-ability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.	P-1
07.42	Diagnose emission and drive-ability concerns caused by catalytic converter system; determine needed action.	P-2
07.43	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.	P-2
Manufacturer Specific Engine Performance Related Tasks		
07.44	Adjust valves on engines with mechanical or hydraulic lifters.	P-4
07.45	Remove and replace timing belt; verify correct camshaft timing.	P-4
07.46	Remove and replace thermostat and gasket/seal.	P-4
07.47	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	P-4
07.48	Perform common fastener and thread repairs, to include: remove broken bolt, restore internal and external threads, and repair internal threads with a threaded insert.	P-4
07.49	Inspect engine oil and/or filter for condition and determine necessary action.	P-4
07.50	Identify hybrid vehicle internal combustion engine service precautions.	P-4

07.51	Demonstrate proficiency in use of computer-based information systems.	P-4
07.52	Perform product specific OBD II drive cycle diagnostic tests.	P-4
07.53	Service product specific ignition systems.	P-4
07.54	Inspect and test distributor; service as needed.	P-4
07.55	Perform exhaust system back-pressure test; determine needed action.	P-4
07.56	Service product specific fuel injection systems.	P-4
07.57	Locate and interpret vehicle engine performance major components and identification numbers.	P-4
07.58	Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.	P-4
07.59	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.	P-4
07.60	Check for module communication (including CAN/BUS systems) errors using a scan tool.	P-4
07.61	Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.	P-4
07.62	Inspect and test mechanical components of secondary air injection systems; perform necessary action.	P-4
07.63	Demonstrate knowledge of direct injection systems.	P-4
07.64	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the engine control systems; determine necessary action.	P-4
07.65	Perform multiplex check to determine that engine control components are communicating and are performing within specifications.	P-4
07.66	Perform universal drive cycle to run monitors and erase permanent DTCs.	P-4

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 P-1, P-2, or P-3 are ASE tasks. P-4 tasks are additional tasks that may be required by the manufacturer partner. P-4 tasks can be either instructor led or performed by the student as determined by the manufacturer's curriculum.

It is highly recommended that the program be ASEEF Master Certified and be approved by the appropriate industry manufacturer to provide manufacturer certification. Instructors must meet the specific manufacturer certification and be A1-A8 ASE Master certified, Advanced Engine Performance (L1) ASE Certification is also recommended. Program must meet the equipment and specialty tool requirement as specified by the manufacturer sponsor. The program must offer EPA section 609 recognized refrigerant-recycling certification training.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting

the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Aviation Airframe Mechanics**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T640300	
CIP Number	0647060703	
Grade Level	30, 31	
Program Length	1,350 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 9

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 Maintenance General Technician, and an Aviation Airframe Maintenance Technician.

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 Aviation Maintenance General Technician (AMT0705) course is the core course.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	AMT0705	Aviation Maintenance General Technician	AIR MECH @7 7G	450 hours
B	AMT0765 AMT0766	Aviation Maintenance Airframe Technician 1 Aviation Maintenance Airframe Technician 2		450 hours 450 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Aircraft Airframe Mechanics program can be found using the following link: http://www.gpo.gov/fdsys/pkg/CFR-2012-title14-vol3/pdf/CFR-2012-title14-vol3-part147-appC.pdf.

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 basic aircraft drawing skills.
02.0 Demonstrate aircraft weight and balance skills.
03.0 Perform ground operations and servicing duties.
04.0 Demonstrate mathematical skills.
05.0 Maintain forms and records.
06.0 Apply principles of basic physics.
07.0 Demonstrate the use of maintenance publications.
08.0 Demonstrate appropriate communication skills.
09.0 Demonstrate employability skills as an Aviation Maintenance General Technician.
10.0 Maintain aircraft fluid lines and fittings.
11.0 Perform aircraft materials and processes skills.
12.0 Perform cleaning and corrosion-control operations.
13.0 Perform basic electricity skills.
14.0 Interpret mechanic privileges and limitations.
15.0 Maintain wood structures.
16.0 Perform aircraft covering.
17.0 Apply aircraft finishes.
18.0 Repair sheet-metal and non-metallic structures.
19.0 Perform and identify proper welding.
20.0 Perform assembly and rigging.
21.0 Perform airframe inspection.
22.0 Maintain aircraft landing-gear systems.
23.0 Maintain hydraulic and pneumatic power systems.
24.0 Maintain cabin atmosphere control systems.
25.0 Maintain aircraft instrument systems.
26.0 Maintain communication and navigation systems.
27.0 Inspect and repair aircraft fuel systems.
28.0 Inspect and repair aircraft electrical systems.
29.0 Inspect and repair position and warning systems.
30.0 Maintain ice and rain control systems.
31.0 Inspect and repair aircraft fire-protection systems.
32.0 Demonstrate knowledge of Federal Aviation Administration Airframe licensing requirements.
33.0 Demonstrate employability skills for an Aviation Maintenance Airframe Technician (AMT) with an FAA Airframe rating.
34.0 Demonstrate an understanding of entrepreneurship related to opportunities in Aviation Airframe Maintenance occupations.

Florida Department of Education
Student Performance Standards

Program Title: **Aviation Airframe Mechanics**
Career Certificate Program Number: **T640300**

Course Description: The Aviation Maintenance General Technician course prepares students for entry into the aviation industry. Students explore career opportunities and requirements of a professional aviation mechanic. Students study basic electricity, aircraft drawing, weight, balance, fluid lines, fittings, materials, processes, operations, services, cleaning, corrosion-control, math, forms, records, basic physics, maintenance publications, communication, and employability skills.

Course Number: AMT0705 **Occupational Completion Point: A** **Aviation Maintenance General Technician – 450 Hours**	**FAA FAR Part 147**
01.0 Perform basic aircraft drawing skills. The student will be able to:	
01.01 Use aircraft drawings, symbols, and system schematics.	App. B, B, 7. Level 2
01.02 Draw sketches of repairs and alterations.	App. B, B, 8. Level 3
01.03 Use blueprint information.	App. B, B, 9. Level 3
01.04 Use graphs and charts.	App. B, B, 10. Level 3
02.0 Demonstrate aircraft weight and balance skills. The student will be able to:	
02.01 Weigh aircraft.	App. B, C, 11. Level 2
02.02 Perform complete weight-and-balance check and record data.	App. B, C, 12. Level 3
02.03 Properly configure aircraft for weighing and capable of setting up and using weighing equipment.	
03.0 Perform ground operations and servicing duties. The student will be able to:	
03.01 Start, ground operate, move, service, and secure aircraft and identify typical ground-operations hazards.	App. B, G, 20. Level 2
03.02 Identify and select fuels.	App. B, G, 21. Level 2
03.03 Comply with prescribed shop and personal safety procedures.	
04.0 Demonstrate mathematical skills. The student will be able to:	
04.01 Extract roots and raise numbers to a given power.	App. B, H, 24. Level 3
04.02 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

	04.03 Solve ratio, proportion, and percentage problems.	App. B, H, 26. Level 3
	04.04 Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.	App. B, H, 27. Level 3
05.0	Maintain forms and records. The student will be able to:	
	05.01 Write descriptions of work performed including aircraft discrepancies and corrective actions using typical aircraft maintenance records.	App. B, I, 28. Level 3
	05.02 Complete required maintenance forms, records, and inspection reports.	App. B, I, 29. Level 3
06.0	Apply principles of basic physics. The student will be able to:	
	06.01 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
	06.02 Understand molecular action because of temperature extremes, chemical reaction, and moisture content.	
	06.03 Draw conclusions or make inferences from data.	
	06.04 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.	
	06.05 Understand pressure measurement in terms of PSI, inches of mercury, and KPA.	
07.0	Demonstrate the use of maintenance publications. The student will be able to:	
	07.01 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
	07.02 Read technical data.	App. B, K, 32. Level 3
08.0	Demonstrate appropriate communication skills. The student will be able to:	
	08.01 Describe the importance of clear and concise writing.	
	08.02 Write logical and understandable statements or phrases to accurately complete forms/invoices commonly used in business and industry.	
	08.03 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.	
	08.04 Read and follow written and oral instructions.	
	08.05 Answer and ask questions coherently and concisely.	
	08.06 Read critically by recognizing assumptions and implications and by evaluating ideas.	
	08.07 Demonstrate appropriate telephone/communication skills.	
09.0	Demonstrate employability skills as an Aviation Maintenance General Technician. The student will be able to:	

	09.01 Conduct a job search.	
	09.02 Secure information about a job.	
	09.03 Identify documents that may be required when applying for a job position.	
	09.04 Complete a job-application form correctly.	
	09.05 Demonstrate job-interview skills.	
	09.06 Exhibit punctuality, initiative, courtesy, loyalty, and honesty.	
	09.07 Identify appropriate responses to criticism from employer, supervisor, or other employees.	
	09.08 Identify work habits for getting and keeping a job.	
	09.09 Explain how to make job changes.	
	09.10 Explain the purpose of the Federal Law as recorded in (29 CFR-1910.1200).	
10.0	Maintain aircraft fluid lines and fittings. The student will be able to:	
	10.01 Fabricate and install rigid and flexible fluid lines and fittings.	App. B, D, 13. Level 3
	10.02 Utilize proper personal safety procedures for fluid lines and fittings.	
11.0	Perform aircraft materials and processes skills. The student will be able to:	
	11.01 Identify and select appropriate nondestructive testing methods.	App. B, E, 14. Level 1
	11.02 Perform dye penetrant, eddy current, ultrasonic, and magnetic particle inspections.	App. B, E, 15. Level 2
	11.03 Perform basic heat-testing processes.	App. B, E, 16. Level 1
	11.04 Identify and select aircraft hardware and materials.	App. B, E, 17. Level 3
	11.05 Inspect and check welds.	App. B, E, 18. Level 3
	11.06 Perform precision measurements.	App. B, E, 19. Level 3
	11.07 Perform safety-wiring techniques.	
12.0	Perform cleaning and corrosion-control operations. The student will be able to:	
	12.01 Identify and select cleaning materials.	App. B, G, 22. Level 3
	12.02 Identify and utilize appropriate equipment for cleaning and corrosion control.	
	12.03 Observe appropriate personal safety procedures for corrosive chemicals.	
	12.04 Inspect, identify, remove, and treat aircraft corrosion and perform aircraft cleaning. Understand metal strength limitations when removing corrosion.	App. B, G, 23. Level 3
13.0	Perform basic electricity skills. The student will be able to:	

	13.01 Troubleshoot electrical systems.	
	13.02 Calculate and measure capacitance and inductance.	App. B, A, 1. Level 2
	13.03 Calculate and measure electrical power.	App. B, A, 2. Level 2
	13.04 Measure voltage, current, resistance, and continuity.	App. B, A, 3. Level 3
	13.05 Determine the relationship of voltage, current, and resistance in electrical circuits.	App. B, A, 4. Level 3
	13.06 Read and interpret aircraft electrical-circuit diagrams, including solid-state devices and logic functions.	App. B, A, 5. Level 3
	13.07 Inspect and service batteries.	App. B, A, 6. Level 3
	13.08 Utilize proper electrical safety procedures.	
14.0	Interpret mechanic privileges and limitations. The student will be able to:	
	14.01 Exercise mechanic privileges within the limitations prescribed by Part 65 of this chapter.	App. B, L, 33. Level 3
	14.02 Identify the information in Federal Aviation Regulations (FAR) Part 65 pertaining to eligibility for Aviation Maintenance Technician (AMT) certification and ratings.	
	14.03 Identify the FAA requirements that must be satisfied to display the FAA Airframe and Powerplant license.	

Course Description: The Aviation Maintenance Airframe Technician 1 course is designed to build on the skills and knowledge students learned in the Aviation Maintenance General Technician course. Students explore career opportunities and requirements of a professional aviation mechanic. Students study wood structures, aircraft covering, finishes, metallic and non-metallic surfaces, basic welding, assembly, rigging, airframe inspection, landing gear, hydraulic and pneumatic systems, atmosphere control, aircraft instruments, communication, and navigation systems.

Course Number: AMT0765 Occupational Completion Point: B (1 of 2) Aviation Maintenance Airframe Technician 1 – 450 Hours		**FAA FAR Part 147**
15.0	Maintain wood structures. The student will be able to:	
	15.01 Service and repair wood structures.	App. C, I, A, 1. Level 1
	15.02 Identify wood defects.	App. C, I, A, 2. Level 1
	15.03 Inspect wood structures.	App. C, I, A, 3. Level 1
16.0	Perform aircraft covering. The student will be able to:	
	16.01 Select and apply fabric and fiberglass covering materials.	App. C, I, B, 4. Level 1
	16.02 Inspect, test, and repair fabric and fiberglass.	App. C, I, B, 5. Level 1
17.0	Apply aircraft finishes. The student will be able to:	

	17.01 Apply trim, letters, and touch-up paint.	App. C, I, C, 6. Level 1
	17.02 Identify and select aircraft finishing materials.	App. C, I, C, 7. Level 2
	17.03 Apply finishing materials.	App. C, I, C, 8. Level 2
	17.04 Inspect finishes and identify defects.	App. C, I, C, 9. Level 2
	17.05 Demonstrate an understanding of common safety practices dealing with paints and solvents.	
18.0	Repair sheet-metal and non-metallic structures. The student will be able to:	
	18.01 Select, install, and remove special fasteners for metallic, bonded, and composite structures.	App. C, I, D, 10. Level 2
	18.02 Inspect bonded structures.	App. C, I, D, 11. Level 2
	18.03 Inspect, test, and repair fiberglass, plastics, honeycomb, composite, and laminated primary and secondary structures.	App. C, I, D, 12. Level 2
	18.04 Inspect, check, service, and repair windows, doors, and interior furnishings.	App. C, I, D, 13. Level 2
	18.05 Inspect and repair sheet-metal structures.	App. C, I, D, 14. Level 3
	18.06 Install conventional rivets.	App. C, I, D, 15. Level 3
	18.07 Form, lay out, and bend sheet metal.	App. C, I, D, 16. Level 3
19.0	Perform and identify proper welding. The student will be able to:	
	19.01 Weld magnesium and titanium.	App. C, I, E, 17. Level 1
	19.02 Solder stainless steel.	App. C, I, E, 18. Level 1
	19.03 Fabricate tubular structures.	App. C, I, E, 19. Level 1
	19.04 Solder, braze, gas-weld, and arc-weld steel.	App. C, I, E, 20. Level 2
	19.05 Weld aluminum and stainless steel.	App. C, I, E, 21. Level 1
20.0	Perform assembly and rigging. The student will be able to:	
	20.01 Rig rotary-wing aircraft.	App. C, I, F, 22. Level 1
	20.02 Rig fixed-wing aircraft.	App. C, I, F, 23. Level 2
	20.03 Check alignment of structures.	App. C, I, F, 24. Level 2
	20.04 Assemble aircraft components, including flight control surfaces.	App. C, I, F, 25. Level 3
	20.05 Balance, rig, and inspect movable primary and secondary flight control structures.	App. C, I, F, 26. Level 3
21.0	Perform airframe inspection. The student will be able to:	
	21.01 Perform aircraft conformity and airworthiness inspections.	App. C, I, G, 28. Level 3

22.0	Maintain aircraft landing gear systems. The student will be able to:	
22.01	Jack aircraft.	
22.02	Inspect, check, service, and repair landing gear, retraction systems, shock struts, brakes, wheels, tires, and steering systems.	App. C, II, A, 29. Level 3
22.03	Utilize proper safety procedures and equipment when working on aircraft with electrical or hydraulic power on.	
22.04	Utilize proper safety procedures when working on landing gear struts or wheel and tire assemblies.	
23.0	Maintain hydraulic and pneumatic power systems. The student will be able to:	
23.01	Repair hydraulic and pneumatic power system components.	App. C, II, B, 30. Level 2
23.02	Identify and select hydraulic fluids.	App. C, II, B, 31. Level 3
23.03	Inspect, check, service, troubleshoot, and repair hydraulic and pneumatic power systems.	App. C, II, B, 32. Level 3
24.0	Maintain cabin atmosphere control systems. The student will be able to:	
24.01	Inspect, check, troubleshoot, service, and repair heating, cooling, air-conditioning, pressurization systems, and air-cycle machines.	App. C, II, C, 33. Level 1
24.02	Inspect, check, troubleshoot, service, and repair heating, cooling, air-conditioning, and pressurization systems.	App. C, II, C, 34. Level 1
24.03	Inspect, check, troubleshoot, service and repair oxygen systems.	App. C, II, C, 35. Level 2
25.0	Maintain aircraft instrument systems. The student will be able to:	
25.01	Inspect, check, service, troubleshoot, and repair electronic flight-instrument systems and both mechanical and electrical heading, speed, altitude, temperature, pressure, and position-indicating systems to include the use of built-in test equipment.	App. C, II, D, 36. Level 1
25.02	Install instruments and perform a static pressure-system leak test.	App. C, II, D, 37. Level 2
26.0	Maintain communication and navigation systems. The student will be able to:	
26.01	Inspect, check, and troubleshoot autopilot, servos, and approach coupling systems.	App. C, II, E, 38. Level 1
26.02	Inspect, check, and service aircraft electronic communication and navigation systems, including VHF passenger address interphones and static-discharge devices, aircraft VOR, ILS, LORAN, radar beacon transponders, flight-management computers, and GPWS.	App. C, II, E, 39. Level 1
26.03	Inspect and repair antenna and electronic equipment installations.	App. C, II, E, 40. Level 2

Course Description: The Aviation Maintenance Airframe Technician 2 course is designed to build on the skills and knowledge students learned in the Aviation Maintenance Airframe Technician 1 course. Students explore career opportunities and requirements of a professional aviation mechanic. Students study aircraft fuel, electrical, position, warning, ice and rain control, fire-protection, FAA Airframe licensing requirements, employability skills, and entrepreneurship.

