Florida Department of Education
Curriculum Framework

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

Career Certificate Program – Career Preparatory	
Program Number	T400310
CIP Number	0647060905
Grade Level	30, 31
Standard Length	1200 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-2091 – Avionics Technicians
Basic Skills Level	Mathematics: 10 Language: 10 Reading: 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers 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	SOC Code
A	AVS0680	Basic Electronics Wiring Installer/Technician	AVIONICS @7 7G ELECTRONIC @7 7G	150 hours	49-2091
B	AVS0681	Electrical Systems Technician		150 hours	49-2091
C	AVS0682	Analog Circuits Technician		150 hours	49-2091
D	AVS0683	Aircraft Electronics Technician		150 hours	49-2091
E	AVS0684	Avionics Installer/Technician		300 hours	49-2091
F	AVS0685	Advanced Avionics Installer/Technician		300 hours	49-2091

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:

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.

2019 - 2020

Florida Department of Education
Student Performance Standards

Program Title: Avionics Systems Technician
Career Certificate Program Number: T400310

Course Number: AVS0680
Occupational Completion Point: A
Basic Electronics Wiring Installer/Technician – 150 Hours – SOC Code 49-2091

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	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.

CTE Standards and Benchmarks	
	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.

CTE Standards and Benchmarks	
	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.

Florida Department of Education
Student Performance Standards

Course Number: AVS0681
Occupational Completion Point: B
Electrical Systems Technician – 150 Hours – SOC Code 49-2091

Course Description:
Students in the Electrical Systems Technician course 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 circuits.
07.06	Define frequency, cycle, Hertz, wavelength, sine wave, phase angle, and period.
07.07	Calculate peak-to-peak, average, and RMS values of an AC signal.
07.08	Identify sine waves, square waves, saw-tooth waves, and ramp waveforms.
07.09	Use Ohm's law to determine resistance in an AC circuit.
07.10	Define the characteristics of AC capacitive circuits.
07.11	Analyze and troubleshoot AC capacitive circuits.
07.12	Define the characteristics of AC inductive circuits.
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.

CTE Standards and Benchmarks	
	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.

Florida Department of Education
Student Performance Standards

Course Number: AVS0682
Occupational Completion Point: C
Analog Circuits Technician – 150 Hours – SOC Code 49-2091

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.

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.
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.

CTE Standards and Benchmarks	
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 as a result of temperature extremes, chemical reaction, and moisture content.
14.02	Describe the types of corrosion and explain their effects on avionics equipment.
14.03	Describe the preventative processes to reduce or eliminate avionics corrosion.
15.0	Demonstrate proficiency in aircraft aerodynamic fundamentals.-The student will be able to:
15.01	Identify and explain the effects of aerodynamic forces on aircraft structures and components
15.02	Identify and describe the purpose aircraft flight controls and aircraft how they affect flight operations.
15.03	Define the concept of weight and balance in aircraft to include arms, weights, moments, the Law of Lever, and the center of gravity.
15.04	Describe the effects of installing equipment, modifying equipment, modifying airframe structures and repositioning equipment on weight and balance.
16.0	Demonstrate proficiency in Unmanned Aerial Systems Foundations.-The students will be able to:
16.01	Compare and contrast the differences between UAS and UAV components, elements and systems.

CTE Standards and Benchmarks	
	16.02 Identify UAV structures, fabrication methods, and components.
	16.03 Describe the types of UAV aerodynamics and flight characteristics
	16.04 Define the certifications and requirements required of UAS operators and technicians
	16.05 Explain cost and risk factors associated with and alleviated by the usage of Unmanned Aerial System.
17.0	Demonstrate knowledge in Unmanned Aerial Vehicle Operations.-The students will able to:
	17.01 Demonstrate an understanding of the levels of direct and autonomous control currently in use for guiding, navigating, and controlling a UAV.
	17.02 Discriminate the various types of UAV payloads, power, and communications systems.
	17.03 Understand and apply the regulatory requirements outlined by the FAA (Federal Aviation Administration) in the ownership, use, and operation of an Unmanned Aerial Vehicle.

Florida Department of Education
Student Performance Standards

Course Number: AVS0683
Occupational Completion Point: D
Aircraft Electronics Technician – 150 Hours – SOC Code 49-2091

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.

CTE Standards and Benchmarks	
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.

CTE Standards and Benchmarks	
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

CTE Standards and Benchmarks	
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.