Course Number: AMT0766 **Occupational Completion Point: B (2 of 2)** **Aviation Maintenance Airframe Technician 2 – 450 Hours**	**FAA FAR Part 147**
27.0 Inspect and repair aircraft fuel systems. The student will be able to:	
27.01 Check and service fuel-dump systems	App. C, II, F, 41. Level 1
27.02 Perform fuel-management transfer, re-fueling, and de-fueling	App. C, II, F, 42. Level 1
27.03 Inspect, check, and repair pressure fuel systems	App. C, II, F, 43. Level 1
27.04 Repair aircraft fuel-system components.	App. C, II, F, 44. Level 2
27.05 Inspect and repair fluid quantity-indicating systems.	App. C, II, F, 45. Level 2
27.06 Troubleshoot, service, and repair fluid pressure and temperature warning systems.	App. C, II, F, 46. Level 2
27.07 Inspect, check, service, troubleshoot, and repair aircraft fuel systems.	App. C, II, F, 47. Level 3
28.0 Inspect and repair aircraft electrical systems. The student will be able to:	
28.01 Repair and inspect aircraft electrical system components; crimp and splice wiring to manufacturers' specifications; and repair pins and sockets of aircraft connectors.	App. C, II, G, 48. Level 2
28.02 Install, check, and service airframe electric wiring, controls, switches, indicators, and protective devices.	App. C, II, G, 49. Level 3
28.03 Inspect, check, troubleshoot, service, and repair alternating and direct current electrical systems.	App. C, II, G, 50a. Level 3
28.04 Inspect, check, and troubleshoot constant and integrated speed- drive generators.	App. C, II, G, 50b. Level 1
29.0 Inspect and repair position and warning systems. The student will be able to:	
29.01 Inspect, check, and service speed and configuration warning systems, electrical brake controls, and antiskid systems.	App. C, II, H, 51. Level 2
29.02 Inspect, check, troubleshoot, and service landing gear position- indicating and warning systems.	App. C, II, H, 52. Level 3
30.0 Maintain ice and rain control systems. The student will be able to:	
30.01 Inspect, check, troubleshoot, service, and repair airframe ice and rain control systems.	App. C, II, I, 53. Level 2
31.0 Inspect and repair aircraft fire-protection systems. The student will be able to:	
31.01 Inspect, check, and service smoke and carbon monoxide detection systems.	App. C, II, J, 54. Level 1
31.02 Inspect, check, service, troubleshoot, and repair aircraft fire detection and extinguishing systems.	App. C, II, J, 55. Level 3

32.0	Demonstrate knowledge of Federal Aviation Administration Airframe licensing requirements. The student will be able to:	
	32.01 Explain the requirements for obtaining FAA authorization to take the FAA Airframe examinations.	
33.0	Demonstrate employability skills for an Aviation Maintenance Airframe Technician (AMT) with an FAA Airframe rating. The student will be able to:	
	33.01 Conduct a job search for an AMT with FAA Airframe rating position.	
	33.02 Secure information about the requirements for an AMT with FAA Airframe rating in a particular firm.	
	33.03 Identify documents that may be required when applying for an AMT with FAA Airframe rating position.	
	33.04 Complete a job-application form correctly.	
	33.05 Demonstrate competency in job-interview techniques.	
	33.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other employees.	
	33.07 Identify or adopt acceptable work habits.	
	33.08 Demonstrate knowledge of how to make job changes appropriately.	
	33.09 Demonstrate acceptable employee health habits.	
	33.10 Demonstrate knowledge of the Federal Law as recorded in (29 CFR-1910.1200).	
34.0	Demonstrate an understanding of entrepreneurship related opportunities in Aviation Airframe Maintenance occupations. The student will be able to:	
	34.01 Define entrepreneurship.	
	34.02 Describe the importance of entrepreneurship to Aviation Airframe Maintenance occupations.	
	34.03 List the advantages and disadvantages of Aviation Airframe Maintenance business ownership.	
	34.04 Identify the risks involved in ownership of an Aviation Airframe Maintenance business.	
	34.05 Identify the necessary personal characteristics of a successful Aviation Airframe Maintenance business owner.	

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.

Special Notes

Required FAA exams include GENERAL written, oral, and practical; AIRFRAME written, oral, and practical; and POWERPLANT written, oral, and practical. The only way a person can get authorization to take these examinations 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.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Aviation Powerplant Mechanics**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T640400	
CIP Number	0647060801	
Grade Level	30, 31	
Program Length	1,350 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 9

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 Maintenance General Technician, and an Aviation Powerplant Maintenance Technician.

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 Aviation Maintenance General Technician (AMT0705) course is the core course.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	AMT0705	Aviation Maintenance General Technician	AIR MECH @7 7G	450 hours
B	AMT0775 AMT0776	Aviation Maintenance Powerplant Technician 1 Aviation Maintenance Powerplant Technician 2		450 hours 450 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Aircraft Airframe Mechanics program can be found using the following link: http://www.gpo.gov/fdsys/pkg/CFR-2012-title14-vol3/pdf/CFR-2012-title14-vol3-part147-appC.pdf

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 basic aircraft drawing skills.
02.0 Demonstrate aircraft weight and balance skills.
03.0 Perform ground operations and servicing duties.
04.0 Demonstrate mathematical skills.
05.0 Maintain forms and records.
06.0 Apply principles of basic physics.
07.0 Demonstrate the use of maintenance publications.
08.0 Demonstrate appropriate communication skills.
09.0 Demonstrate employability skills as an Aviation Maintenance General Technician.
10.0 Maintain aircraft fluid lines and fittings.
11.0 Perform aircraft materials and processes skills.
12.0 Perform cleaning and corrosion-control operations.
13.0 Perform basic electricity skills.
14.0 Interpret mechanic privileges and limitations.
15.0 Perform basic reciprocating engine skills.
16.0 Perform basic turbine engine skills.
17.0 Perform engine inspection.
18.0 Maintain engine instrument systems.
19.0 Maintain engine fire-protection systems.
20.0 Maintain engine electrical systems.
21.0 Maintain lubrication systems.
22.0 Maintain ignition and starting systems.
23.0 Maintain fuel-metering systems.
24.0 Maintain engine fuel systems.
25.0 Maintain induction and engine airflow systems.
26.0 Maintain engine cooling systems.
27.0 Maintain engine exhaust and reverser systems.
28.0 Maintain aircraft propellers.
29.0 Maintain unducted fans.
30.0 Maintain auxiliary power units.
31.0 Demonstrate knowledge of FAA Powerplant licensing requirements.
32.0 Demonstrate employability skills for an Aviation Maintenance Powerplant Technician (AMT) with an FAA Powerplant rating.
33.0 Demonstrate an understanding of entrepreneurship opportunities in Aviation Powerplant Maintenance occupations.

Florida Department of Education
Student Performance Standards

Program Title: **Aviation Powerplant Mechanics**
Career Certificate Program Number: **T640400**

Course Description: The Aviation Maintenance General Technician course prepares students for entry into the aviation industry. Students explore career opportunities and requirements of a professional aviation mechanic. Students study basic electricity, aircraft drawing, weight, balance, fluid lines, fittings, materials, processes, operations, services, cleaning, corrosion-control, math, forms, records, basic physics, maintenance publications, communication, and employability skills.

Course Number: AMT0705 **Occupational Completion Point: A** **Aviation Maintenance General Technician – 450 Hours**	**FAA FAR Part 147**
01.0 Perform basic aircraft drawing skills. The student will be able to:	
01.01 Use aircraft drawings, symbols, and system schematics.	App. B, B, 7. Level 2
01.02 Draw sketches of repairs and alterations.	App. B, B, 8. Level 3
01.03 Use blueprint information.	App. B, B, 9. Level 3
01.04 Use graphs and charts.	App. B, B, 10. Level 3
02.0 Demonstrate aircraft weight and balance skills. The student will be able to:	
02.01 Weigh aircraft.	App. B, C, 11. Level 2
02.02 Perform complete weight-and-balance check and record data.	App. B, C, 12. Level 3
02.03 Properly configure aircraft for weighing and capable of setting up and using weighing equipment.	
03.0 Perform ground operations and servicing duties. The student will be able to:	
03.01 Start, ground operate, move, service, and secure aircraft and identify typical ground-operations hazards.	App. B, G, 20. Level 2
03.02 Identify and select fuels.	App. B, G, 21. Level 2
03.03 Comply with prescribed shop and personal safety procedures.	
04.0 Demonstrate mathematical skills. The student will be able to:	
04.01 Extract roots and raise numbers to a given power.	App. B, H, 24. Level 3
04.02 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

	04.03 Solve ratio, proportion, and percentage problems.	App. B, H, 26. Level 3
	04.04 Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.	App. B, H, 27. Level 3
05.0	Maintain forms and records. The student will be able to:	
	05.01 Write descriptions of work performed including aircraft discrepancies and corrective actions using typical aircraft maintenance records.	App. B, I, 28. Level 3
	05.02 Complete required maintenance forms, records, and inspection reports.	App. B, I, 29. Level 3
06.0	Apply principles of basic physics. The student will be able to:	
	06.01 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
	06.02 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.	
	06.03 Draw conclusions or make inferences from data.	
	06.04 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.	
	06.05 Understand pressure measurement in terms of PSI, inches of mercury, and KPA.	
07.0	Demonstrate the use of maintenance publications. The student will be able to:	
	07.01 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
	07.02 Read technical data.	App. B, K, 32. Level 3
08.0	Demonstrate appropriate communication skills. The student will be able to:	
	08.01 Write logical and understandable statements or phrases to accurately complete forms/invoices commonly used in business and industry.	
	08.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.	
	08.03 Read and follow written and oral instructions.	
	08.04 Answer and ask questions coherently and concisely.	
	08.05 Read critically by recognizing assumptions and implications and by evaluating ideas.	
	08.06 Demonstrate appropriate telephone/communication skills.	
09.0	Demonstrate employability skills as an Aviation Maintenance General Technician. The student will be able to:	
	09.01 Conduct a job search.	

	09.02 Secure information about a job.	
	09.03 Identify documents that may be required when applying for a job position.	
	09.04 Complete a job-application form correctly.	
	09.05 Demonstrate job-interview skills.	
	09.06 Identify appropriate responses to criticism from employer, supervisor, or other employees.	
	09.07 Identify work habits for getting and keeping a job.	
	09.08 Explain how to make job changes.	
	09.09 Explain the purpose of the Federal Law as recorded in (29 CFR-1910.1200).	
10.0	Maintain aircraft fluid lines and fittings. The student will be able to:	
	10.01 Fabricate and install rigid and flexible fluid lines and fittings.	App. B, D, 13. Level 3
	10.02 Utilize proper personal safety procedures for fluid lines and fittings.	
11.0	Perform aircraft materials and processes skills. The student will be able to:	
	11.01 Identify and select appropriate nondestructive testing methods.	App. B, E, 14. Level 1
	11.02 Perform dye penetrant, eddy current, ultrasonic, and magnetic particle inspections.	App. B, E, 15. Level 2
	11.03 Perform basic heat-testing processes.	App. B, E, 16. Level 1
	11.04 Identify and select aircraft hardware and materials.	App. B, E, 17. Level 3
	11.05 Inspect and check welds.	App. B, E, 18. Level 3
	11.06 Perform precision measurements.	App. B, E, 19. Level 3
	11.07 Perform safety-wiring techniques.	
12.0	Perform cleaning and corrosion-control operations. The student will be able to:	
	12.01 Identify and select cleaning materials.	App. B, G, 22. Level 3
	12.02 Inspect, identify, remove, and treat aircraft corrosion and perform aircraft cleaning. Understand metal strength limitations when removing corrosion.	App. B, G, 23. Level 3
13.0	Perform basic electricity skills. The student will be able to:	
	13.01 Calculate and measure capacitance and inductance.	App. B, A, 1. Level 2
	13.02 Calculate and measure electrical power.	App. B, A, 2. Level 2
	13.03 Measure voltage, current, resistance, and continuity.	App. B, A, 3. Level 3
	13.04 Determine the relationship of voltage, current, and resistance in electrical circuits.	App. B, A, 4. Level 3

	13.05 Read and interpret aircraft electrical-circuit diagrams, including solid-state devices and logic functions.	App. B, A, 5. Level 3
	13.06 Inspect and service batteries.	App. B, A, 6. Level 3
	13.07 Utilize proper electrical safety procedures.	
14.0	Interpret mechanic privileges and limitations. The student will be able to:	
	14.01 Exercise mechanic privileges within the limitations prescribed by Part 65 of this chapter.	App. B, L, 33. Level 3
	14.02 Identify the information in Federal Aviation Regulations (FAR) Part 65 pertaining to eligibility for Aviation Maintenance Technician (AMT) certification and ratings.	
	14.03 Identify the FAA requirements that must be satisfied to display the FAA Airframe and Powerplant license.	

Course Description: The Aviation Maintenance Powerplant Technician 1 course is designed to build on the skills and knowledge students learned in the Aviation Maintenance General Technician course. Students explore career opportunities and requirements of a professional aviation mechanic. Students study reciprocating engines, turbine engines, inspection, instruments, fire-protection, electrical, lubrication, ignition, and starting systems.

Course Number: AMT0775 Occupational Completion Point: B (1 of 2) Aviation Maintenance Powerplant Technician 1 – 450 Hours		**FAA FAR Part 147**
15.0	Perform basic reciprocating engine skills. The student will be able to:	
	15.01 Inspect and repair a radial engine.	App. D, I, A, 1. Level 1
	15.02 Overhaul a reciprocating engine.	App. D, I, A, 2. Level 2
	15.03 Inspect, check, service, and repair reciprocating engines and engine installations.	App. D, I, A, 3. Level 3
	15.04 Install, troubleshoot, and remove reciprocating engines.	App. D, I, A, 4. Level 3
16.0	Perform basic turbine engine skills. The student will be able to:	
	16.01 Overhaul a turbine engine.	App. D, I, B, 5. Level 2
	16.02 Inspect, check, service, and repair turbine engines and turbine engine installations.	App. D, I, B, 6. Level 3
	16.03 Install, troubleshoot, and remove turbine engines.	App. D, I, B, 7. Level 3
17.0	Perform engine inspection. The student will be able to:	
	17.01 Perform Powerplant conformity and airworthiness inspections.	App. D, I, C, 8. Level 3
18.0	Maintain engine instrument systems. The student will be able to:	
	18.01 Troubleshoot, service, and repair electrical and mechanical fluid rate-of-flow indicating systems.	App. D, II, A, 9. Level 2

	18.02 Inspect, check, service, troubleshoot, and repair electrical and mechanical engine temperature, pressure, and rpm indicating systems.	App. D, II, A, 10. Level 2
19.0	Maintain engine fire-protection systems. The student will be able to:	
	19.01 Inspect, check, service, troubleshoot, and repair engine fire-detection and extinguishing systems.	App. D, II, B, 11. Level 3
20.0	Maintain engine electrical systems. The student will be able to:	
	20.01 Repair engine electrical system components.	App. D, II, C, 12. Level 2
	20.02 Install, check, and service engine electrical wiring, controls, switches, indicators, and protective devices.	App. D, II, C, 13. Level 3
21.0	Maintain lubrication systems. The student will be able to:	
	21.01 Identify and select lubricants.	App. D, II, D, 14. Level 2
	21.02 Repair engine lubrication system components.	App. D, II, D, 15. Level 2
	21.03 Inspect, check, service, troubleshoot, and repair engine lubrication systems.	App. D, II, D, 16. Level 3
22.0	Maintain ignition and starting systems. The student will be able to:	
	22.01 Overhaul magneto and ignition harness.	App. D, II, E, 17. Level 2
	22.02 Inspect, service, troubleshoot, and repair reciprocating and turbine engine ignition systems and components.	App. D, II, E, 18. Level 2
	22.03 Inspect, service, troubleshoot, and repair turbine engine electrical starting systems.	App. D, II, E, 19a. Level 3
	22.04 Inspect, service, and troubleshoot turbine engine pneumatic starting systems.	App. D, II, E, 19b. Level 1

Course Description: The Aviation Maintenance Powerplant Technician 2 course is designed to build on the skills and knowledge students learned in the Aviation Maintenance Powerplant Technician 1 course. Students explore career opportunities and requirements of a professional aviation mechanic. Students study fuel, metering, induction, airflow, cooling, exhaust, reverser, propellers, inductors, auxiliary power units, FAA Powerplant Rating licensing, employability skills, and entrepreneurship.