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

Florida Department of Education
Student Performance Standards

Course Number: AVS0684
Occupational Completion Point: E
Avionics Installer/Technician – 300 Hours – SOC Code 49-2091

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.

CTE Standards and Benchmarks	
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.

CTE Standards and Benchmarks	
	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.

CTE Standards and Benchmarks	
	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).

Florida Department of Education
Student Performance Standards

Course Number: AVS0685
Occupational Completion Point: F
Advanced Avionics Installer/Technician – 300 Hours – SOC Code 49-2091

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.

CTE Standards and Benchmarks	
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.

CTE Standards and Benchmarks	
	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)

CTE Standards and Benchmarks	
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.

Special Notes

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(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 a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 10.0, and Reading 10.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Aircraft Coating and Corrosion Control Technology**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T400500
CIP Number	0647060701
Grade Level	30, 31
Standard Length	600 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	51-9122 – Painters, Transportation Equipment
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers 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 topics: Safety and Health, Aircraft Structures, Aircraft Corrosion, Paint Removal Systems, and Paint Application 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 two occupational completion points.

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

To teach the 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	SOC Code
A	AMT0125 AMT0133	Aircraft Coating Safety, Inspection and Environmental Regulations Aircraft Surface Prep Technician	AIR MECH @7 7G	140 Hours 152 Hours	51-9122
B	AMT0126 AMT0940	Aircraft Coatings Technician Aircraft Coatings Technician Internship		160 Hours 148 Hours	51-9122

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 appropriate understanding of basic safety, health and science concepts.
02.0 Identify various types of aircraft structures and components that require paint/coating applications.
03.0 Identify metallic and non-metallic aircraft structural materials.
04.0 Identify various types of corrosion found on aircraft surfaces.
05.0 Demonstrate proficiency in the removal and treatment of aircraft surface corrosion.
06.0 Demonstrate proficiency in paint removal techniques.
07.0 Demonstrate understanding of masking techniques and their importance.
08.0 Describe various aircraft coating materials used on aircraft structures.
09.0 Demonstrate proficiency in preparing non-metallic and metallic aircraft surfaces for coatings application.
10.0 Demonstrate the ability to select and adjust various types of paint application equipment.
11.0 Demonstrate the ability to select and properly apply required coating materials on aircraft surfaces.
12.0 Demonstrate the ability to set-up and apply various letters, numbers, insignias and decorative decals.
13.0 Demonstrate proficiency in the inspection of applied coatings.
14.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: Aircraft Coating and Corrosion Control Technology
Career Certificate Program Number: T400500

Course Number: AMT0125
Occupational Completion Point: A (1 of 2)
Aircraft Coating Safety, Inspection and Environmental Regulations – 140 Hours – SOC Code 51-9122

Course Description:
The Aircraft Coating Safety, Inspection and Environmental Regulations course prepares students for entry into the aircraft coating and corrosion control industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study basic safety, health, and science concepts.

CTE Standards and Benchmarks	
01.0	Demonstrate appropriate understanding of basic safety, health and science concepts.-The student will be able to:
01.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
01.02	Identify various chemicals used in the aircraft coatings process.
01.03	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.
01.04	Understand the use of personal protection equipment (PPE)
01.05	Understand the proper use of fall protection systems (ANSI Z359)
01.06	Understand pressure measurement in terms of P.S.I. and inches of mercury.
01.07	Understand the regulatory agency requirements for hazardous materials and hazardous waste.

Course Number: AMT0133
Occupational Completion Point: A (2 of 2)
Aircraft Surface Prep Technician – 152 Hours – SOC Code 51-9122

Course Description:
The Aircraft Surface Prep Technician course is designed to build on the skills and knowledge students learned in the Aircraft Coating Safety, Inspection and Environmental Regulations for entry into the aircraft coating and corrosion control industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study aircraft structures and components, metallic and non-metallic materials, types of corrosion, removal and treatment, paint removal, and masking techniques.

CTE Standards and Benchmarks	
02.0	Identify various types of aircraft structures and components that require paint/coating applications.-The student will be able to:
02.01	Identify the major sections of various sizes of fixed and rotary wing aircraft.
02.02	Identify the various removable flight controls.
02.03	Locate aircraft frame stations, butt lines and waterlines.
03.0	Identify metallic and non-metallic aircraft structural materials.-The student will be able to:
03.01	Identify aircraft materials using the applicable aircraft structural manuals.
03.02	Describe ferrous and non-ferrous aircraft materials.
03.03	Describe the various non-metallic materials used on aircraft.
03.04	Visually Identify composite materials.
03.05	Identify aircraft fabric coverings.
04.0	Identify various types of corrosion found on aircraft surfaces.-The student will be able to:
04.01	Discuss the theory of corrosion.
04.02	Describe the different types of corrosion on aircraft.
04.03	Detect corrosion on an aircraft structure.
05.0	Demonstrate proficiency in the removal and treatment of aircraft surface corrosion.-The student will be able to:
05.01	Select proper methods for the removal of various types of corrosion.
05.02	Remove corrosion from an aircraft structure.
05.03	Select the proper treatment methods for the prevention of corrosion.
05.04	Properly treat an aircraft surface.
06.0	Demonstrate proficiency in aircraft paint removal techniques.-The student will be able to:
06.01	Identify various paint removal methods for all aircraft materials.

CTE Standards and Benchmarks	
	06.02 Select proper coating removal method for specific areas and materials of aircraft.
	06.03 Demonstrate proficiency in removing coatings from an aircraft.
07.0	Demonstrate understanding of masking techniques and their importance.-The student will be able to:
	07.01 Identify areas/materials of aircraft that require protection from chemicals used in the aircraft coatings process.
	07.02 Select masking materials and techniques for various applications.
	07.03 Demonstrate proficiency in masking techniques.

Florida Department of Education
Student Performance Standards

Course Number: AMT0126
Occupational Completion Point: B (1 of 2)
Aircraft Coatings Technician – 160 Hours – SOC Code 51-9122

Course Description:
The Aircraft Coatings Technician course prepares students for entry into the aircraft coating and corrosion control industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study coating materials, surface preparation, paint application equipment, and selection of coating materials

CTE Standards and Benchmarks	
08.0	Describe various aircraft coating materials used on aircraft structures.-The student will be able to:
	08.01 Identify various aircraft paints and primers required on aircraft using specific manufactures' information.
	08.02 Determine coating compatibility with various aircraft materials.
	08.03 Identify various sealant materials and their uses.
	08.04 Determine proper mixing ratios of primers, paints and sealants in accordance with manufacturer's requirements.
09.0	Demonstrate the ability to select and adjust various types of paint application equipment.-The student will be able to:
	09.01 Identify various types of equipment used in the aircraft coatings process.

CTE Standards and Benchmarks	
	09.02 Select proper equipment for specific coating systems.
	09.03 Set up equipment for specific paint applications.
10.0	Demonstrate the ability to select and properly apply required coating materials on aircraft surfaces.-The student will be able to:
	10.01 Select proper coatings to be applied to specific aircraft surfaces.
	10.02 Properly mix coatings in accordance with manufacturer's recommendations.
	10.03 Apply coatings using various types of equipment and methods.
11.0	Demonstrate the ability to set-up and apply various letters, numbers, insignias and decorative decals.-The student will be able to:
	11.01 Select proper coatings to be applied to specific aircraft.
	11.02 Properly mix coatings in accordance with manufacturer's recommendations.
	11.03 Determine proper processes for applying coatings with acceptable results.
	11.04 Apply coatings using various types of equipment and methods.

Course Number: AMT0940
Occupational Completion Point: B (2 of 2)
Aircraft Coatings Technician Internship – 148 Hours – SOC Code 51-9122

Course Description:
The Aircraft Coatings Technician Internship course is designed to build on the skills and knowledge students learned in the Aircraft Coatings Technician for entry into the aircraft coating and corrosion control industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study set-up and application of aircraft identification markings, inspection of applied coatings, and employability skills.

CTE Standards and Benchmarks	
12.0	Demonstrate proficiency in preparing non-metallic and metallic aircraft surfaces for coatings application.-The student will be able to:
	12.01 Identify surface treatment methods for metallic and non-metallic surfaces.
	12.02 Identify proper methods of surface treatment for various coatings.

CTE Standards and Benchmarks	
	12.03 Properly treat and prepare various surface materials for specific coating applications.
13.0	Demonstrate proficiency in the inspection of applied coatings.-The student will be able to:
	13.01 Identify flaws in applied coatings
	13.02 Determine acceptance criteria on applied coatings
	13.03 Develop a plan to repair coating flaws.
14.0	Demonstrate Employability skills.-The student will be able to:
	14.01 Conduct a job search.
	14.02 Secure information about a job.
	14.03 Identify documents, which may be required when applying for a job interview.
	14.04 Complete a job application form correctly.
	14.05 Demonstrate competence in job interview techniques.
	14.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other employees.
	14.07 Identify acceptable work habits.
	14.08 Demonstrate knowledge of how to make job changes appropriately.
	14.09 Demonstrate acceptable employee health habits.
	14.10 Demonstrate knowledge of 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.