Course Number: AMT0776 Occupational Completion Point: B (2 of 2) Aviation Maintenance Powerplant Technician 2 – 450 Hours		**FAA FAR Part 147**
23.0	Maintain fuel metering systems. The student will be able to:	
	23.01 Troubleshoot and adjust turbine engine fuel-metering systems and electronic-engine fuel controls.	App. D, II, F, 20. Level 1
	23.02 Overhaul carburetor.	App. D, II, F, 21. Level 1
	23.03 Repair engine fuel metering system components.	App. D, II, F, 22. Level 2
	23.04 Inspect, check, service, troubleshoot, and repair reciprocating and turbine engine fuel-metering systems.	App. D, II, F, 23. Level 3

24.0	Maintain engine fuel systems. The student will be able to:	
	24.01 Repair engine fuel system components.	App. D, II, G, 24. Level 2
	24.02 Inspect, check, service, troubleshoot, and repair engine fuel systems.	App. D, II, G, 25. Level 3
25.0	Maintain induction and engine airflow systems. The student will be able to:	
	25.01 Inspect, check, troubleshoot, service, and repair engine ice and rain control systems.	App. D, II, H, 26. Level 2
	25.02 Inspect, check, service, troubleshoot, and repair heat exchangers, superchargers, and turbine engine airflow and temperature control systems.	App. D, II, H, 27. Level 1
	25.03 Inspect, check, service, and repair carburetor air intake and induction manifolds.	App. D, II, H, 28. Level 3
26.0	Maintain engine cooling systems. The student will be able to:	
	26.01 Repair engine cooling system components.	App. D, II, I, 29. Level 2
	26.02 Inspect, check, troubleshoot, service, and repair engine cooling systems.	App. D, II, I, 30. Level 3
27.0	Maintain engine exhaust and reverser systems. The student will be able to:	
	27.01 Repair engine exhaust system components.	App. D, II, J, 31. Level 2
	27.02 Inspect, check, troubleshoot, service, and repair engine exhaust systems.	App. D, II, J, 32a. Level 3
	27.03 Troubleshoot and repair engine thrust reverser systems and related components.	App. D, II, J, 32b. Level 1
28.0	Maintain aircraft propellers. The student will be able to:	
	28.01 Inspect, check, service, and repair propeller synchronizing and ice control systems.	App. D, II, K, 33. Level 1
	28.02 Identify and select propeller lubricants.	App. D, II, K, 34. Level 2
	28.03 Balance propellers.	App. D, II, K, 35. Level 1
	28.04 Repair propeller control system components.	App. D, II, K, 36. Level 2
	28.05 Inspect, check, service, and repair fixed-pitch, constant-speed, feathering propellers, and propeller-governing systems.	App. D, II, K, 37. Level 3
	28.06 Install, troubleshoot, and remove propellers.	App. D, II, K, 38. Level 3
	28.07 Repair aluminum alloy propeller blades.	App. D, II, K, 39. Level 3
29.0	Maintain unducted fans. The student will be able to:	
	29.01 Inspect and troubleshoot unducted fan systems and components.	App. D, II, L, 40. Level 1
30.0	Maintain auxiliary power units. The student will be able to:	
	30.01 Inspect, check, service, and troubleshoot turbine-driven auxiliary power units.	
31.0	Demonstrate knowledge of Federal Aviation Administration Powerplant licensing requirements.--The student	

	will be able to:	
	31.01 Explain the requirements for obtaining FAA authorization to take the FAA Powerplant examinations.	
32.0	Demonstrate employability skills for an Aviation Maintenance Powerplant Technician (AMT) with an FAA Powerplant rating. The student will be able to:	
	32.01 Conduct a job search for an AMT position.	
	32.02 Secure information about the requirements for an AMT in a particular firm.	
	32.03 Identify documents that may be required when applying for an AMT position.	
	32.04 Complete a job-application form correctly.	
	32.05 Demonstrate competency in job-interview techniques.	
	32.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other employees.	
	32.07 Identify or adopt acceptable AMT work habits.	
	32.08 Demonstrate knowledge of how to make job changes appropriately.	
	32.09 Demonstrate acceptable employee health habits.	
	32.10 Demonstrate knowledge of the Federal Law as recorded in (29 CFR-1910.1200).	
33.0	Demonstrate an understanding of entrepreneurship related to opportunities in Aviation Powerplant Maintenance occupations. The student will be able to:	
	33.01 Define entrepreneurship.	
	33.02 Describe the importance of entrepreneurship to the Aviation Maintenance industry.	
	33.03 List the advantages and disadvantages of Aviation Maintenance business ownership.	
	33.04 Identify the risks involved in ownership of an Aviation Maintenance business.	
	33.05 Identify the necessary personal characteristics of a successful Aviation Maintenance business owner.	
	33.06 Identify the business skills needed to operate an Aviation Maintenance 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.

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.

Special Notes

Required FAA exams include GENERAL written, oral, and practical; AIRFRAME written, oral, and practical; and POWERPLANT written, oral, and practical. The only way a person can get authorization to take these examinations 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.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Diesel Systems Technician 1**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T650100	
CIP Number	0647061305	
Grade Level	30, 31	
Program Length	1050 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 maintaining and repairing diesel engines and electrical systems; reconditioning diesel fuel injection systems; overhauling diesel engines; and performing diesel engine preventive maintenance.

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.

The courses after the core (OCP-A) may be taken in any sequence.

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

When offered at the postsecondary level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	DIM0101	Diesel Engine Mechanic/Technician Helper	DIESEL MECH @7 7G	150 hours
B	DIM0102	Diesel Electrical and Electronics Technician		300 hours
C	DIM0104	Diesel Engine Technician		300 hours
D	DIM0105	Diesel Brakes Technician		300 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Diesel Systems Technician program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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 General electrical systems.
08.0 Diagnose and repair Battery systems.
09.0 Diagnose and repair Starting systems.
10.0 Diagnose and repair Charging systems.
11.0 Diagnose and repair Lighting systems.
12.0 Diagnose and repair Gauges and warning devices.
13.0 Diagnose and repair related electrical systems.
14.0 General engine diagnosis and repair.
15.0 Cylinder head and valve train diagnosis and repair.
16.0 Engine block diagnosis and repair.
17.0 Lubrication systems diagnosis and repair.
18.0 Cooling system diagnosis and repair.
19.0 Air induction and exhaust systems diagnosis and repair.
20.0 Fuel system diagnosis and repair.
21.0 Diagnose and repair engine brakes.
22.0 Diagnose and repair air supply and service systems.
23.0 Diagnose and repair mechanical/foundation air brake systems.
24.0 Diagnose and repair parking brakes.
25.0 Diagnose and repair hydraulic systems.
26.0 Diagnose and repair mechanical/foundation hydraulic brake systems.
27.0 Diagnose and repair power assist units.
28.0 Diagnose and repair air and hydraulic antilock brake systems (ABS) and automatic traction control (ATC).
29.0 Diagnose and repair wheel bearings.

Florida Department of Education
Student Performance Standards

Program Title: **Diesel Systems Technician 1**
Career Certificate Program Number: **T650100**

Course Description: The Diesel Engine Mechanic/Technician Helper 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.

ASE = Required Supplemental Tasks

Course Number: DIM0101 **Occupational Completion Point: A** **Diesel Engine Mechanic/Technician Helper – 150 Hours**		**Priority Number**
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
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 types of bearings and their uses.	
	02.02 Identify drive power 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
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
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

Course Description: The Diesel Electrical and Electronics Technician course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study general electrical systems, batteries, starting, charging, lighting, gauges, warning devices, and related electrical system diagnostics, service, and repair.

For every task in Diesel Electrical and Electronics Technician, 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 first task in Diesel Electrical and Electronics Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

EE Task List:
P-1 = 38
P-2 = 15
P-3 = 12
Total 65

Course Number: DIM0102 Occupational Completion Point: B Diesel Electrical and Electronics Technician – 300 Hours		Priority Number
07.0	Diagnose and repair general electrical systems. The student will be able to:	
07.01	Read and interpret electrical/electronic circuits using wiring diagrams.	P-1
07.02	Check continuity in electrical/electronic circuits using appropriate test equipment.	P-1
07.03	Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment.	P-1
07.04	Check current flow in electrical/electronic circuits and components using appropriate test equipment.	P-1
07.05	Check resistance in electrical/electronic circuits and components using appropriate test equipment.	P-1
07.06	Locate shorts, grounds, and opens in electrical/electronic circuits.	P-1
07.07	Diagnose parasitic (key-off) battery drain problems; perform tests; determine needed action.	P-1
07.08	Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed.	P-1
07.09	Inspect and test spike suppression devices; replace as needed.	P-3
07.10	Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment.	P-3
08.0	Diagnose and repair battery systems. The student will be able to:	
08.01	Identify battery type; perform appropriate battery load test; determine needed action.	P-1
08.02	Determine battery state of charge using an open circuit voltage test.	P-1
08.03	Inspect, clean, and service battery; replace as needed.	P-1
08.04	Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed.	P-1
08.05	Charge battery using appropriate method for battery type.	P-1
08.06	Inspect, test, and clean battery cables and connectors; repair or replace as needed.	P-1
08.07	Jump start a vehicle using jumper cables and a booster battery or auxiliary power supply using proper safety procedures.	P-1
08.08	Perform battery capacitance test; determine needed action.	P-2
08.09	Identify and test low voltage disconnect (LVD) systems; determine needed repair.	P-2
09.0	Diagnose and repair starting systems. The student will be able to:	
09.01	Perform starter circuit cranking voltage and voltage drop tests; determine needed action.	P-1
09.02	Inspect and test components (key switch, push button and/or magnetic switch) and wires and harnesses in the starter control circuit; replace as needed	P-2

	09.03 Inspect and test starter relays and solenoids/switches; replace as needed.	P-1
	09.04 Remove and replace starter; inspect flywheel ring gear or flex plate.	P-1
10.0	Diagnose and repair charging systems. The student will be able to:	
	10.01 Test instrument panel mounted volt meters and/or indicator lamps; determine needed action.	P-1
	10.02 Identify causes of a no charge, low charge, or overcharge problems; determine needed action.	P-1
	10.03 Inspect and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets; adjust drive belts and check alignment.	P-1
	10.04 Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action.	P-1
	10.05 Perform charging circuit voltage drop tests; determine needed action.	P-1
	10.06 Remove and replace alternator.	P-1
	10.07 Inspect, repair, or replace cables, wires, and connectors in the charging circuit.	P-1
11.0	Diagnose and repair lighting systems. The student will be able to:	
	11.01 Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-1
	11.02 Identify causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation.	P-1
	11.03 Test, aim, and replace headlights.	P-1
	11.04 Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components/modules; repair or replace as needed.	P-1
	11.05 Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays, and control components/modules of parking, clearance, and taillight circuits; repair or replace as needed.	P-1
	11.06 Inspect and test instrument panel light circuit switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires, and printed circuits/control modules; repair or replace as needed.	P-2
	11.07 Inspect and test interior cab light circuit switches, bulbs/LEDs, sockets, low voltage disconnect (LVD), connectors, terminals, wires, and control components/modules; repair or replace as needed.	P-2
	11.08 Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed.	P-1
	11.09 Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.	P-1
	11.10 Inspect and test turn signal and hazard circuit flasher(s), switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.	P-1
	11.11 Inspect and test reverse lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, wires and control components/modules; repair or replace as needed.	P-1
12.0	Diagnose and repair gauges and warning devices. The student will be able to:	

12.01	Interface with vehicle's on-board computer; perform diagnostic procedure, verify instrument cluster operations using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-1
12.02	Identify causes of intermittent, high, low, or no gauge readings; determine needed action.	P-2
12.03	Identify causes of data bus-driven gauge malfunctions; determine needed action.	P-3
12.04	Inspect and test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires; repair or replace as needed.	P-2
12.05	Inspect and test warning devices (lights and audible) circuit sensor/sending units, bulbs/LEDs, sockets, connectors, wires, and control components/modules; repair or replace as needed.	P-1
12.06	Inspect, test, replace, and calibrate (if applicable) electronic speedometer, odometer, and tachometer systems.	P-2
13.0	Diagnose and repair related electrical systems. The student will be able to:	
13.01	Interface with vehicle’s on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-1
13.02	Identify causes of constant, intermittent, or no horn operation; determine needed action.	P-1
13.03	Inspect and test horn circuit relays, horns, switches, connectors, wires, clock springs, and control components/modules; repair or replace as needed.	P-2
13.04	Identify causes of constant, intermittent, or no wiper operation; diagnose the cause of wiper speed control and/or park problems; determine needed action.	P-2
13.05	Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, wires, and control components/modules; repair or replace as needed.	P-2
13.06	Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed.	P-2
13.07	Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.	P-3
13.08	Inspect and test side view mirror motors, heater circuit grids, relays, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.	P-3
13.09	Inspect and test heater and A/C electrical components including A/C clutches, motors, resistors, relays, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.	P-3
13.10	Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repair or replace as needed.	P-3
13.11	Identify causes of slow, intermittent, or no power window operation; determine needed action.	P-3
13.12	Inspect and test motors, switches, relays, connectors, terminals, wires, and control components/modules of power window circuits; repair or replace as needed.	P-3
13.13	Inspect and test block heaters; determine needed repairs.	P-2
13.14	Inspect and test cruise control electrical components; repair or replace as needed.	P-3

13.15	Inspect and test switches, relays, controllers, actuator/solenoids, connectors, terminals, and wires of electric door lock circuits.	P-3
13.16	Inspect and test engine cooling fan electrical control components/modules, wiring; repair or replace as needed.	P-2
13.17	Identify causes of data bus communication problems; determine needed action.	P-2

Course Description: The Diesel Engine Technician course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engine, cylinder head, valve train, engine block, lubrication, cooling, air induction, exhaust, fuel, and engine brakes diagnostics, service, and repair.

For every task in Diesel Engine Technician, 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 first task in Diesel Engine Technician is to listen to and verify the operator's concern, review past maintenance, and repair documents, and determine necessary action.

DE Task List:
P-1 = 35
P-2 = 32
P-3 = 21
Total 88

Course Number: DIM0104 Occupational Completion Point: C Diesel Engine Technician – 300 Hours		**Priority Number**
14.0	General engine diagnosis and repair. The student will be able to:	
14.01	Inspect fuel, oil, Diesel Exhaust Fluid (DEF), coolant levels, and condition; determine needed action.	P-1
14.02	Identify and diagnose the causes of engine fuel, oil, coolant, air, and other leaks; determine needed action.	P-1
14.03	Listen and interpret engine noises; determine needed action.	P-3
14.04	Observe engine exhaust smoke color and quantity; determine needed action.	P-2
14.05	Check and diagnose no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action.	P-1
14.06	Identify and diagnose causes of engine surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action.	P-1
14.07	Identify and diagnose engine vibration problems; determine needed action.	P-2
14.08	Check, record, and clear electronic diagnostic (fault) codes; monitor electronic data; determine needed action.	P-1
14.09	Perform air intake system restriction and leakage tests; determine needed action.	
14.10	Perform intake manifold pressure (boost) test; determine needed action.	

	14.11 Perform exhaust pressure test; determine needed action for DPF.	
	14.12 Perform cylinder contribution test; determine needed action.	
15.0	Cylinder head and valve train diagnosis and repair. The student will be able to:	
	15.01 Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.	P-2
	15.02 Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action.	P-3
	15.03 Measure valve head height relative to deck, valve face-to-seat contact; determine needed action.	P-3
	15.04 Inspect valve train components; determine needed action.	P-1
	15.05 Reassemble cylinder head.	P-3
	15.06 Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash.	P-3
	15.07 Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness; determine needed action.	P-1
	15.08 Inspect and adjust valve bridges (crossheads); adjust valve clearances and injector settings.	P-2
	15.09 Remove, clean, inspect for visible damage, and replace cylinder head(s) assembly.	
	15.10 Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action.	
	15.11 Inspect pushrods, rocker arms, rocker arm shafts, and blocked oil passages; perform needed action.	
	15.12 Inspect cam followers; perform needed action.	
16.0	Engine block diagnosis and repair. The student will be able to:	
	16.01 Perform crankcase pressure test; determine needed action	P-1
	16.02 Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.	P-2
	16.03 Disassemble, clean, and inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action.	P-2
	16.04 Inspect cylinder sleeve counter bore and lower bore; check bore distortion; determine needed action.	P-2
	16.05 Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.	P-2
	16.06 Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion).	P-2
	16.07 Inspect in-block camshaft bearings for wear and damage; determine needed action.	P-3
	16.08 Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action.	P-2

	16.09 Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play.	P-2
	16.10 Inspect, install, and time gear train; measure gear backlash; determine needed action.	P-2
	16.11 Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action.	P-3
	16.12 Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons.	P-3
	16.13 Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.	P-2
	16.14 Check condition of piston cooling jets (nozzles); determine needed action.	P-2
	16.15 Inspect and measure crankshaft vibration damper; determine needed action.	P-3
	16.16 Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.	P-3
	16.17 Inspect flywheel/flex-plate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.	P-2
17.0	Lubrication systems diagnosis and repair. The student will be able to:	
	17.01 Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit, test engine oil temperature and check operation of temperature sensor; determine needed action.	P-1
	17.02 Check engine oil level, condition, and consumption; determine needed action.	P-1
	17.03 Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action.	P-3
	17.04 Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.	P-3
	17.05 Inspect, clean, and test oil cooler and components; determine needed action.	P-3
	17.06 Inspect turbocharger lubrication system; determine needed action.	P-2
	17.07 Determine proper lubricant and perform oil and filter change.	P-1
18.0	Cooling system diagnosis and repair. The student will be able to:	
	18.01 Check engine coolant type, level, condition, and consumption; test coolant for freeze protection and additive package concentration; determine needed action.	P-1
	18.02 Test coolant temperature and check operation of temperature and level sensors, gauge, and/or sending unit; determine needed action.	P-1
	18.03 Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.	P-2
	18.04 Recover coolant, flush, and refill with recommended coolant/additive package; bleed cooling system.	P-1
	18.05 Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed (if equipped).	P-1

	18.06 Inspect water pump and hoses; replace as needed.	P-1
	18.07 Inspect, clean, and pressure test radiator. Pressure test cap, tank(s), and recovery systems; determine needed action.	P-1
	18.08 Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.	P-1
	18.09 Inspect turbo charger cooling systems; determine needed action.	P-2
19.0	Air induction and exhaust systems diagnosis and repair. The student will be able to:	
	19.01 Perform air intake system restriction and leakage test; determine needed action.	P-1
	19.02 Perform intake manifold pressure (boost) test; determine needed action.	P-3
	19.03 Check exhaust back pressure; determine needed action.	P-3
	19.04 Inspect turbocharger(s), wastegate, and piping systems; determine needed action.	P-2
	19.05 Inspect turbocharger(s) (variable ratio/geometry VGT), pneumatic, hydraulic, electronic controls, and actuators.	P-2
	19.06 Check air induction system: piping, hoses, clamps, and mounting; service or replace air filter as needed.	P-1
	19.07 Inspect intake manifold, gaskets, and connections; replace as needed.	P-3
	19.08 Inspect, clean, and test charge air cooler assemblies; replace as needed.	P-2
	19.09 Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed.	P-2
	19.10 Inspect exhaust after treatment devices; determine necessary action.	P-2
	19.11 Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed action.	P-2
	19.12 Inspect exhaust gas recirculation (EGR) system including EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action.	P-2
20.0	Fuel system diagnosis and repair. The student will be able to:	
	20.01 Fuel supply system	
	• Check fuel level, and condition; determine needed action.	P-1
	• Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action.	P-1
	• Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine needed action.	P-1
	• Inspect and test pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action.	P-1

• Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump.	P-1
20.01 Electronic fuel management system	
• Interface with vehicle's on-board computer; perform diagnostic procedures using electronic service tool(s) (to include PC based software and/or data scan tools); determine needed action.	P-1
• Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; clear codes; determine further diagnosis.	P-1
• Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).	P-1
• Inspect and replace electrical connector terminals, seals, and locks.	P-1
• Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed.	P-1
• Using electronic service tool(s) access and interpret customer programmable parameters.	P-1
• Perform on-engine inspections, test and adjustments on electronic unit injectors (EUI); determine needed action	P-2
• Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable).	P-2
• Perform cylinder contribution test utilizing electronic service tool(s).	P-1
• Perform on-engine inspections and tests on hydraulic electronic unit injectors (HEUI) and system electronic controls; determine needed action.	P-2
• Perform on-engine inspections and tests on hydraulic electronic unit injector (HEUI) high pressure oil supply and control systems; determine needed action.	P-2
• Perform on-engine inspections and tests on high pressure common rail (HPCR) type injection systems; determine needed action.	P-2
• Inspect high pressure injection lines, hold downs, fittings and seals; determine needed action.	P-2
21.0 Diagnose and repair engine brakes. The student will be able to:	
21.01 Inspect and adjust engine compression/exhaust brakes; determine needed action.	P-2
21.02 Inspect, test, and adjust engine compression/exhaust brake control circuits, switches, and solenoids; determine needed action.	P-3
21.03 Inspect engine compression/exhaust brake housing, valves, seals, lines, and fittings; repair or replace as needed.	P-3

Course Description: The Diesel Brakes Technician 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, and hydraulic brakes.