Special Notes

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(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 a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 9.0, and Reading 10.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Automotive Service Technology 1**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T400700
CIP Number	0647060411
Grade Level	30, 31
Standard Length	1050 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 9

Purpose

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

For institutions using this framework, the National Automotive Technicians Education Foundation (NATEF) highly recommends the Master Automotive Service Technology (MAST) program Certification/Accreditation. Florida Statute (F.S.) 1004.925 – Automotive service technology education programs; certification. – requires all automotive service technology education programs shall be industry certified in accordance with rules adopted by the State Board of Education.

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

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	SOC Code
A	AER0014	Automobile Services Assistor	AUTO IND @7 %7 %G AUTO MECH @7 7G	300 hours	49-3023
B	AER0418	Automotive Brake System Technician		150 hours	49-3023
C	AER0453	Automobile Suspension and Steering Technician		150 hours	49-3023
D	AER0360	Automotive Electrical/Electronic System Technician		300 hours	49-3023
E	AER0110	Engine Repair Technician		150 hours	49-3023

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 Number: AER0014
Occupational Completion Point: A
Automotive Services Assistor – 300 Hours – SOC Code 49-3023

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.

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.	
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.	

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks		Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: AER0418
Occupational Completion Point: B
Automotive Brake System Technician – 150 Hours – SOC Code 49-3023

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:

BR Task List:
P-1 = 40
P-2 = 11
P-3 = 5
Total 56

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.

CTE Standards and Benchmarks		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	

CTE Standards and Benchmarks		Priority Number
	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

CTE Standards and Benchmarks		Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: AER0453
Occupational Completion Point: C
Automotive Suspension and Steering Technician – 150 Hours – SOC Code 49-3023

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**

CTE Standards and Benchmarks	**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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: AER0360
Occupational Completion Point: D
Automotive Electrical/Electronic System Technician – 300 Hours – SOC Code 49-3023

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

CTE Standards and Benchmarks		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 including vehicle service history, service precautions, and technical service bulletins.	P-1
06.02	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1
06.03	Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.	P-1
06.04	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1
06.05	Demonstrate proper use of a test light on an electrical circuit.	P-1
06.06	Use fused jumper wires to check operation of electrical circuits.	P-1
06.07	Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.	P-1
06.08	Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.	P-1
06.09	Inspect and test fusible links, circuit breakers, and fuses; determine needed action.	P-1
06.10	Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.	P-1
06.11	Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.	P-2
06.12	Repair data bus wiring harness.	P-1
06.13	Identify and interpret electrical/electronic system concern; determine necessary action.	
06.14	Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures.	
Battery Diagnosis and Service		
06.15	Perform battery state-of-charge test; determine needed action.	P-1
06.16	Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action.	P-1
06.17	Maintain or restore electronic memory functions.	P-1
06.18	Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1
06.19	Perform slow/fast battery charge according to manufacturer's recommendations.	P-1
06.20	Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1
06.21	Identify safety precautions for high voltage systems on electric, hybrid, hybrid-electric, and diesel vehicles.	P-2

CTE Standards and Benchmarks		Priority Number
06.22	Identify electrical/electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.	P-1
06.23	Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.	P-2
06.24	Perform battery conductance test; determine necessary action.	
Starting System Diagnosis and Repair		
06.25	Perform starter current draw tests; determine needed action.	P-1
06.26	Perform starter circuit voltage drop tests; determine needed action.	P-1
06.27	Inspect and test starter relays and solenoids; determine needed action.	P-2
06.28	Remove and install starter in a vehicle.	P-1
06.29	Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.	P-2
06.30	Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.	P-2
06.31	Demonstrate knowledge of an automatic idle-stop/start-stop system.	P-2
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 generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P-1
06.35	Remove, inspect, and/or replace generator (alternator).	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	Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.	P-1
06.39	Aim headlights.	P-2
06.40	Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2
06.41	Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.	
Instrument Cluster and Driver Information Systems Diagnosis and Repair		
06.42	Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action.	P-2

CTE Standards and Benchmarks		Priority Number
06.43	Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine needed action.	P-2
06.44	Reset maintenance indicators as required.	P-2
06.45	Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.	
Body Electrical Systems Diagnosis and Repair		
06.46	Diagnose operation of comfort and convenience accessories and related circuits (such as: power window, power seats, pedal height, power locks, truck locks, remote start, 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
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-3
06.49	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
06.50	Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action.	P-2
06.51	Describe the process for software transfer, software updates, or reprogramming of electronic modules.	P-2
06.52	Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action.	