For every task in Diesel Brakes Technician, 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 first task in Diesel Brakes Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

BR Task List:	
P-1 =	39
P-2 =	9
P-3 =	7
Total	55

Course Number: DIM0105 Occupational Completion Point: D Diesel Brakes Technician – 300 Hours		Priority Number
22.0	Diagnose and repair air supply and service systems. The student will be able to:	
22.01	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
22.02	Check air system build-up time; determine needed action.	P-1
22.03	Drain air reservoir/tanks; check for oil, water, and foreign material; determine needed action.	P-1
22.04	Inspect air compressor inlet; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed.	P-1
22.05	Inspect and test air system pressure controls: governor, unloader assembly valves, filters, lines, hoses, and fittings; replace as needed.	P-1
22.06	Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed.	P-1
22.07	Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check-valves, manual and automatic drain valves; replace as needed.	P-1
22.08	Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; repair or replace as needed.	P-1
22.09	Inspect and test brake application (foot/treadle) valve, fittings, and mounts; check pedal operation; replace as needed.	P-1
22.10	Inspect and test stop light circuit switches, wiring, and connectors; repair or replace as needed.	P-1
22.11	Inspect and test hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed.	P-1
22.12	Inspect and test brake relay valve; replace as needed.	P-1
22.13	Inspect and test quick release valves; replace as needed.	P-1
22.14	Inspect and test tractor protection valve; replace as needed.	P-1
22.15	Inspect and test emergency (spring) brake control/modulator valve(s); replace as needed. (as applicable)	P-1
22.16	Inspect and test low pressure warning devices, wiring, and connectors; repair or replace as needed.	P-1

	22.17 Inspect and test air pressure gauges, lines, and fittings; replace as needed.	P-2
23.0	Diagnose and repair mechanical/foundation air brake systems. The student will be able to:	
	23.01 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
	23.02 Inspect and test service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed.	P-1
	23.03 Identify type, inspect and service slack adjusters; perform needed action.	P-1
	23.04 Inspect camshafts, tubes, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; replace as needed.	P-1
	23.05 Inspect, clean, and adjust air disc brake caliper assemblies; determine needed repairs.	P-2
	23.06 Inspect and measure brake shoes or pads; perform needed action.	P-1
	23.07 Inspect and measure brake drums or rotors; perform needed action.	P-1
24.0	Diagnose and repair parking brakes. The student will be able to**:**	
	24.01 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
	24.02 Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed.	P-1
	24.03 Inspect and test parking (spring) brake application and release valve; replace as needed.	P-1
	24.04 Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers' recommendations.	P-1
	24.05 Identify and test anti compounding brake function.	P-1
25.0	Diagnose and repair hydraulic systems. The student will be able to:	
	25.01 Identify and diagnose poor stopping, premature wear, pulling, dragging, balance, or pedal feel problems caused by the hydraulic system; determine needed action.	P-2
	25.02 Inspect and test master cylinder for internal/external leaks and damage; replace as needed.	P-1
	25.03 Inspect hydraulic system brake lines for leaks and damage, flexible hoses, and fittings for leaks and damage; replace as needed.	P-1
	25.04 Inspect and test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; replace as needed.	P-3
	25.05 Inspect and test brake pressure differential valve and warning light circuit switch, bulbs/LEDs, wiring, and connectors; repair or replace as needed.	P-2
	25.06 Inspect disc brake caliper assemblies; replace as needed.	P-1
	25.07 Inspect/test brake fluid; bleed and/or flush system; determine proper fluid type.	P-1
	25.08 Inspect and clean wheel cylinders; replace as needed.	

	25.09 Test and adjust brake stop light switch, bulbs, wiring, and connectors; repair or replace as needed.	
26.0	Diagnose and repair mechanical/foundation hydraulic brake systems. The student will be able to:	
	26.01 Identify and diagnose poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems caused by mechanical components; determine needed action.	P-2
	26.02 Inspect and measure rotors; perform needed action.	P-1
	26.03 Inspect and measure disc brake pads; inspect mounting hardware; perform needed action.	P-1
	26.04 Check parking brake operation; inspect parking brake application and holding devices; adjust and replace as needed.	P-2
	26.05 Inspect and measure drum brake shoes and linings; inspect mounting hardware, adjuster mechanisms, and backing plates; perform needed action.	
27.0	Diagnose and repair power assist units. The student will be able to:	
	27.01 Identify and diagnose stopping problems caused by the brake assist (booster) system; determine needed action.	P-3
	27.02 Inspect, test, repair, or replace hydraulic brake assist (booster), hoses, and control valves; determine proper fluid type.	P-3
	27.03 Check emergency (back-up, reserve) brake assist system.	P-3
28.0	Diagnose and repair air and hydraulic antilock brake systems (ABS) and automatic traction control (ATC). The student will be able to:	
	28.01 Observe antilock brake system (ABS) warning light operation (includes trailer and dash mounted ABS warning light); determine needed action.	P-1
	28.02 Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or electronic service tool(s); determine needed action.	P-1
	28.03 Identify poor stopping and wheel lock-up caused by failure of the antilock brake system (ABS); determine needed action.	P-1
	28.04 Test and check operation of antilock brake system (ABS) air, hydraulic, electrical, and mechanical components; perform needed action.	P-1
	28.05 Test antilock brake system (ABS) wheel speed sensors and circuits; adjust or replace as needed.	P-1
	28.06 Bleed the ABS hydraulic circuits according to manufacturers' procedures.	P-2
	28.07 Observe automatic traction control (ATC) warning light operation; determine needed action.	P-3
	28.08 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
	28.09 Verify power line carrier (PLC) operations.	P-2
	28.10 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).	

29.0	Diagnose and repair wheel bearings. The student will be able to:	
	29.01 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
	29.02 Identify, inspect or replace unitized/preset hub bearing assemblies.	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

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

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 Automotive Service Excellence (ASE) Education Foundation.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Language and Reading 9). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Diesel Systems Technician 2**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T650200	
CIP Number	0647061306	
Grade Level	30, 31	
Program Length	750 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 maintaining and repairing diesel engines and electrical systems; reconditioning diesel fuel injection systems; overhauling diesel engines; and performing diesel engine preventive maintenance.

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 five occupational completion points.

The courses may be taken in any sequence. However, an individual must take the Diesel Engine Preventive Maintenance Technician course (DIM0103).

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

When offered at the postsecondary level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	DIM0103	Diesel Engine Preventative Maintenance Technician	DIESEL MECH @7 7G	150 hours
B	DIM0106	Diesel Heating and Air Conditioning Technician		150 hours
C	DIM0107	Diesel Steering and Suspension Technician		150 hours
D	DIM0108	Diesel Drivetrain Technician		150 hours
E	DIM0109	Diesel Hydraulics Technician		150 hours

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Diesel Systems Technician program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

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 Inspect and service Engine systems record findings as needed.
02.0 Diagnose and repair Fuel system.
03.0 Diagnose and repair Air induction and exhaust system.
04.0 Diagnose and repair Cooling system.
05.0 Diagnose and repair Lubrication system.
06.0 Diagnose and repair Instruments and controls.
07.0 Diagnose and repair Safety equipment.
08.0 Diagnose and repair Hardware.
09.0 Diagnose and repair Heating, ventilation, and air conditioning (HVAC).
10.0 Diagnose and repair Battery and starting systems.
11.0 Diagnose and repair Electrical/Electronic charging systems.
12.0 Diagnose and repair Lighting systems.
13.0 Diagnose and repair Air brake systems.
14.0 Diagnose and repair Hydraulic brake systems.
15.0 Inspect, service and record Drive Train systems.
16.0 Diagnose and repair Suspension and steering systems.
17.0 Diagnose and repair Tires and wheels.
18.0 Diagnose and repair Frame and fifth wheel.
19.0 HVAC systems diagnosis, service, and repair.
20.0 A/C system and component diagnosis, service, and repair.
21.0 Diagnose and repair Compressor and clutch.
22.0 Diagnose and repair Evaporator, condenser, and related components.
23.0 Heating and engine cooling systems diagnosis, service, and repair.
24.0 Electrical system diagnosis, service, and repair.
25.0 Air/vacuum/mechanical diagnosis, service, and repair.
26.0 Refrigerant recovery, recycling, and handling.
27.0 Steering column diagnosis, service, and repair.
28.0 Steering units' diagnosis, service, and repair.
29.0 Steering linkage diagnosis, service, and repair.
30.0 Suspension systems diagnosis and repair.
31.0 Wheel alignment diagnosis, adjustment, and repair.
32.0 Wheels and tires diagnosis, service, and repair.
33.0 Frame and coupling diagnosis, service, and repair.
34.0 Clutch diagnosis and repair.
35.0 Transmission diagnosis and repair.
36.0 Driveshaft and universal joint diagnosis and repair.

37.0 Drive axle diagnosis and repair.
38.0 General hydraulic system diagnosis and repair.
39.0 Diagnose and repair hydraulic pumps.
40.0 Diagnose and repair hydraulic filtration/reservoirs (tanks).
41.0 Diagnose and repair hydraulic hoses, fittings, and connections.
42.0 Diagnose and repair hydraulic control valves.
43.0 Diagnose and repair hydraulic actuators.

Florida Department of Education
Student Performance Standards

Program Title: Diesel Systems Technician 2
Career Certificate Program Number: T650200

Course Description: The Diesel Engine Preventative Maintenance Technician course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engine system, cab and hood systems, electrical/electronic systems, frame and chassis systems diagnostics, service, and repair.

For every task in Diesel Engine Preventative Maintenance Technician, 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 Engine Preventative Maintenance Technician 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.

The first task in Diesel Engine Preventative Maintenance Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

PM Task List:	
P-1 =	**132**
P-2 =	**11**
P-3 =	**0**
Total	**143**

Course Description: The Diesel Hydraulics Technician 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 hydraulic, pumps, filtration/reservoir, hoses, fittings, connectors, control valves, and actuator systems.

For every task in Diesel Hydraulics Technician, 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 first task in Diesel Hydraulics Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

HY Task List:	
P-1 =	**27**
P-2 =	**5**
P-3 =	**0**
Total	**32**

Course Number: DIM0103 Occupational Completion Point: A Diesel Engine Preventative Maintenance Technician – 150 Hours		Priority Number
01.0	Inspect and service engine systems record findings as needed. The student will be able to:	
01.01	Check engine starting/operation (including unusual noises, vibrations, exhaust smoke, etc.); record idle and governed rpm.	P-1
01.02	Inspect vibration damper.	P-1
01.03	Inspect belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment.	P-1
01.04	Check engine oil level and condition; check dipstick seal.	P-1
01.05	Inspect engine mounts for looseness and deterioration.	P-1
01.06	Check engine for oil, coolant, air, fuel and exhaust leaks (Engine Off and Running).	P-1
01.07	Check engine compartment wiring harnesses, connectors, and seals for damage and proper routing.	P-1
01.08	Check electrical wiring, routing, and hold-down clamps, including Engine Control Module/Powertrain Control Module (ECM/PCM).	
02.0	Diagnose and repair fuel system. The student will be able to:	
02.01	Check fuel tanks, mountings, lines, caps, and vents.	P-1
02.02	Drain water from fuel system.	P-1
02.03	Service water separator/fuel heater; replace fuel filter(s); prime and bleed fuel system.	P-1
03.0	Diagnose and repair air induction and exhaust system. The student will be able to:	
03.01	Check exhaust system mountings for looseness and damage.	P-1
03.02	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
03.03	Check air induction system: piping, charge air cooler, hoses, clamps, and mountings; check for air restrictions and leaks.	P-1
03.04	Inspect turbocharger for leaks; check mountings and connections.	P-1
03.05	Check operation of engine compression/exhaust brake.	P-2
03.06	Service or replace air filter as needed; check and reset air filter restriction indicator.	P-1
03.07	Inspect and service crankcase ventilation system.	P-1
03.08	Inspect diesel exhaust fluid (DEF) system, to include tanks, lines, gauge pump, and filter (if equipped).	P-1
03.09	Inspect selective catalyst reduction (SCR) system; including diesel exhaust fluid (DEF) for proper levels, leaks, mounting and connections (if equipped).	P-2

04.0	Diagnose and repair cooling system. The student will be able to:	
04.01	Check operation of fan clutch.	P-1
04.02	Inspect radiator (including air flow restriction, leaks, and damage) and mountings.	P-1
04.03	Inspect fan assembly and shroud.	P-1
04.04	Pressure test cooling system and radiator cap.	P-1
04.05	Inspect coolant hoses and clamps.	P-1
04.06	Inspect coolant recovery system.	P-1
04.07	Check coolant for contamination, additive package concentration, aeration, and protection level (freeze point).	P-1
04.08	Service coolant filter (if equipped).	P-1
04.09	Inspect water pump.	P-1
05.0	Diagnose and repair lubrication system. The student will be able to:	
05.01	Change engine oil and filters; visually check oil for coolant or fuel contamination; inspect and clean magnetic drain plugs.	P-1
05.02	Take an engine oil sample for analysis.	P-1
06.0	Diagnose and repair instruments and control systems. The student will be able to:	
06.01	Inspect key condition and operation of ignition switch.	P-1
06.02	Check warning indicators.	P-1
06.03	Check instruments; record oil pressure and system voltage.	P-1
06.04	Check operation of electronic power take off (PTO) and engine idle speed controls (if applicable)	P-2
06.05	Check HVAC controls.	P-1
06.06	Check operation of all accessories.	P-1
06.07	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
06.08	Check mechanical and electronic engine speed controls (if equipped).	
07.0	Diagnose and repair safety equipment. The student will be able to:	
07.01	Check operation of electric/air horns and back-up warning devices.	P-1
07.02	Check condition of spare fuses, safety triangles, fire extinguisher, and all required decals.	P-1

	07.03 Inspect seat belts and sleeper restraints.	P-1
	07.04 Inspect wiper blades and arms.	P-1
08.0	Diagnose and repair hardware. The student will be able to:	
	08.01 Check operation of wiper and washer.	P-1
	08.02 Inspect windshield glass for cracks or discoloration; check sun visor.	P-1
	08.03 Check seat condition, operation, and mounting.	P-1
	08.04 Check door glass and window operation.	P-1
	08.05 Inspect steps, catwalks, and grab handles (if applicable).	P-1
	08.06 Inspect mirrors, mountings, brackets, and glass.	P-1
	08.07 Record all observed physical damage.	P-2
	08.08 Lubricate all cab and hood grease fittings.	P-2
	08.09 Inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.	P-1
	08.10 Inspect cab mountings, hinges, latches, linkages and ride height; service as needed.	P-1
	08.11 Inspect tilt cab hydraulic pump, lines, and cylinders for leakage; inspect safety devices; service as needed.	
09.0	Diagnose and repair heating, ventilation, and air conditioning (HVAC). The student will be able to:	
	09.01 Inspect A/C condenser and lines for condition and visible leaks; check mountings.	P-2
	09.02 Inspect A/C compressor and lines for condition and visible leaks; check mountings.	P-2
	09.03 Check A/C system condition and operation; check A/C monitoring system, if applicable.	P-1
	09.04 Check HVAC air inlet filters and ducts; service as needed.	P-1
10.0	Diagnose and repair electrical/electronic battery and starting systems. The student will be able to:	
	10.01 Inspect battery box(es), cover(s), and mountings.	P-1
	10.02 Inspect battery hold-downs, connections, cables, and cable routing; service as needed.	P-1
	10.03 Check/record battery state-of-charge (open circuit voltage) and condition.	P-1
	10.04 Perform battery test (capacitance).	P-1
	10.05 Inspect starter, mounting, and connections.	P-1
	10.06 Engage starter; check for unusual noises, starter drag, and starting difficulty.	P-1
11.0	Diagnose and repair electrical/electronic charging systems. The student will be able to:	

	11.01 Inspect alternator, mountings, cable, wiring, and wiring routing; determine needed action.	P-1
	11.02 Perform alternator output tests.	P-1
12.0	Diagnose and repair electrical/electronic lighting systems. The student will be able to:	
	12.01 Check operation of interior lights; determine needed action.	P-1
	12.02 Check all exterior lights, lenses, reflectors, and conspicuity tape; check headlight alignment; determine needed action.	P-1
	12.03 Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s); determine needed action.	P-1
13.0	Diagnose and repair air brake systems. The student will be able to:	
	13.01 Check operation of parking brake.	P-1
	13.02 Record air governor cut-in and cut-out setting (psi).	P-1
	13.03 Check operation of air reservoir/tank drain valves.	P-1
	13.04 Check air system for leaks (brakes released).	P-1
	13.05 Check air system for leaks (brakes applied).	P-1
	13.06 Test one-way and double-check valves.	P-1
	13.07 Check low air pressure warning devices.	P-1
	13.08 Check emergency (spring) brake control/modulator valve, if applicable.	P-1
	13.09 Check tractor protection valve.	P-1
	13.10 Test air pressure build-up time.	P-1
	13.11 Inspect coupling air lines, holders, and gladhands.	P-1
	13.12 Check brake chambers and air lines for secure mounting and damage.	P-1
	13.13 Check operation of air drier.	P-1
	13.14 Inspect and record brake shoe/pad condition, thickness, and contamination.	P-1
	13.15 Inspect and record condition of brake drums/rotors.	P-1
	13.16 Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing	P-1
	13.17 Check operation and adjustment of brake automatic slack adjusters (ASA); check and record push rod stroke.	P-1
	13.18 Lubricate all brake component grease fittings.	P-1
	13.19 Check condition and operation of hand brake (trailer) control valve, if applicable.	P-2
	13.20 Perform antilock brake system (ABS) operational system self-test.	P-1

	13.21 Drain air tanks and check for contamination.	P-1
	13.22 Check condition of pressure relief (safety) valves.	P-1
14.0	Diagnose and repair hydraulic brake systems. The student will be able to:	
	14.01 Check master cylinder fluid level and condition.	P-1
	14.02 Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage.	P-1
	14.03 Check parking brake operation; inspect parking brake application and holding devices; adjust as needed.	P-1
	14.04 Check operation of hydraulic system: pedal travel, pedal effort, pedal feel.	P-1
	14.05 Inspect calipers for leakage, binding and damage.	P-1
	14.06 Inspect brake assist system (booster), hoses and control valves; check for leaks.	P-1
	14.07 Inspect and record brake lining/pad condition, thickness, and contamination.	P-1
	14.08 Inspect and record condition of brake rotors.	P-1
	14.09 Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing.	P-1
	14.10 Check drum brakes for proper adjustment.	
15.0	Inspect, service and record drive train systems. The student will be able to:	
	15.01 Check operation of clutch, clutch brake, and gearshift.	P-1
	15.02 Check clutch linkage/cable for looseness or binding, if applicable.	P-1
	15.03 Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable.	P-1
	15.04 Check clutch adjustment; adjust as needed.	P-1
	15.05 Check transmission case, seals, filter, hoses, lines and cooler for cracks and leaks.	P-1
	15.06 Inspect transmission breather.	P-1
	15.07 Inspect transmission mounts.	P-1
	15.08 Check transmission oil level, condition, determine proper type and service as needed.	P-1
	15.09 Inspect U-joints, yokes, driveshafts, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing.	P-1
	15.10 Inspect axle housing(s) for cracks and leaks.	P-1
	15.11 Inspect axle breather(s).	P-1
	15.12 Lubricate all drivetrain grease fittings.	P-1
	15.13 Check drive axle(s) oil level, condition, determine proper type, and service as needed.	P-1

	15.14 Change drive axle(s) oil and filter/screen, if applicable; check and clean magnetic plugs.	P-2
	15.15 Check transmission wiring, connectors, seals, and harnesses for damage and proper routing.	P-1
	15.16 Change transmission oil and filter, if applicable; check and clean magnetic plugs.	P-2
	15.17 Check interaxle differential lock operation.	P-1
	15.18 Check transmission range shift operation.	P-1
16.0	Diagnose and repair suspension and steering systems. The student will be able to:	
	16.01 Check steering wheel operation for free play and binding.	P-1
	16.02 Check power steering pump, mounting, and hoses for leaks, condition, and routing; check fluid level.	P-1
	16.03 Change power steering fluid and filter.	P-1
	16.04 Inspect steering gear for leaks and secure mounting.	P-1
	16.05 Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages.	P-1
	16.06 Check kingpins for wear.	P-1
	16.07 Check wheel bearings for looseness and noise; adjust as necessary.	P-1
	16.08 Check oil level and condition in all non-drive hubs; check for leaks.	P-1
	16.09 Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators.	P-1
	16.10 Inspect shock absorbers for leaks and secure mounting.	P-1
	16.11 Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage.	P-1
	16.12 Check and record suspension ride height.	P-1
	16.13 Lubricate all suspension and steering grease fittings.	P-1
	16.14 Check axle locating components (radius, torque, and/or track rods).	P-1
17.0	Diagnose and repair tires and wheels. The student will be able to:	
	17.01 Inspect tires for wear patterns and proper mounting.	P-1
	17.02 Inspect tires for cuts, cracks, bulges, and sidewall damage.	P-1
	17.03 Inspect valve caps and stems; determine needed action.	P-1
	17.04 Measure and record tread depth; probe for imbedded debris.	P-1
	17.05 Check and record air pressure; adjust air pressure in accordance with manufacturers' specifications.	P-1
	17.06 Check wheel mounting hardware condition; determine needed action.	P-1

17.07	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
17.08	Check tire matching (diameter and tread) on single and dual tire applications.	P-1
17.09	Retorque lugs in accordance with manufacturer's specifications.	
18.0	Diagnose and repair frame and fifth wheel. The student will be able to:	
18.01	Inspect fifth wheel mounting, bolts, air lines, and locks.	P-1
18.02	Test operation of fifth wheel locking device; adjust if necessary.	P-1
18.03	Check quarter fenders, mud flaps, and brackets.	P-1
18.04	Check pintle hook assembly and mounting; if applicable.	P-2
18.05	Lubricate all fifth wheel grease fittings and plate; if applicable	P-1
18.06	Inspect frame and frame members for cracks and damage.	P-1

Course Description: The Diesel Heating and Air Conditioning Technician 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 HVAC, and A/C systems.

For every task in Diesel Heating and Air Conditioning Technician, 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 first task in Diesel Heating and Air Conditioning Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

HV Task List:
P-1 = 31
P-2 = 17
P-3 = 10
Total 58

Course Number: DIM0106 Occupational Completion Point: B Diesel Heating and Air Conditioning Technician – 150 Hours		**Priority Number**
19.0	HVAC systems diagnosis, service, and repair. The student will be able to:	
19.01	Verify the need for service or repair of HVAC systems based on unusual operating noises; determine needed action.	P-1
19.02	Verify the need for service or repair of HVAC systems based on unusual visual, smell, and touch conditions; determine needed action.	P-1
19.03	Identify system type and components (cycling clutch orifice tube - CCOT, expansion valve) and conduct performance test(s) on HVAC systems; determine needed action.	P-1

	19.04 Retrieve diagnostic codes; determine needed action.	P-3
20.0	A/C system and component diagnosis, service, and repair. The student will be able to:	
	20.01 Identify causes of temperature control problems in the A/C system; determine needed action.	P-1
	20.02 Identify refrigerant and lubricant types; check for contamination; determine needed action.	P-1
	20.03 Identify A/C system problems indicated by pressure gauge and temperature readings; determine needed action.	P-1
	20.04 Identify A/C system problems indicated by visual, audible, smell, and touch procedures; determine needed action.	P-1
	20.05 Perform A/C system leak test; determine needed action.	P-1
	20.06 Recover, evacuate, and recharge A/C system using appropriate equipment.	P-1
	20.07 Identify contamination in the A/C system components; determine needed action.	P-3
	20.08 Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-2
21.0	Diagnose and repair compressor and clutch. The student will be able to:	
	21.01 Identify and diagnose A/C system problems that cause protection devices (pressure, thermal, and electronic) to interrupt system operation; determine needed action.	P-1
	21.02 Inspect, test, and replace A/C system pressure, thermal, and electronic protection devices.	P-2
	21.03 Inspect, and replace A/C compressor drive belts, pulleys, and tensioners; adjust belt tension and check alignment.	P-1
	21.04 Inspect, test, adjust, service, or replace A/C compressor clutch components or assembly.	P-2
	21.05 Inspect and correct A/C compressor lubricant level (if applicable).	P-2
	21.06 Inspect, test, or replace A/C compressor.	P-1
	21.07 Inspect, repair, or replace A/C compressor mountings and hardware.	P-2
22.0	Diagnose and repair evaporator, condenser, and related components. The student will be able to:	
	22.01 Correct system lubricant level when replacing the evaporator, condenser, receiver/drier or accumulator/drier, and hoses.	P-1
	22.02 Inspect A/C system hoses, lines, filters, fittings, and seals; determine needed action.	P-1
	22.03 Inspect and test A/C system condenser. Check for proper airflow and mountings; determine needed action.	P-1
	22.04 Inspect and replace receiver/drier or accumulator/drier.	P-1
	22.05 Inspect and test cab/sleeper refrigerant solenoid, expansion valve(s); check placement of thermal bulb (capillary tube); determine needed action.	P-3

	22.06 Remove and replace orifice tube.	P-1
	22.07 Inspect and test cab/sleeper evaporator core; determine needed action.	P-3
	22.08 Inspect, clean, and repair evaporator housing and water drain; inspect and service/replace evaporator air filter.	P-1
	22.09 Identify and inspect A/C system service ports (gauge connections); determine needed action.	P-1
	22.10 Identify the cause of system failures resulting in refrigerant loss from the A/C system high pressure relief device; determine needed action.	P-2
23.0	Heating and engine cooling systems diagnosis, service, and repair. The student will be able to:	
	23.01 Identify causes of outlet air temperature control problems in the HVAC system; determine needed action.	P-1
	23.02 Diagnose window fogging problems; determine needed action.	P-2
	23.03 Perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration; determine needed action.	P-1
	23.04 Inspect engine cooling and heating system hoses, lines, and clamps; determine needed action.	P-1
	23.05 Inspect and test radiator, pressure cap, and coolant recovery system (surge tank); determine needed action.	P-1
	23.06 Inspect water pump; determine needed action.	P-1
	23.07 Inspect and test thermostats, by-passes, housings, and seals; determine needed repairs.	P-2
	23.08 Recover, flush and refill with recommended coolant/additive package; bleed cooling system.	P-1
	23.09 Inspect thermostatic cooling fan system (pneumatic and electronic) and fan shroud; replace as needed.	P-2
	23.10 Inspect and test heating system coolant control valve(s) and manual shut-off valves; determine needed action.	P-2
	23.11 Inspect and flush heater core; determine needed action.	P-3
24.0	Electrical system diagnosis, service, and repair. The student will be able to:	
	24.01 Identify causes of HVAC electrical control system problems; determine needed action.	P-1
	24.02 Inspect and test A/C heater blower motors, resistors, switches, relays, modules, wiring, and protection devices; determine needed action.	P-2
	24.03 Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action.	P-2
	24.04 Inspect and test A/C related electronic engine control systems; determine needed action.	P-2
	24.05 Inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices; determine needed action.	P-2
	24.06 Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action.	P-2

	24.07 Inspect and test HVAC system electrical/electronic control panel assemblies; determine needed action.	P-2
	24.08 Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-2
25.0	Air/vacuum/mechanical diagnostics, service, and repair. The student will be able to:	
	25.01 Identify causes of HVAC air and mechanical control problems; determine needed action.	P-3
	25.02 Inspect and test HVAC system air and mechanical control panel assemblies; determine needed action.	P-3
	25.03 Inspect, test, and adjust HVAC system air and mechanical control cables and linkages; determine needed action.	P-3
	25.04 Inspect and test HVAC system actuators and hoses; determine needed action.	P-3
	25.05 Inspect, test, and adjust HVAC system ducts, doors, and outlets; determine needed action.	P-3
NOTE: Tasks 1 through 5 should be accomplished in accordance with appropriate EPA regulations and SAE "J" standards.		
26.0	Refrigerant recovery, recycling, and handling. The student will be able to:	
	26.01 Maintain and verify correct operation of certified equipment.	P-1
	26.02 Identify and recover A/C system refrigerant.	P-1
	26.03 Recycle or properly dispose of refrigerant.	P-1
	26.04 Handle, label, and store refrigerant.	P-1
	26.05 Test recycled refrigerant for non-condensable gases.	P-1
	26.06 Demonstrate knowledge of federal requirements for the handling of refrigerants.	

Course Description: The Diesel Steering and Suspension Technician 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 steering, suspension, wheel alignment, wheels, tires, and frame systems.

For every task in Diesel Steering and Suspension Technician, 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 first task in Diesel Steering and Suspension Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

SS Task List:
P-1 = 23
P-2 = 14
P-3 = 8
Total 45

Course Number: DIM0107 Occupational Completion Point: C Diesel Steering and Suspension Technician – 150 Hours		Priority Number
27.0	Steering column diagnosis, service, and repair. The student will be able to:	
27.01	Identify and diagnose fixed and driver adjustable steering column and shaft noise, looseness, and binding problems; determine needed action.	P-1
27.02	Inspect and service steering shaft U-joint(s), slip joints, bearings, bushings, and seals; phase shaft.	P-1
27.03	Check cab mounting and adjust ride height.	P-2
27.04	Remove the steering wheel (includes steering wheels equipped with electrical/electronic controls and components); install and center the steering wheel. Inspect, test, replace and calibrate steering angle sensor.	P-1
27.05	Disable and enable supplemental restraint system (SRS) in accordance with manufacturers' procedures.	P-1
28.0	Steering units diagnosis, service, and repair. The student will be able to:	
28.01	Identify and diagnose power steering system noise, steering binding, darting/oversteer, reduced wheel cut, steering wheel kick, pulling, non-recovery, turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems; determine needed action.	P-1
28.02	Determine recommended type of power steering fluid; check level and condition; determine needed action.	P-1
28.03	Flush and refill power steering system; purge air from system.	P-2
28.04	Perform power steering system pressure, temperature, and flow tests; determine needed action.	P-3
28.05	Inspect, service, or replace power steering reservoir including filter, seals, and gaskets.	P-2
28.06	Inspect power steering pump drive gear and coupling; replace as needed.	P-3
28.07	Inspect, adjust, or replace power steering pump, mountings, and brackets.	P-3
28.08	Inspect and replace power steering system cooler, lines, hoses, clamps/mountings, hose routings, and fittings.	P-2
28.09	Inspect, adjust, repair, or replace integral type power steering gear(s) (single and/or dual) and mountings.	P-2
29.0	Steering linkage diagnosis, service, and repair. The student will be able to:	
29.01	Inspect and align pitman arm; replace as needed.	P-1
29.02	Check and adjust steering (wheel) stops; verify relief pressures.	P-1
29.03	Inspect and lubricate steering components.	P-1
29.04	Inspect drag link (relay rod) and tie rod ends; adjust or replace as needed.	
29.05	Inspect steering arm and levers, and linkage pivot joints; replace as needed.	

	29.06 Inspect clamps and retainers on cross tube/relay rod/centerline/tie rod; position or replace as needed.	
30.0	Suspension systems diagnosis, service, and repair. The student will be able to:	
	30.01 Inspect front axles and attaching hardware; determine needed action.	P-1
	30.02 Inspect and service kingpins, steering knuckle bushings, locks, bearings, seals, and covers; determine needed action.	P-1
	30.03 Inspect shock absorbers, bushings, brackets, and mounts; replace as needed.	P-1
	30.04 Inspect leaf springs, center bolts, clips, pins and bushings, shackles, U-bolts, insulators, brackets, and mounts; determine needed action.	P-1
	30.05 Inspect axle aligning devices such as radius rods, track bars, stabilizer bars, torque arms, related bushings, mounts, shims, and cams; determine needed action.	P-1
	30.06 Inspect tandem suspension equalizer components; determine needed action.	P-3
	30.07 Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; adjust, repair or replace as needed.	P-1
	30.08 Inspect air springs, mounting plates, springs, suspension arms, and bushings; replace as needed.	P-1
	30.09 Measure and adjust vehicle ride height; determine needed action.	P-1
	30.10 Identify rough ride problems; determine needed action.	P-3
	30.11 Inspect walking beams, center (cross) tube, bushings, mounts, load pads, and saddles/caps; replace as needed.	
31.0	Wheel alignment diagnosis, adjustment, and repair. The student will be able to:	
	31.01 Identify and diagnose vehicle wandering, pulling, shimmy, hard steering and off-center steering wheel problems; adjust or repair as needed.	P-1
	31.02 Check camber; determine needed action.	P-2
	31.03 Check caster; adjust as needed.	P-2
	31.04 Check and adjust toe settings.	P-1
	31.05 Check rear axle(s) alignment (thrust line/centerline) and tracking; adjust or repair as needed.	P-2
	31.06 Diagnose turning/Ackerman angle (toe-out-on-turns) problems; determine needed action.	P-3
	31.07 Check front axle alignment (centerline); adjust or repair as needed.	P-2
32.0	Wheels and tires diagnosis, service, and repair. The student will be able to:	
	32.01 Identify and diagnose tire wear patterns; check tread depth and pressure; determine needed action.	P-1
	32.02 Identify and diagnose wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action.	P-2

	32.03 Remove and install steering and drive axle wheel/tire assemblies; torque mounting hardware to specifications with a torque wrench.	P-1
	32.04 Inspect tire for proper application, (size, load range, position, and tread design); determine needed action.	P-2
	32.05 Inspect wheel/rims for flaws, proper application, load range and design; ensure dual rims are properly clocked to access valve stems; determine needed action.	P-2
	32.06 Check operation of tire pressure monitoring system (TPMS); determine needed action if applicable.	P-3
33.0	Frame and coupling diagnosis, service, and repair. The student will be able to:	
	33.01 Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, and mounting hardware.	P-1
	33.02 Inspect and service sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls.	P-2
	33.03 Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed repairs.	P-1
	33.04 Inspect, install, or repair frame hangers, brackets, and cross members in accordance with manufacturers' recommended procedures.	P-3
	33.05 Inspect, repair or replace pintle hooks and draw bars, if applicable.	P-2

Course Description: The Diesel Drivetrain Technician 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 clutch, transmission, driveshaft, universal joint, and drive axle systems.