Florida Department of Education
Student Performance Standards

Course Number: AER0110
Occupational Completion Point: E
Engine Repair Technician – 150 Hours – SOC Code 49-3023

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 =	24
P-2 =	16
P-3 =	11
Total	51

CTE Standards and Benchmarks		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	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P-1
07.02	Research vehicle service information including fluid type, internal engine operation, vehicle service history, service precautions, and technical service bulletins.	P-1
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.	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.	P-1
07.08	Inspect, remove and/or replace engine mounts.	P-2

CTE Standards and Benchmarks		Priority Number
07.09	Identify service precautions related to service of the internal combustion engine of a hybrid 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	Perform cylinder power balance tests; determine necessary action.	
07.17	Perform cylinder cranking and running compression tests; determine necessary action.	
07.18	Perform cylinder leakage tests; determine necessary action.	
Cylinder Head and Valve Train Diagnosis and Repair		
07.19	Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure.	P-1
07.20	Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1
07.21	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-2
07.22	Adjust valves (mechanical or hydraulic lifters).	P-1
07.23	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
07.24	Establish camshaft position sensor indexing.	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; determine needed action.	P-2
07.31	Inspect and/or measure camshaft for runout, journal wear and lobe wear.	P-3

CTE Standards and Benchmarks		Priority Number
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	Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-1
07.34	Disassemble engine block; clean and prepare components for inspection and reassembly.	P-1
07.35	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.	P-2
07.36	Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.	P-2
07.37	Deglaze and clean cylinder walls.	P-2
07.38	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.	P-3
07.39	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
07.40	Inspect main and connecting rod bearings for damage and wear; determine needed action.	P-2
07.41	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.	P-3
07.42	Inspect and measure piston skirts and ring lands; determine needed action.	P-2
07.43	Determine piston-to-bore clearance.	P-2
07.44	Inspect, measure, and install piston rings.	P-2
07.45	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
07.46	Assemble engine block.	P-1
07.47	Remove and replace piston pin; where applicable.	
Lubrication and Cooling Systems Diagnosis and Repair		
07.48	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
07.49	Identify causes of engine overheating.	P-1
07.50	Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
07.51	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
07.52	Inspect, remove, and replace water pump.	P-2

CTE Standards and Benchmarks		Priority Number
07.53	Remove and replace radiator.	P-2
07.54	Remove, inspect, and replace thermostat and gasket/seal.	P-1
07.55	Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.	P-1
07.56	Perform oil pressure tests; determine needed action.	P-1
07.57	Perform engine oil and filter change; use proper fluid type per manufacturer specification.	P-1
07.58	Inspect auxiliary coolers; determine needed action.	P-3
07.59	Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
07.60	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.	P-2
07.61	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 NATEF Master Certified (MAST) and the instructors be A1-A8 ASE Master and Advanced Engine Performance (L1) ASE Certified.

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Automotive Drivetrain Technician**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T400710
CIP Number	0647060423
Grade Level	30, 31
Standard Length	750 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 9

Purpose

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

For institutions using this framework, the National Automotive Technicians Education Foundation (NATEF) highly recommends the Master Automotive Service Technology (MAST) program Certification/Accreditation. Florida Statute (F.S.) 1004.925 – Automotive service technology education programs; certification. – requires all automotive service technology education programs shall be industry certified in accordance with rules adopted by the State Board of Education.

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

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	SOC Code
A	AER0014	Automobile Services Assistor	AUTO IND @7 %7 %G AUTO MECH @7 7G	300 hours	49-3023
B	AER0110	Engine Repair Technician		150 hours	49-3023
C	AER0274	Manual Drivetrain and Axle Technician		150 hours	49-3023
D	AER0257	Automatic Transmission and Transaxle Technician		150 hours	49-3023

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 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, repair and overhaul of automatic transmissions/transaxles.

Florida Department of Education
Student Performance Standards

Program Title: Automotive Drivetrain Technician
Career Certificate Program Number: T400710

Course Number: AER0014
Occupational Completion Point: A
Automotive Services Assistor – 300 Hours – SOC Code 49-3023

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.