For every task in Diesel Drivetrain Technician, 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 first task in Diesel Drivetrain Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

DT Task List:	
	P-1 = 27
	P-2 = 18
	P-3 = 12
Total	**57**

Course Number: DIM0108 Occupational Completion Point: D Diesel Drivetrain Technician – 150 Hours		**Priority Number**
34.0	Clutch diagnosis and repair. The student will be able to:	
	34.01 Identify causes of clutch noise, binding, slippage, pulsation, vibration, grabbing, dragging, and chatter problems; determine needed action.	P-1
	34.02 Inspect and adjust clutch linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch	P-1

	(includes push and pull-type assemblies); check pedal height and travel; perform needed action.	
34.03	Inspect, adjust, repair, and replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system.	P-2
34.04	Inspect, adjust, lubricate or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals.	P-1
34.05	Inspect, adjust, and replace single-disc clutch pressure plate and clutch disc.	P-1
34.06	Inspect, adjust, and replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs.	P-1
34.07	Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; perform needed action.	P-1
34.08	Inspect, adjust, and replace self-adjusting/continuous-adjusting clutch mechanisms.	P-1
34.09	Inspect and replace pilot bearing.	P-1
34.10	Remove and reinstall flywheel, inspect mounting area on crankshaft, rear main oil seal, and measure crankshaft end play; determine needed action.	P-1
34.11	Inspect flywheel, starter ring gear and measure flywheel face and pilot bore runout; determine needed action.	P-1
34.12	Inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.	P-2
35.0	Transmission diagnosis and repair. The student will be able to:	
35.01	Identify causes of transmission noise, shifting concerns, lockup, jumping-out-of-gear, overheating, and vibration problems; determine needed action.	P-1
35.02	Inspect, test, repair, or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies.	P-2
35.03	Inspect and replace transmission mounts, insulators, and mounting bolts.	P-1
35.04	Inspect for leakage and replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; repair as needed.	P-1
35.05	Check transmission fluid level and condition; determine needed service; add proper type of lubricant.	P-1
35.06	Inspect, adjust, and replace transmission shift lever, cover, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires.	P-2
35.07	Remove and reinstall transmission.	P-1
35.08	Inspect input shaft, gear, spacers, bearings, retainers, and slingers; determine needed action.	P-3
35.09	Inspect transmission oil filters and coolers and related components; replace as needed.	P-2
35.10	Inspect speedometer components; determine needed action.	P-2
35.11	Inspect and adjust power take-off (P.T.O.) assemblies, controls, and shafts; determine needed action.	P-3

35.12	Inspect and test function of reverse light, neutral start, and warning device circuits; determine needed action.	P-1
35.13	Inspect and test transmission temperature gauge, wiring harnesses and sensor/sending unit; determine needed action.	P-2
35.14	Inspect and test operation of automated mechanical transmission and manual electronic shift controls, shift, range and splitter solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU) neutral/in gear and reverse switches, and wiring harnesses; determine needed action.	P-2
35.15	Inspect and test operation of automated mechanical transmission electronic shift selectors, air and electrical switches, displays and indicators, wiring harnesses, and air lines; determine needed action.	P-2
35.16	Use appropriate electronic service tool(s) and procedures to diagnose automated mechanical transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed action.	P-1
35.17	Inspect and test operation of automatic transmission electronic shift controls, shift solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, and wiring harnesses.	P-2
35.18	Inspect and test operation of automatic transmission electronic shift selectors, switches, displays and indicators, wiring harnesses.	P-2
35.19	Use appropriate electronic service tool(s) and procedures to diagnose automatic transmission problems; check and record diagnostic codes, clear codes, and interpret digital multi-meter (DMM) readings; determine needed repairs.	P-3
35.20	Diagnose transmission component failure cause, both before and during disassembly procedures; determine needed action.	
35.21	Inspect, adjust, service, repair, or replace transmission remote shift linkages, brackets, bushings, pivots, and levers.	
35.22	Inspect and adjust main shaft, gears, sliding clutches, washers, spacers, bushings, bearings, auxiliary drive assemblies, retainers, and keys; replace as needed.	
35.23	Inspect countershafts, gears, bearings, retainers, and keys; adjust bearing preload and time multiple countershaft gears; replace as needed.	
35.24	Inspect output shafts, gears, washers, spacers, bearings, retainers, and keys; replace as needed.	
35.25	Inspect and/or replace reverse idler shafts, gears, bushings, bearings, thrust washers, and retainers; check reverse idler gear end play (where applicable).	
35.26	Inspect synchronizer hub, sleeve, keys (inserts), springs, blocking rings, synchronizer plates, blocker pins, and sliding clutches; replace as needed.	
35.27	Inspect transmission cases including surfaces, bores, bushings, pins, studs, and magnets; replace as needed.	
35.28	Inspect transmission lubrication system pumps, troughs, collectors, and slingers; service or replace as needed.	
36.0	Driveshaft and universal joint diagnosis and repair. The student will be able to:	

	36.01 Identify causes of driveshaft and universal joint noise and vibration problems; determine needed action.	P-1
	36.02 Inspect, service, or replace driveshaft, slip joints, yokes, drive flanges, and universal joints; driveshaft boots and seals, and retaining hardware; check phasing of all shafts.	P-1
	36.03 Inspect driveshaft center support bearings and mounts; determine needed action.	P-1
	36.04 Measure drive line angles; determine needed action.	P-1
37.0	Drive axle diagnosis and repair. The student will be able to:	
	37.01 Identify causes of drive axle(s) drive unit noise and overheating problems; determine needed action.	P-2
	37.02 Check and repair fluid leaks; inspect and replace drive axle housing cover plates, gaskets, sealants, vents, magnetic plugs, and seals.	P-1
	37.03 Check drive axle fluid level and condition; determine needed service; add proper type of lubricant.	P-1
	37.04 Remove and replace differential carrier assembly.	P-2
	37.05 Inspect and replace differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearings.	P-3
	37.06 Inspect and replace components of locking differential case assembly.	P-3
	37.07 Inspect differential carrier housing and caps, side bearing bores, and pilot (spigot, pocket) bearing bore; determine needed action.	P-3
	37.08 Measure ring gear runout; determine needed action.	P-2
	37.09 Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cages, and bearings.	P-3
	37.10 Measure and adjust drive pinion bearing preload.	P-3
	37.11 Measure and adjust drive pinion depth.	P-3
	37.12 Measure and adjust side bearing preload and ring gear backlash.	P-2
	37.13 Check and interpret ring gear and pinion tooth contact pattern; determine needed action.	P-2
	37.14 Inspect, adjust, or replace ring gear thrust block/bolt.	P-3
	37.15 Inspect power divider (inter-axle differential) assembly; determine needed action.	P-3
	37.16 Inspect, adjust, repair, or replace air operated power divider (inter-axle differential) lockout assembly including diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls.	P-2
	37.17 Inspect, repair, or replace drive axle lubrication system: pump, troughs, collectors, slingers, tubes, and filters.	P-3
	37.18 Inspect and replace drive axle shafts.	P-1
	37.19 Remove and replace wheel assembly; check rear wheel seal and axle flange gasket for leaks; perform needed action.	P-1
	37.20 Identify causes of drive axle wheel bearing noise and check for damage; perform needed action.	P-1

	37.21 Inspect and test drive axle temperature gauge, wiring harnesses, and sending unit/sensor; determine needed action.	P-2
	37.22 Clean, inspect, lubricate and replace wheel bearings; replace seals and wear rings; inspect and replace retaining hardware; adjust drive axle wheel bearings. Verify end play with dial indicator method	P-1

Course Number: DIM0109 Occupational Completion Point: E Diesel Hydraulics Technician – 150 Hours		**Priority Number**
38.0	General hydraulic system diagnosis and repair. The student will be able to:	
	38.01 Identify system type (closed and open) and verify proper operation.	P-1
	38.02 Read and interpret system diagrams and schematics.	P-1
	38.03 Perform system temperature, pressure, flow, and cycle time tests; determine needed action.	P-1
	38.04 Verify placement of equipment /component safety labels and placards; determine needed action.	P-1
39.0	Diagnose and repair hydraulic pumps. The student will be able to:	
	39.01 Identify system fluid type.	P-1
	39.02 Identify causes of pump failure, unusual pump noises, temperature flow, and leakage problems; determine needed action.	P-1
	39.03 Determine pump type, rotation, and drive system.	P-1
	39.04 Remove and install pump; prime and/or bleed system.	P-2
	39.05 Inspect pump inlet for restrictions and leaks; determine needed action.	P-2
	39.06 Inspect pump outlet for restrictions and leaks; determine needed action.	P-2
40.0	Diagnose and repair hydraulic filtration/reservoirs (tanks). The student will be able to:	
	40.01 Identify type of filtration system; verify filter application and flow direction.	P-1
	40.02 Service filters and breathers.	P-1
	40.03 Identify causes of system contamination; determine needed action.	P-2
	40.04 Take a hydraulic oil sample for analysis.	P-1
	40.05 Check reservoir fluid level and condition; determine needed action.	P-1
	40.06 Inspect and repair or replace reservoir, sight glass, vents, caps, mounts, valves, screens, supply and return lines.	P-1
41.0	Diagnose and repair hydraulic hoses, fittings, and connections. The student will be able to:	

41.01	Diagnose causes of component leakage, damage, and restriction; determine needed action.	P-2
41.02	Inspect hoses and connections (length, size, routing, bend radii, and protection); repair or replace as needed.	P-1
41.03	Assemble hoses, tubes, connectors, and fittings in accordance with manufacturers' specifications; use proper procedures to avoid contamination.	P-1
41.04	Inspect and replace fitting seals and sealants.	P-1
42.0	Diagnose and repair hydraulic control valves. The student will be able to:	
42.01	Pressure test system safety relief valve; determine needed action.	P-1
42.02	Perform control valve operating pressure and flow tests; determine needed action.	P-1
42.03	Inspect, test, and adjust valve controls (electrical/electronic, mechanical, and pneumatic).	P-1
42.04	Identify causes of control valve leakage problems (internal/external); determine needed action.	P-1
42.05	Inspect pilot control valve linkages, cables, and PTO controls; adjust, repair, or replace as needed.	P-1
43.0	Diagnose and repair hydraulic actuators. The student will be able to:	
Comply with manufacturers' and industry accepted safety practices associated with equipment lock out/tag out; pressure line release; implement/support (blocked or resting on ground); and articulated cylinder devices/machinery safety locks.		
43.01	Identify actuator type (single/double acting, multi-stage/telescopic, and motors).	P-1
43.02	Identify the cause of seal failure; determine needed repairs.	P-1
43.03	Identify the cause of incorrect actuator movement and leakage (internal and external); determine needed repairs.	P-1
43.04	Inspect actuator mounting, frame components, and hardware for looseness, cracks, and damage; determine needed action.	P-1
43.05	Remove, repair, and/or replace actuators in accordance with manufacturers' recommended procedures.	P-1
43.06	Inspect actuators for dents, cracks, damage, and leakage; determine needed action.	P-1
43.07	Purge and/or bleed system in accordance with manufacturers' recommended procedures.	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

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

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 Automotive Service Excellence (ASE) Education Foundation.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Language and Reading 9). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Transit Technician 1**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T660100	
CIP Number	0647061307	
Grade Level	30, 31	
Program Length	620 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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: maintaining and repairing diesel engines, performing diesel engine and bus preventive maintenance (PMI) inspections, maintaining and repairing ADA accessible lifts and ramps, maintaining and repairing basic electrical systems, and maintaining, and repairing steering and suspension systems.

The course content will also include training in communication, leadership, human relations, transit safety awareness, Safety Data Sheets (SDS), employability skills, and safe efficient work practices.

The purpose of this program is to prepare students for employment as transit technicians, train existing employees to become FTMC certified transit technicians and to prepare existing technicians for the ASE series of Transit Bus tests.

It is recommended that students complete the five occupational completion points (OCP's) for each technician level before advancing to the next tier. Transit technician I and II are prerequisites for the Transit Technician III, and ultimately, the FTMC Transit Technician certification.

The courses may be taken in any sequence within their respective tier, but tiers must be taken sequentially, starting with tier 1, then tier 2, and ending with tier 3. Students must demonstrate proficiency in the preceding tier prior to advancement to the next higher tier.

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 programs of instruction consisting of 15 occupational completion points. The recommended sequence allows students to complete specified portions of the program for employment or to remain for advanced training. A student who completes the applicable competencies at any occupational completion point may either continue with the training program or terminate as an occupational completer.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	DIM0810	Transit Equipment Preventive Maintenance Technician	DIESEL MECH @7 7G	200 hours
B	DIM0811	Transit Basic Electrical Systems Technician		120 hours
C	DIM0812	Transit Wheelchair Lift/Ramp Technician		60 hours
D	DIM0813	Transit Diesel Engine Preventive Maintenance Technician		120 hours
E	DIM0814	Transit Steering and Suspension Technician		120 hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership, and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Identify shop organization, management, and safety requirements.
02.0 Demonstrate infection control procedures and general shop safety.
03.0 Demonstrate SDS procedures and practice general shop safety.
04.0 Demonstrate the use of hardware and fasteners, basic tools, and equipment.
05.0 Demonstrate and apply proper oxy-acetylene gas practices and techniques.
06.0 Demonstrate workplace communication skills.
07.0 Demonstrate shop and occupational safety procedures.
08.0 Perform transit bus and support equipment preventive maintenance.
09.0 Perform tire service, identification, and repair.
10.0 Identify tire monitoring system features.
11.0 Demonstrate Road Call procedures.
12.0 Demonstrate the qualifications for employment.
13.0 Demonstrate shop and occupational safety procedures.
14.0 Maintain and repair transit bus basic electrical systems and components.
15.0 Demonstrate the qualifications for employment.
16.0 Demonstrate shop and occupational safety procedures.
17.0 Maintain and repair transit bus wheelchair lift and ramp systems and components.
18.0 Demonstrate the qualifications for employment.
19.0 Demonstrate shop and occupational safety procedures.
20.0 Perform engine preventive maintenance.
21.0 Perform Diesel Exhaust Fluid (DEF) system preventive maintenance.
22.0 Demonstrate a basic familiarity with diagnostic software.
23.0 Demonstrate the qualifications for employment.
24.0 Demonstrate shop and occupational safety procedures.
25.0 Maintain and repair steering and suspension systems.
26.0 Demonstrate the qualifications for employment.

Florida Department of Education
Student Performance Standards

Program Title: **Transit Technician 1**
Career Certificate Program Number: **T660100**

Course Description: The Transit Equipment Preventive Maintenance Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study shop safety, infection control, SDS, AED, and CPR procedures, basic tools and equipment, welding, communication, occupational safety, bus and forklift preventative maintenance, tire service, and employability.

Course Number: DIM0810 **Occupational Completion Point: A** **Transit Equipment Preventive Maintenance Technician – 200 Hours**
01.0 Identify shop and occupational safety procedures. The student will be able to:
01.01 Identify basic shop organization and management regulations.
01.02 Identify required shop-safety practices.
01.03 Identify and describe shop-maintenance procedures, including precautions for handling and storing work-related chemicals and hazardous materials.
02.0 Demonstrate infection control procedures and general shop safety. The student will be able to:
02.01 Understand how blood-borne pathogens are spread and how to clean contamination on environmental surfaces.
02.02 Identify cleaning solutions that will kill the AIDS virus on environmental surfaces.
02.03 Practice general shop safety.
03.0 Demonstrate SDS procedures and practice general shop safety. The student will be able to:
03.01 Understand where the Safety Data Sheet (SDS) booklet is located (central location) and how it is used.
04.0 Demonstrate the use of hardware and fasteners, basic tools and equipment. The student will be able to:
04.01 Identify and use the following correctly and safely:
• Basic hand tools
• Basic welding tools and equipment
• Power tools
• Measuring and precision tools.
• Basic and specialty hardware and fasteners.

	04.02 Read a digital micrometer.
05.0	Demonstrate and apply proper oxy-acetylene gas practices, and techniques. The student will be able to:
	05.01 Perform safety inspections of equipment and accessories.
	05.02 Perform external inspections of equipment and accessories.
	05.03 Set up equipment safely and prepare for operations.
	05.04 Examine and prepare working surfaces.
	05.05 Adjust gas pressure properly.
	05.06 Identify a neutral flame.
	05.07 Apply proper flux.
	05.08 Apply proper heat.
	05.09 Perform proper shutdown procedures.
	05.10 Properly store equipment and accessories according to OSHA regulations.
	05.11 Inspect, clean, and secure work area.
06.0	Demonstrate workplace communication skills. The student will be able to:
	06.01 Locate information in technical literature, such as a manufacturer's manual, in both print and computer versions.
	06.02 Read, interpret, and apply information from parts and service manuals.
	06.03 Read and follow written and oral instructions.
	06.04 Read and interpret graphs, charts, diagrams, and tables commonly used in the transit technology industry.
	06.05 Answer and ask questions coherently and concisely.
	06.06 Use basic keyboarding and computer skills.
	06.07 Use industry-related computer software.
	06.08 Interpret technical specification information and diagnose problems, both verbally and in writing.
	06.09 Solve basic transit technology problems by combining knowledge of transit systems with technical information and diagnostic data.
	06.10 Complete accurately the required information for journals, repair orders, invoices, timecards, job sheets, and forms.
	06.11 Demonstrate telephone and interpersonal communication skills to exchange information accurately and courteously with customers, co-worker, and supervisors.
07.0	Demonstrate shop and occupational safety procedures. The student will be able to:
	07.01 Comply with safety regulations for all preventive maintenance technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.