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.	
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.	

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks	Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: AER0110
Occupational Completion Point: B
Engine Repair Technician – 150 Hours – SOC Code 49-3023

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 =	24
P-2 =	16
P-3 =	11
Total	51

CTE Standards and Benchmarks		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	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P-1
04.02	Research vehicle service information including fluid type, internal engine operation, vehicle service history, service precautions, and technical service bulletins.	P-1
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.	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.	P-1
04.08	Inspect, remove and/or replace engine mounts.	P-2

CTE Standards and Benchmarks		Priority Number
04.09	Identify service precautions related to service of the internal combustion engine of a hybrid 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	Perform cylinder power balance tests; determine necessary action.	
04.17	Perform cylinder cranking and running compression tests; determine necessary action.	
04.18	Perform cylinder leakage tests; determine necessary action.	
Cylinder Head and Valve Train Diagnosis and Repair		
04.19	Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure.	P-1
04.20	Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1
04.21	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-2
04.22	Adjust valves (mechanical or hydraulic lifters).	P-1
04.23	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
04.24	Establish camshaft position sensor indexing.	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; determine needed action.	P-2
04.31	Inspect and/or measure camshaft for runout, journal wear and lobe wear.	P-3

CTE Standards and Benchmarks		Priority Number
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	Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-1
04.34	Disassemble engine block; clean and prepare components for inspection and reassembly.	P-1
04.35	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.	P-2
04.36	Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.	P-2
04.37	Deglaze and clean cylinder walls.	P-2
04.38	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.	P-3
04.39	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
04.40	Inspect main and connecting rod bearings for damage and wear; determine needed action.	P-2
04.41	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.	P-3
04.42	Inspect and measure piston skirts and ring lands; determine needed action.	P-2
04.43	Determine piston-to-bore clearance.	P-2
04.44	Inspect, measure, and install piston rings.	P-2
04.45	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
04.46	Assemble engine block.	P-1
04.47	Remove and replace piston pin; where applicable.	
Lubrication and Cooling Systems Diagnosis and Repair		
04.48	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
04.49	Identify causes of engine overheating.	P-1
04.50	Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
04.51	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
04.52	Inspect, remove, and replace water pump.	P-2

CTE Standards and Benchmarks		Priority Number
04.53	Remove and replace radiator.	P-2
04.54	Remove, inspect, and replace thermostat and gasket/seal.	P-1
04.55	Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.	P-1
04.56	Perform oil pressure tests; determine needed action.	P-1
04.57	Perform engine oil and filter change; use proper fluid type per manufacturer specification.	P-1
04.58	Inspect auxiliary coolers; determine needed action.	P-3
04.59	Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
04.60	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.	P-2
04.61	Inspect and replace engine cooling and heater system hoses.	

Florida Department of Education
Student Performance Standards

Course Number: AER0274
Occupational Completion Point: C
Manual Drivetrain and Axle Technician – 150 Hours – SOC Code 49-3023

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 =	18
P-2 =	16
P-3 =	16
Total	50

CTE Standards and Benchmarks		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	Identify and interpret drive train 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	Check fluid condition; check for leaks; determine needed action.	P-1
05.04	Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification.	P-1
05.05	Diagnose fluid loss, level, and condition concerns; determine necessary action.	
Clutch Diagnosis and Repair		
05.06	Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action.	P-1

CTE Standards and Benchmarks		Priority Number
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
05.14	Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.	
05.15	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		
05.16	Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers.	P-2
05.17	Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.	P-2
05.18	Diagnose noise concerns through the application of transmission/transaxle power-flow principles.	P-2
05.19	Diagnose hard shifting and jumping out of gear concerns; determine needed action.	P-2
05.20	Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action.	P-3
05.21	Disassemble, inspect clean, and reassemble internal transmission/transaxle components.	P-2
05.22	Remove and reinstall manual transmission/transaxle.	
05.23	Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action.	
05.24	Inspect, replace, and align powertrain mounts.	
05.25	Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.	
05.26	Remove and replace transaxle final drive.	
05.27	Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.	
05.28	Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action.	
05.29	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.	
05.30	Inspect lubrication devices (oil pump or slingers); perform necessary action.	