	07.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
08.0	Perform transit bus and support equipment preventive maintenance. The student will be able to:
	08.01 Identify the types of preventive maintenance, including oil analysis, required for components and systems, according to manufacturer and company specifications.
	08.02 Schedule preventive-maintenance inspections at the miles and/or times required by manufacturer and company specifications.
	08.03 Perform preventive maintenance inspections and record results according to manufacturer and company specifications, including:
	• Air, parking, and anti-locking brake systems, Ref: FMVSS121
	• Wheels, bearings, hubs, and tires, Ref: TMC RP618
	• Heating and air-conditioning components, refrigerants, and system operations.
	• Hydraulic systems, including fluids, filters, lines, and reservoirs.
	• Tires, suspension, and drive train.
	• Other interior and exterior items as indicated on the Preventive Maintenance Work Order/Checklist.
	08.04 Test-drive equipment, where liability and safety allow such tests, and identify needed repairs.
09.0	Perform tire service, identification, and repair. The student will be able to:
	09.01 Identify the types of tires, wheels, tread depth measurement, and sidewall inspection criteria.
	09.02 Understand relationship between tire size and speedometer, odometer, hub meter.
	09.03 Identify different wear indicator patterns and relationship to defective components.
10.0	Identify tire monitoring system features and their basic preventive maintenance procedures. The student will be able to:
	10.01 Identify and understand the features of transit tire monitoring systems.
	10.02 Perform preventive maintenance inspections and record results according to manufacturer and company specifications.
11.0	Demonstrate Road Call procedures. The student will be able to:
	11.01 Understand the importance of road call procedures as they relate to safety of the vehicle, personnel, and environment.
	11.02 Identify road call specific items, including: flares, flags, reflective vests, triangles, and safe setup these items.
	11.03 Practice considerate interaction with the public.
12.0	Demonstrate the qualifications for employment. The student will be able to:
	12.01 Demonstrate shop organization, management, and safety requirements for a preventive maintenance technician.
	12.02 Demonstrate the use of tools and equipment required for a preventive maintenance technician.
	12.03 Demonstrate workplace communication skills required by a preventive maintenance technician.

12.04	Demonstrate the application of math and science principles required for a preventive maintenance technician's job tasks.
12.05	Identify and demonstrate work habits of successful employees concerning:
	• Quality of work
	• Work hours and schedule
	• Actions, initiative, teamwork, dependability, and responsible decision making
	• Self-control, responses to criticism, and relationships with customers and supervisors
	• Time management, cost effectiveness, and fair pricing
	• Personal hygiene, health habits, and professional appearance
	• Driving records, drug-free workplace, and industry policies
12.06	Obtain information about training and licensing requirements, equipment needs, responsibilities, pay, benefits, work conditions, risks, and opportunities for advancement.
12.07	Demonstrate knowledge of the Federal Law, as recorded in (29 CFR 1910.1200).
12.08	Demonstrate employability skills as a transit bus preventive maintenance technician.

Course Description: The Transit Basic Electrical Systems Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, basic electrical systems, and employability.

Course Number: DIM0811 Occupational Completion Point: B Transit Basic Electrical Systems Technician – 120 Hours	
13.0	Demonstrate shop and occupational safety procedures. The student will be able to:
13.01	Comply with safety regulations for all basic electrical technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
13.02	Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
14.0	Maintain and repair transit bus basic electrical systems and components.--The student will be able to:
14.01	Explain the theory and nature of electricity.
14.02	Understand basic electrical terminology and symbols.
14.03	Analyze electrical circuits.
14.04	Work problems using Ohm's law.
14.05	Understand circuit characteristics: series, parallel, open, short, and grounded.

	14.06 Explain the principals of relays and transistors.
	14.07 Understand mystery harness application.
	14.08 Explain magnetism and electromagnetic induction.
	14.09 Explain applications of alternating current (AC).
	14.10 Explain principles of direct current (DC) motors and generators.
	14.11 Explain principles of AC motors.
	14.12 Locate and match electrical units by their symbols on a wiring diagram.
	14.13 Set up and use voltmeters, ammeters, and ohmmeters.
15.0	Demonstrate the qualifications for employment. The student will be able to:
	15.01 Demonstrate shop organization, management, and safety requirements for a basic electrical systems technician.
	15.02 Demonstrate the use of tools and equipment required for a basic electrical systems technician.
	15.03 Demonstrate workplace communication skills required by a basic electrical systems technician Ref: OSHA 29CFR1910.303.
	15.04 Demonstrate the application of math and science principles required for a basic electrical systems technician's job tasks.
	15.05 Demonstrate employability skills as a transit bus basic electrical systems technician Ref: OSHA 29CFR1910.305.

Course Description: The Transit Wheelchair Lift/Ramp Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, wheelchair lift and ramp systems, employability.

Course Number: DIM0812 Occupational Completion Point: C Transit Wheelchair Lift/Ramp Technician – 60 Hours	
16.0	Demonstrate shop and occupational safety procedures. The student will be able to:
	16.01 Comply with safety regulations for all wheelchair lift and ramp activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
	16.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
17.0	Maintain and repair transit bus wheelchair lift/ramp systems and components. The student will be able to:
	17.01 Troubleshoot and repair the following:
	17.02 Wheelchair lift, ramp, pumps, hoses, and components and associated hardware.
	17.03 Troubleshoot and repair kneeler faults and components.

	17.04 Troubleshoot and repair lift hydraulic/electrical system.
	17.05 Perform inspection, maintenance, and lubrication as per manufacturer specifications.
	17.06 Identify, demonstrate, and verify proper maintenance and operation of safety components of wheelchair lift systems.
18.0	Demonstrate the qualifications for employment. The student will be able to:
	18.01 Demonstrate shop organization, management, and safety requirements for a wheelchair lift/ramp systems technician.
	18.02 Demonstrate the use of tools and equipment required for a wheelchair lift/ramp systems technician.
	18.03 Demonstrate workplace communication skills required by a wheelchair lift/ramp systems technician.
	18.04 Demonstrate the application of math and science principles required for a wheelchair lift/ramp systems technician's job tasks.
	18.05 Demonstrate employability skills as a transit bus wheelchair lift/ramp systems technician.

Course Description: The Transit Vehicle Engine Preventive Maintenance Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, diesel engine preventive maintenance skills, and employability.

Course Number: DIM0813 Occupational Completion Point: D Transit Diesel Engine Preventive Maintenance Technician – 120 Hours	
19.0	Demonstrate shop and occupational safety procedures. The student will be able to:
	19.01 Comply with safety regulations for all engine technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
	19.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
20.0	Perform engine preventive maintenance.--The student will be able to:
	20.01 Identify types of bearings and their uses.
	20.02 Identify seals, gaskets, and fasteners.
	20.03 Identify drive power train components and functions.
	20.04 Identify threaded fasteners by size, type, thread series, thread classes, material hardness, and compatibility.
	20.05 Identify the types of preventive maintenance, including oil analysis, required for components and systems, according to manufacturer, company specifications, and total base number (TBN).
	20.06 Schedule preventive-maintenance inspections at the miles and/or times required by manufacturer and company specifications.
	20.07 Perform preventive-maintenance inspections and record results according to manufacturer and company specifications.
	20.08 Demonstrate the ability to correctly remove an oil sample for analysis, including mid-point drain and pressure drain.

21.0	Perform Diesel Exhaust Fluid (DEF) system preventive maintenance. The student will be able to:
	21.01 Inspect, remove, and install DEF tank.
	21.02 Inspect, remove, and install DEF dosing filter.
	21.03 Inspect and test DEF level sensor.
	21.04 Diagnose and repair DEF Fault Codes.
22.0	Demonstrate a basic familiarity with the dialogistic software. The student will be able to:
	22.01 Enter ESN and retrieve Fault Codes
	22.02 Identify and interpret Engine Fault Code(s).
	22.03 Retrieve current Cummins engine manuals and TSB's
	22.04 Search and locate parts using online resources.
23.0	Demonstrate the qualifications for employment. The student will be able to:
	23.01 Demonstrate shop organization, management, and safety.
	23.02 Demonstrate the use of tools and equipment required for a transit engine technician.
	23.03 Demonstrate workplace communication skills required by a transit engine technician.
	23.04 Demonstrate the application of math and science principles required for a transit engine technician's job tasks.
	23.05 Demonstrate employability skills as a transit engine technician.

Course Description: The Transit Steering and Suspension Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, steering and suspension systems, employability**.**

Course Number: DIM0814 **Occupational Completion Point: E** **Transit Steering and Suspension Technician – 120 Hours**	
24.0	Demonstrate shop and occupational safety procedures. The student will be able to:
	24.01 Comply with safety regulations for all steering and suspension technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
	24.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
25.0	Maintain and repair steering and suspension systems. The student will be able to:
	25.01 Troubleshoot and repair the following:

	• Conventional steering systems
	• Hydraulic steering systems
	• Rear-axle suspensions
	• Front-axle suspensions
	• Air ride suspension system
	• Electric power steering systems (familiarization)
25.02	Service wheels, bearings, hubs, and seals.
25.03	Service tires.
25.04	Align bus frame.
25.05	Align bus height.
26.0	Demonstrate the qualifications for employment. The student will be able to:
26.01	Demonstrate shop organization, management, and safety requirements for a steering and suspension technician.
26.02	Demonstrate the use of tools and equipment required for a steering and suspension technician.
26.03	Demonstrate workplace communication skills required by a steering and suspension maintenance technician.
26.04	Demonstrate the application of math and science principles required for a steering and suspension technician's job tasks.
26.05	Demonstrate employability skills as a transit bus steering and suspension maintenance technician.

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 safety guidelines in the student performance standards have been recommended in the ASE Program Certification Standards administered by the Automotive Service excellence Education Foundation (ASEEF).

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Transit Technician 2**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T660200	
CIP Number	0647061308	
Grade Level	30, 31	
Program Length	620 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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: maintaining and repairing diesel engines, maintaining and repairing hydraulic systems, maintaining and repairing electrical systems, maintaining and repairing heavy duty bus drive train systems and components, maintaining and repairing brake and air systems.

The course content will also include training in communication, leadership, human relations, transit safety awareness, Safety Data Sheets (SDS), employability skills, and safe efficient work practices.

The purpose of this program is to prepare students for employment as transit technicians, train existing employees to become FTMC certified transit technicians and to prepare existing technicians for the ASE series of Transit Bus tests.

It is recommended that students complete the five OCP's for each technician level before advancing to the next tier. Transit technician 1 and 2 are prerequisites for the Transit Technician 3, and ultimately, the FTMC Transit Technician certification.

The courses may be taken in any sequence within their respective tier, but tiers must be taken sequentially, starting with tier 1, then tier 2, and ending with tier 3. Students must demonstrate proficiency in the preceding tier prior to advancement to the next higher tier.

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 programs of instruction consisting of 15 occupational completion points. The recommended sequence allows students to complete specified portions of the program for employment or to remain for advanced training. A student who completes the applicable competencies at any occupational completion point may either continue with the training program or terminate as an occupational completer.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	DIM0820	Transit Hydraulics Technician	DIESEL MECH @7 7G	60 hours
B	DIM0821	Transit Diesel Electrical and Diesel Engine Electronics Technician		120 hours
C	DIM0822	Transit Drivetrain Technician		120 hours
D	DIM0823	Transit Intermediate Electrical Systems Technician		120 hours
E	DIM0824	Transit Brakes/Air System Technician		200 hours

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 shop and occupational safety procedures.
02.0 Maintain and repair transit bus hydraulic systems.
03.0 Demonstrate the qualifications for employment.
04.0 Demonstrate shop and occupational safety procedures.
05.0 Identify and apply electrical principles related to transit technology.
06.0 Identify and apply electronic principles related to transit technology.
07.0 Maintain and repair electrical systems.
08.0 Demonstrate the qualifications for employment.
09.0 Demonstrate shop and occupational safety procedures.
10.0 Maintain and repair transit bus power train systems and components.
11.0 Demonstrate the qualifications for employment.
12.0 Demonstrate shop and occupational safety procedures.
13.0 Maintain and repair transit vehicle intermediate electrical systems and components.
14.0 Demonstrate the qualifications for employment.
15.0 Demonstrate shop and occupational safety procedures.
16.0 Maintain and repair brake systems.
17.0 Demonstrate the qualifications for employment.

Florida Department of Education
Student Performance Standards

Program Title: **Transit Technician 2**
Career Certificate Programs Number: **T660200**

Course Description: The Transit Hydraulics Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, hydraulic systems, and employability.

Course Number: DIM0820 **Occupational Completion Point: A** **Transit Hydraulics Technician – 60 Hours**	
01.0	Demonstrate shop and occupational safety procedures. The student will be able to:
01.01	Comply with safety regulations for all hydraulic systems technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
01.02	Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
02.0	Maintain and repair hydraulic system components. The student will be able to:
02.01	Explain the basic principles of hydraulics.
02.02	Identify and explain the operating components of hydraulic systems, including Pascal's Law.
02.03	Locate and identify hydraulic units by their symbols on a diagram.
02.04	Troubleshoot hydraulic circuits using test equipment.
02.05	Maintain hydraulic fluids, filters, lines, and reservoirs.
02.06	Identify and explain the operating components of the following:
•	Hydraulic pumps and motors
•	Control valves
•	Hydraulic cylinders
•	Hydraulic accessories
•	Hydraulic steering
•	Hydraulic fan control assembly
03.0	Demonstrate the qualifications for employment. The student will be able to:
03.01	Demonstrate shop organization, management, and safety requirements for a hydraulic systems technician.

03.02	Demonstrate the use of tools and equipment required for a hydraulic systems technician.
03.03	Demonstrate workplace communication skills required by a hydraulic systems technician.
03.04	Demonstrate the application of math and science principles required for a hydraulic maintenance technician's job tasks.
03.05	Demonstrate employability skills as a transit bus hydraulic systems technician.

Course Description: The Transit Electrical and Engine Electronics Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, electrical and electronic principles, and employability.

Course Number: DIM0821 Occupational Completion Point: B Transit Diesel Electrical and Diesel Engine Electronics Technician – 120 Hours	
04.0	Demonstrate shop and occupational safety procedures. The student will be able to:
04.01	Comply with safety regulations for all electrical and engine electronics technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
04.02	Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, and the handling, storage, and disposal of chemicals and hazardous materials.
05.0	Identify and apply electrical principles related to transit technology. The student will be able to:
05.01	Explain the basic concept of electricity.
05.02	Analyze electrical circuits.
05.03	Determine problems using Ohm's law.
05.04	Understand and explain magnetism and electromagnetic induction.
05.05	Understand and explain applications of alternating current (AC).
05.06	Understand and explain principles of direct current (DC) motors and generators.
05.07	Understand and explain principles of AC motors.
05.08	Locate and match electrical units by their symbols on a wiring diagram.
05.09	Set up and use voltmeters, ammeters, and ohmmeters.
06.0	Identify and apply electronic principles related to diesel technology. The student will be able to:
06.01	Understand and explain the principles of diodes and rectifiers.
06.02	Understand and explain the principles of voltage regulation and power supply circuits.
06.03	Understand and explain the principles of transistors.

	06.04 Understand and explain the principles of the silicon-controlled rectifier (SCR).
	06.05 Identify components of electronic systems and explain their functions.
07.0	Maintain and repair electrical systems. The student will be able to:
	07.01 Test and service the following:
	• Batteries
	• Instruments and gauges
	07.02 Test and repair the following systems:
	• Starting
	• Charging
	• Ignition
	• Lighting and accessories
	07.03 Inspect, remove, clean, and install batteries and cables for parallel and/or series hookups.
	07.04 Install batteries correctly where two or more batteries are used.
	07.05 Perform load test on batteries.
	07.06 Identify, diagnose, remove, and replace electronic sensors.
	07.07 Identify the methods for testing and repair of electronic governors.
08.0	Demonstrate the qualifications for employment. The student will be able to:
	08.01 Demonstrate shop organization, management, and safety requirements for an electrical and engine electronics technician.
	08.02 Demonstrate the use of tools and equipment required for an electrical and diesel engine electronics technician.
	08.03 Demonstrate workplace communication skills required by an electrical and diesel engine electronics technician.
	08.04 Demonstrate the application of math and science principles required for an electrical and engine electronics technician's job tasks.
	08.05 Demonstrate employability skills as an electrical and engine electronics technician.

Course Description: The Transit Drivetrain Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, powertrain systems and components, and employability.

Course Number: DIM0822 Occupational Completion Point: C Transit Drivetrain Technician – 120 Hours	
09.0	Demonstrate shop and occupational safety procedures. The student will be able to:
09.01	Comply with safety regulations for all drive-train technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
09.02	Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
10.0	Maintain and repair transit bus power train systems and components. The student will be able to:
10.01	Explain power train operating principles and identify components.
10.02	Service and Repair automatic transmissions.
10.03	Troubleshoot power trains.
10.04	Troubleshoot transmission shift patterns
10.05	Service and repair differentials.
10.06	Identify and service drivelines.
11.0	Demonstrate the qualifications for employment. The student will be able to:
11.01	Demonstrate shop organization, management, and safety requirements for a drive-train technician.
11.02	Demonstrate the use of tools and equipment required for a drive-train technician.
11.03	Demonstrate workplace communication skills required by a drive-train technician.
11.04	Demonstrate the application of math and science principles required for a drive-train technician's job tasks.
11.05	Demonstrate employability skills as a transit bus drive-train systems technician.

Course Description: The Transit Intermediate Electrical Systems Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, intermediate electrical systems, and employability.

Course Number: DIM0823 Occupational Completion Point: D Transit Intermediate Electrical Systems Technician – 120 Hours	
12.0	Demonstrate shop and occupational safety procedures. The student will be able to:
12.01	Comply with safety regulations for all intermediate electrical systems technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
12.02	Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power

	equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
13.0	Maintain and repair transit vehicle intermediate electrical systems and components. The student will be able to:
13.01	Explain the principles of operation and purposes of transistors, relays, and switches found on transit equipment.
13.02	Understand and explain the principle and design of starter motor and solenoid.
13.03	Understand the design and characteristics of generator, alternator, and battery equalizer.
13.04	Test and Trouble-shoot charging systems:
13.05	Perform a Battery Equalizer test and a Diode test.
13.06	Build and diagnose electrical circuits.
13.07	Analyze a transit component and corresponding schematic.
13.08	Read and understand electrical schematics and charts.
14.0	Demonstrate the qualifications for employment. The student will be able to:
14.01	Demonstrate shop organization, management, and safety requirements for an intermediate electrical systems technician.
14.02	Demonstrate the use of tools and equipment required for an intermediate electrical systems technician.
14.03	Demonstrate workplace communication skills required by an intermediate electrical systems technician.
14.04	Demonstrate the application of math and science principles required for an intermediate electrical systems technician's job tasks.
14.05	Demonstrate employability skills as a transit bus intermediate electrical systems technician.