CTE Standards and Benchmarks	Priority Number
05.31 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)	
05.32 Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action.	P-1
05.33 Diagnose universal joint noise and vibration concerns; perform needed action.	P-2
05.34 Inspect, remove, and/or replace bearings, hubs, and seals.	P-1
05.35 Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.	P-1
05.36 Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.	P-2
05.37 Inspect, service, and replace shaft center support bearings.	
Drive Axle Diagnosis and Repair – Ring and Pinion Gears and Differential Case Assembly	
05.38 Clean and inspect differential case; check for leaks; inspect housing vent.	P-1
05.39 Check and adjust differential case fluid level; use proper fluid type per manufacturer specification.	P-1
05.40 Drain and refill differential case; use proper fluid type per manufacturer specifications.	P-1
05.41 Diagnose noise and vibration concerns; determine needed action.	P-2
05.42 Inspect and replace companion flange and/or pinion seal; measure companion flange runout.	P-2
05.43 Inspect ring gear and measure runout; determine needed action.	P-3
05.44 Remove, inspect, reinstall and/or drive pinion and ring gear, spacers, sleeves, and bearings.	P-3
05.45 Measure and adjust drive pinion depth.	P-3
05.46 Measure and adjust drive pinion bearing preload.	P-3
05.47 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
05.48 Check ring and pinion tooth contact patterns; perform needed action.	P-3
05.49 Disassemble, inspect, measure, adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.	P-3
05.50 Reassemble and reinstall differential case assembly; measure runout; determine needed action.	P-3
05.51 Diagnose noise and vibration concerns; determine necessary action.	
Drive Axle Diagnosis and Repair – Limited Slip Differential	
05.52 Diagnose noise, slippage, and chatter concerns; determine needed action.	P-3
05.53 Measure rotating torque; determine needed action.	P-3

CTE Standards and Benchmarks	Priority Number
05.54 Inspect and reinstall limited slip differential components.	
Drive Axle Diagnosis and Repair – Drive Axles	
05.55 Inspect and replace drive axle wheel studs.	P-1
05.56 Remove and replace drive axle shafts.	P-1
05.57 Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2
05.58 Measure drive axle flange runout and shaft end play; determine needed action.	P-2
05.59 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	
05.60 Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-3
05.61 Inspect locking hubs; determine needed action.	P-3
05.62 Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P-3
05.63 Identify concerns related to variations in tire circumference and/or final drive ratios.	P-2
05.64 Diagnose noise, vibration, and unusual steering concerns; determine needed action.	P-3
05.65 Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive/all-wheel drive systems.	P-2
05.66 Disassemble, service, and reassemble transfer case and components.	P-2
05.67 Remove and reinstall transfer case.	

Florida Department of Education
Student Performance Standards

Course Number: AER0257
Occupational Completion Point: D
Automatic Transmission and Transaxle Technician – 150 Hours – SOC Code 49-3023

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	**17**
P-2	**19**
P-3	**3**
Total	**39**

CTE Standards and Benchmarks		**Priority Number**
06.0	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		
06.01	Identify and interpret transmission/transaxle concerns, differentiate between engine performance and transmission/transaxle concerns; determine needed action.	P-1
06.02	Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
06.03	Diagnose fluid loss and condition concerns; determine needed action.	P-1
06.04	Check fluid level in a transmission or a transaxle equipped with a dip-stick.	P-1
06.05	Check fluid level in a transmission or a transaxle not equipped with a dip-stick.	P-1
06.06	Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine needed action.	P-1
06.07	Diagnose noise and vibration concerns; determine needed action.	P-2
06.08	Perform stall test; determine needed action.	P-2

CTE Standards and Benchmarks		Priority Number
06.09	Perform lock-up converter system tests; determine needed action.	P-3
06.10	Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.	P-1
06.11	Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.	P-1
06.12	Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).	P-2
In-Vehicle Transmission/Transaxle Maintenance and Repair		
06.13	Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.	P-1
06.14	Inspect for leakage; replace external seals, gaskets, and bushings.	P-2
06.15	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
06.16	Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.	P-1
06.17	Inspect, replace and align powertrain mounts.	P-2
06.18	Diagnose electronic transmission control systems using a scan tool; determine necessary action.	
Off-Vehicle Transmission and Transaxle Repair		
06.19	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
06.20	Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings.	P-1
06.21	Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.	P-2
06.22	Describe the operational characteristics of a continuously variable transmission (CVT).	P-3
06.23	Describe the operational characteristics of a hybrid vehicle drive train.	P-3
06.24	Disassemble, clean, and inspect transmission/transaxle.	P-1
06.25	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
06.26	Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine needed action.	P-2
06.27	Assemble transmission/transaxle.	P-1
06.28	Inspect, measure, and reseal oil pump assembly and components.	P-2
06.29	Measure transmission/transaxle end play and/or preload; determine needed action.	P-1
06.30	Inspect, measure, and/or replace thrust washers and bearings.	P-2