Course Description: The Transit Brakes/Air System Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, transit bus brake and air systems, and employability**.**

Course Number: DIM0824 Occupational Completion Point: E Transit Brakes/Air System Technician – 200 Hours	
15.0	Demonstrate shop and occupational safety procedures. The student will be able to:
15.01	Comply with safety regulations for all transit brake and air system technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
15.02	Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
16.0	Maintain and repair brake systems. The student will be able to:
16.01	Explain the principles and identify components of different types of brake systems.
16.02	Service and recondition brake systems.

16.03	Identify the principles and components of the following brake systems.
	• Air
	• Parking
	• Anti-locking (ABS)
	• Disc
	• S-Cam
	• Hydraulic brakes
16.04	Troubleshoot brake systems.
16.05	Service and adjust air compressors and governors.
16.06	Service and recondition parking brakes.
16.07	Troubleshoot and service hydraulic booster.
16.08	Remove, inspect, repair, and replace brake pads, shoes, linings, cams, cam bearings, springs, brake air chambers, drums, and rotors.
16.09	Troubleshoot and service air system valves, tanks, lines, and fittings.
16.10	Troubleshoot brake and air system utilizing air brake board.
16.11	Perform a brake performance test utilizing FMVSS121.
16.12	Perform a brake decelerometer (decel) test.
17.0	Demonstrate the qualifications for employment. The student will be able to:
17.01	Demonstrate shop organization, management, and safety requirements for a transit brake and air system technician.
17.02	Demonstrate the use of tools and equipment required for a transit brake and air system technician.
17.03	Demonstrate workplace communication skills required by a transit brake and air system technician.
17.04	Demonstrate the application of math and science principles required for a transit brake and air system technician’s job tasks.
17.05	Demonstrate employability skills as a transit brake and air system technician.

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 safety guidelines in the student performance standards have been recommended in the ASE Program Certification Standards administered by the Automotive Service excellence Education Foundation (ASEEF).

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Language and Reading 9). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

Florida Department of Education
Curriculum Framework

Program Title: **Transit Technician 3**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T660300	
CIP Number	0647061309	
Grade Level	30, 31	
Program Length	680 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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: maintaining and repairing diesel engines, maintaining and repairing transmission and cooling systems, maintaining and repairing digital multiplex electrical systems, overhauling diesel engines and bus transmissions, maintaining and repairing heavy duty (10 ton) A/C systems and components, maintaining and repairing alternative fuel vehicles and components, and troubleshooting, maintaining, and repairing electronic computer controls and sensors and advanced electrical systems.

The course content will also include training in communication, leadership, human relations, transit safety awareness, Safety Data Sheets (SDS), employability skills, and safe efficient work practices.

The purpose of this program is to prepare students for employment as transit technicians, train existing employees to become FTMC certified transit technicians and to prepare existing technicians for the ASE series of Transit Bus tests.

It is recommended that students complete the five OCP's for each technician level before advancing to the next tier. Transit technician 1 and 2 are prerequisites for the Transit Technician 3, and ultimately, the FTMC Transit Technician certification.

The courses may be taken in any sequence within their respective tier, but tiers must be taken sequentially, starting with tier 1, then tier 2, and ending with tier 3. Student must demonstrate proficiency in the preceding tier prior to advancement to the next higher tier.

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 programs of instruction consisting of 15 occupational completion points. The recommended sequence allows students to complete specified portions of the program for employment or to remain for advanced training. A student who completes the applicable competencies at any occupational completion point may either continue with the training program or terminate as an occupational completer.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	DIM0830	Transit Alternative Fuels System Technician	DIESEL MECH @7 7G	120 hours
B	DIM0831	Transit Advanced Electrical Systems Technician		120 hours
C	DIM0832	Transit Heating and Air-Conditioning Technician		200 hours
D	DIM0833	Transmission Diagnosis, Rebuild and Repair Technician		120 hours
E	DIM0834	Diesel Engine Diagnosis, Rebuild and Repair Technician		120 hours

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 shop and occupational safety procedures.
02.0 Maintain and repair transit bus alternative fuels systems and components.
03.0 Demonstrate the qualifications for employment.
04.0 Demonstrate shop and occupational safety procedures.
05.0 Maintain and repair transit bus advanced electrical systems and components.
06.0 Demonstrate the qualifications for employment.
07.0 Demonstrate shop and occupational safety procedures.
08.0 Maintain and repair transit vehicle(s) heating and air-conditioning systems.
09.0 Demonstrate the qualifications for employment.
10.0 Demonstrate shop and occupational safety procedures.
11.0 Maintain, diagnose, repair, and rebuild transit vehicle transmission assemblies.
12.0 Maintain, diagnose, repair, and rebuild transit vehicle Torque Converter assembly.
13.0 Demonstrate the qualifications for employment.
14.0 Demonstrate shop and occupational safety procedures.
15.0 Identify principles, assemblies, and systems of engine operation.
16.0 Apply math skills to engine technology tasks.
17.0 Apply scientific principles common to engine technology operations.
18.0 Troubleshoot and repair engine systems.
19.0 Rebuild a cylinder-head assembly.
20.0 Remove and replace camshaft assemblies.
21.0 Rebuild a block assembly.
22.0 Demonstrate the qualifications for employment.

Florida Department of Education
Student Performance Standards

Program Title: **Transit Technician 3**
Career Certificate Program Number: **T660300**

Course Description: The Transit Alternative Fuels System Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, alternative fuel systems and components, and employability.

Course Number: DIM0830 **Occupational Completion Point: A** **Transit Alternative Fuels System Technician – 120 Hours**	
01.0	Demonstrate shop and occupational safety procedures. The student will be able to:
01.01	Comply with safety regulations for all alternative fuels system technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
01.02	Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
02.0	Maintain and repair transit bus alternative fuels systems and components. The student will be able to:
02.01	Develop an understanding of and become familiar with the following:
	• ESS Energy Storage System
	• DPIM Dual Power Inverter Module
	• TCM/VCM
	• EP40/50
	• BAE Electric Systems-series-battery
	• Propane
02.02	Identify and comprehend torque blending.
02.03	Identify and comprehend Fuel Cells, ULSD, PC-10, PC-11, CK-4, FA-4, and CJ-4 Oils.
02.04	Identify and comprehend the characteristics and limitations of Biodiesel, E85 Ethanol, and EP40 hybrid-electric, and propane.
02.05	Demonstrate the unique characteristics of an Alternative Fuel.
02.06	Demonstrate a working knowledge of alternative fuel systems and associated components.
02.07	Demonstrate proper diagnostic procedures for a fuel system.

02.08	Understand the principles of “Cooled EGR” system.
02.09	Understand the principles of the 3-way exhaust catalyst system.
02.10	Demonstrate CNG/Propane gas safety, Maintenance, Base Engine, Combustion Air System, Fuel system & Fuel Control system, and Electronic Control System(s).
02.11	Identify various CNG/Propane cylinder types and installations, inspect CNG/Propane cylinders for damage, and identify the proper disposition of damaged cylinders.
02.12	Define Mass Air Flow Management Systems and identify the following sensors: Temperature Sensors, Pressure Sensors, Position Sensors, Voltage Producing Sensors, Mass Gas and Air Flow Sensors.
03.0	Demonstrate the qualifications for employment. The student will be able to:
03.01	Demonstrate shop organization, management, and safety requirements for an alternative fuel’s systems technician.
03.02	Demonstrate the use of tools and equipment required for an alternative fuel’s systems technician.
03.03	Demonstrate workplace communication skills required by an alternative fuel’s systems technician.
03.04	Demonstrate the application of math and science principles required for an alternative fuels systems technician’s job tasks.
03.05	Demonstrate employability skills as a transit bus alternative fuels systems technician.

Course Description: The Transit Advanced Electrical Systems Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, advanced electrical systems, and employability.

Course Number: DIM0831 Occupational Completion Point: B Transit Advanced Electrical Systems Technician – 120 Hours	
04.0	Demonstrate shop and occupational safety procedures. The student will be able to:
04.01	Comply with safety regulations for all advanced electrical system technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
04.02	Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
05.0	Maintain and repair transit bus advanced electrical systems and components. The student will be able to:
05.01	Build and diagnose electrical circuits utilizing circuit simulation modules.
05.02	Understand Programmable logic controller (PLC), Multiplex system and its components, Ladder logic/chart, various electrical instruments, and various types of sensors.
05.03	Identify and troubleshoot electrical systems and their components.
05.04	Read and understand complex electrical schematics, ladder logic charts, and Dinex charts.

06.0	Demonstrate the qualifications for employment. The student will be able to:
06.01	Demonstrate shop organization, management, and safety requirements for an advanced electrical systems technician.
06.02	Demonstrate the use of tools and equipment required for an advanced electrical systems technician.
06.03	Demonstrate workplace communication skills required by an advanced electrical systems technician.
06.04	Demonstrate the application of math and science principles required for an advanced electrical systems technician's job tasks.
06.05	Demonstrate employability skills as a transit bus advanced electrical systems technician.

Course Description: The Transit Heating and Air-Conditioning Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, heating and air-conditioning systems, and employability.

Course Number: DIM0832 **Occupational Completion Point: C** **Transit Heating and Air-Conditioning Technician – 200 Hours**	
07.0	Demonstrate shop and occupational safety procedures. The student will be able to:
07.01	Comply with safety regulations for all transit heating and air conditioning systems technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
07.02	Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
08.0	Maintain and repair transit vehicle(s) heating and air-conditioning systems. The student will be able to:
08.01	Identify basic heating and air-conditioning components.
08.02	Recognize and identify different types of refrigerants.
08.03	Describe EPA requirements for handling recycled refrigerants.
08.04	Demonstrate the use of recovery, recycle, and reclaim systems.
08.05	Inspect and pressure tests a basic air-conditioning (AC) system.
08.06	Inspect, remove, and replace compressor belts.
08.07	Perform Leak-test on a basic AC system.
08.08	Evaluate and charge a basic AC system using recovery equipment.
08.09	Assess, repair and/or service AC electrical circuits.
08.10	Assess, repair and/or service vacuum circuits.
08.11	Diagnose basic AC system problems.

	08.12 Remove and replace components in basic AC systems.
	08.13 Remove, repair, and replace compressor fan clutches and controls.
	08.14 Remove and replace blower motors.
	08.15 Diagnose heater malfunctions.
	08.16 Remove and replace heater cores, control units, and cables.
	08.17 Obtain 608 certification.
09.0	Demonstrate the qualifications for employment. The student will be able to:
	09.01 Demonstrate shop organization, management, and safety requirements for a transit heating and air conditioning systems technician.
	09.02 Demonstrate the use of tools and equipment required for a transit heating and air conditioning systems technician.
	09.03 Demonstrate workplace communication skills required by a transit heating and air conditioning systems technician.
	09.04 Demonstrate the application of math and science principles required for a transit heating and air conditioning systems technician's job tasks.
	09.05 Demonstrate employability skills as a transit bus heating and air conditioning systems technician.

Course Description: The Transmission Diagnosis, Rebuild and Repair Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, transit bus transmission assemblies, and employability.

Course Number: DIM0833 Occupational Completion Point: D Transmission Diagnosis, Rebuild and Repair Technician – 120 Hours	
10.0	Demonstrate shop and occupational safety procedures. The student will be able to:
	10.01 Comprehend and comply with safety regulations for all transmission diagnosis, rebuild and repair technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
	10.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
11.0	Maintain, diagnose, repair, and rebuild transit vehicle transmission assemblies. The student will be able to:
	11.01 Identify the basic transmission components and functions.
	11.02 Apply scientific principles common to transmission technology operations.
	11.03 Identify principles of operation, assemblies, and systems of transmission operation.
	11.04 Troubleshoot and repair transmission systems.

	11.05 Rebuild transmission assemblies.
	11.06 Remove and replace transmission assemblies.
	11.07 Rebuild/troubleshoot retarder assembly.
12.0	Maintain, diagnose, repair, and rebuild transit vehicle Torque Converter assembly. The student will be able to:
	12.01 Identify and describe the four major components of a torque converter (pump, stator, turbine, and lockup clutch)
	12.02 Diagnose and troubleshoot symptoms of a bad torque converter
	12.03 Perform a stall test and analyze stall test results
13.0	Demonstrate the qualifications for employment. The student will be able to:
	13.01 Demonstrate shop organization, management, and safety requirements for a transit transmission diagnosis, rebuild and repair technician.
	13.02 Demonstrate the use of tools and equipment required for a transit transmission diagnosis, rebuild and repair technician.
	13.03 Demonstrate workplace communication skills required by a transit transmission diagnosis, rebuild and repair technician.
	13.04 Demonstrate the application of math and science principles required for a transit transmission diagnosis, rebuild and repair technician's job tasks.
	13.05 Demonstrate employability skills as a transit vehicle transmission diagnosis, rebuild and repair technician.

Course Description: The Transit Engine Diagnosis, Rebuild and Repair Technician course prepares students for entry into the transit bus service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study occupational safety, engine operations, math science, troubleshooting skills, cylinder-heads, camshaft assemblies, engine block assemblies, and employability.

Course Number: DIM0834 Occupational Completion Point: E Diesel Engine Diagnosis, Rebuild and Repair Technician – 120 Hours	
14.0	Demonstrate shop and occupational safety procedures. The student will be able to:
	14.01 Comply with safety regulations for all diesel engine diagnosis, rebuild and repair technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
	14.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.
15.0	Identify principles, assemblies, and systems of engine operation. The student will be able to:
	15.01 Explain the operating principles of two-and four-stroke cycle engines.
	15.02 Identify engine assemblies and systems.
	15.03 Identify the components of two-and four-stroke-cycle engines.

16.0	Apply math skills to engine technology tasks. The student will be able to:
16.01	Apply math skills commonly required for performing job duties in engine technology occupations.
	• Recognize, identify, and make metric conversions.
	• Solve problems for volume, weight, area, circumference, and perimeter measurements for rectangles, squares, and cylinders.
	• Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet, and inches.
	• Add, subtract, multiply, and divide using fractions, decimals, and whole numbers.
16.02	Determine the correct purchase price, including sales tax, for a materials list containing a minimum of six items.
17.0	Apply scientific principles common to engine technology operations. The student will be able to:
17.01	Explain molecular action caused by temperature extremes, chemical reaction, and moisture content.
17.02	Interpret and draw reasonable conclusions from information provided in graphs, scales, and gauges.
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	Read and interpret pressure measurement in terms of pounds per square inch (PSI), inches of mercury, and kilopascal (KPA).
18.0	Troubleshoot and repair engine systems. The student will be able to:
18.01	Troubleshoot and repair cooling systems.
18.02	Troubleshoot and repair lubrication systems.
18.03	Troubleshoot and repair induction and exhaust systems.
18.04	Troubleshoot and repair fuel-injection systems and components.
	• Inspect for operation and condition of the parts and systems, including fuel quality and consumption, safety shut-down devices, circuits, sensors, electronic governors, and flywheel.
	• Prime and bleed fuel-injection system.
	• Remove, test, and adjust injectors and nozzles.
	• Remove, repair, and replace individual components as needed.
19.0	Rebuild a cylinder-head assembly. The student will be able to:
19.01	Diagnose valve and head problems using the visual inspection method.
19.02	Diagnose valve and head problems using the compression-tester or cylinder air-pressure method.
19.03	Diagnose valve and head problems using the stethoscope method.
19.04	Disassemble engines.

	19.05 Clean and inspect the heads for cracks, warping, and injector sleeves.
	19.06 Inspect the valve seat and check for warping, burns, cracks, and stem and tip wear.
	19.07 Grinds valve seats and reface valves.
	19.08 Check and inspect springs for free height, distortion, and installed height.
	19.09 Adjust the valve lash.
20.0	Remove and replace camshaft assemblies. The student will be able to:
	20.01 Remove and inspect camshaft bearings and lifters.
	20.02 Time valve-drive assemblies.
21.0	Rebuild a block assembly. The student will be able to:
	21.01 Remove the pistons from the rod assemblies.
	21.02 Measure out-of-round and cylinder taper using a dial bore gauge or inside micrometer.
	21.03 Check the piston pins and boss for wear.
	21.04 Measure the piston ring lands width, out-of-round, and taper.
	21.05 Measure the piston ring gap in a cylinder bore.
	21.06 Install and fit the piston pins.
	21.07 Check the rod-and-piston assembly alignment.
	21.08 Remove and replace the rod bearings.
	21.09 Hone and clean the cylinders, check cross hatching.
	21.10 Install rings on the pistons.
	21.11 Measure and check the crankshafts with a micrometer.
	21.12 Check the bearing bore with a telescope gauge.
	21.13 Reassemble engines using a plastic gauge.
	21.14 Install oil seals.
	21.15 Check for end play on crankshaft and camshaft.
	21.16 Check camshaft backlash.
22.0	Demonstrate the qualifications for employment. The student will be able to:
	22.01 Demonstrate shop organization, management, and safety requirements for a transit engine diagnosis, rebuild and repair technician.

22.02	Demonstrate the use of tools and equipment required for a transit engine diagnosis, rebuild and repair technician.
22.03	Demonstrate workplace communication skills required by a transit engine diagnosis, rebuild and repair technician.
22.04	Demonstrate the application of math and science principles required for a transit engine diagnosis, rebuild and repair technician's job tasks.
22.05	Demonstrate employability skills as a transit vehicle engine diagnosis, rebuild and repair technician.

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 safety guidelines in the student performance standards have been recommended in the ASE Program Certification Standards administered by the Automotive Service excellence Education Foundation (ASEEF).

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Language and Reading 9). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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