CTE Standards and Benchmarks		Priority Number
06.31	Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.	P-2
06.32	Inspect bushings; determine needed action.	P-2
06.33	Inspect and measure planetary gear assembly components; determine needed action.	P-2
06.34	Inspect case bores, passages, bushings, vents, and mating surfaces; determine needed action.	P-2
06.35	Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform needed action.	P-2
06.36	Inspect measure, repair, adjust or replace transaxle final drive components.	P-2
06.37	Inspect clutch drum, piston, check-balls, springs, retainers, seals, friction plates, pressure plates, and bands; determine needed action.	P-2
06.38	Measure clutch pack clearance; determine needed action.	P-1
06.39	Air test operation of clutch and servo assemblies.	P-1
06.40	Inspect one-way clutches, races, rollers, sprags, springs, cages, retainers; determine needed action.	P-2
06.41	Install and seat torque converter to engage drive/splines.	
06.42	Inspect bands and drums; determine necessary action.	

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 NATEF Master Certified (MAST) and the instructors be A1-A8 ASE Master and Advanced Engine Performance (L1) ASE Certified.

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Automotive Electrical Technician**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T400720
CIP Number	0647060424
Grade Level	30, 31
Standard Length	750 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 9

Purpose

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

For institutions using this framework, the National Automotive Technicians Education Foundation (NATEF) highly recommends the Master Automotive Service Technology (MAST) program Certification/Accreditation. Florida Statute (F.S.) 1004.925 – Automotive service technology education programs; certification. – requires all automotive service technology education programs shall be industry certified in accordance with rules adopted by the State Board of Education.

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

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	SOC Code
A	AER0014	Automobile Services Assistor	AUTO IND @7 %7 %G AUTO MECH @7 7G	300 hours	49-3023
B	AER0360	Automotive Electrical/Electronic System Technician		300 hours	49-3023
C	AER0172	Automotive Heating and Air Conditioning Technician		150 hours	49-3023

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 Number: AER0014
Occupational Completion Point: A
Automotive Services Assistor – 300 Hours – SOC Code 49-3023

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.

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.	
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.	

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks	Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: AER0360
Occupational Completion Point: B
Automotive Electrical/Electronic System Technician – 300 Hours – SOC Code 49-3023

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**

CTE Standards and Benchmarks		**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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks	Priority Number
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, 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
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

CTE Standards and Benchmarks		Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: AER0172
Occupational Completion Point: C
Automotive Heating and Air Conditioning Technician – 150 Hours – SOC Code 49-3023

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

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks		Priority Number
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 NATEF Master Certified (MAST) and the instructors be A1-A8 ASE Master and Advanced Engine Performance (L1) ASE Certified.

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Automotive General Service Technician**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T400730
CIP Number	0647060425
Grade Level	30, 31
Standard Length	750 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 9

Purpose

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

For institutions using this framework, the National Automotive Technicians Education Foundation (NATEF) highly recommends the Master Automotive Service Technology (MAST) program Certification/Accreditation. Florida Statute (F.S.) 1004.925 – Automotive service technology education programs; certification. – requires all automotive service technology education programs shall be industry certified in accordance with rules adopted by the State Board of Education.

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

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	SOC Code
A	AER0014	Automobile Services Assistor	AUTO IND @7 %7 %G AUTO MECH @7 7G	300 hours	49-3023
B	AER0418	Automotive Brake System Technician		150 hours	49-3023
C	AER0453	Automobile Suspension and Steering Technician		150 hours	49-3023
D	AER0110	Engine Repair Technician		150 hours	49-3023

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 Number: AER0014
Occupational Completion Point: A
Automotive Services Assistor – 300 Hours – SOC Code 49-3023

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.

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.	
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.	

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks	Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: AER0418
Occupational Completion Point: B
Automotive Brake System Technician – 150 Hours – SOC Code 49-3023

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

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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		

CTE Standards and Benchmarks		Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: AER0453
Occupational Completion Point: C
Automotive Suspension and Steering Technician – 150 Hours – SOC Code 49-3023

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**

CTE Standards and Benchmarks	**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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: AER0110
Occupational Completion Point: D
Engine Repair Technician – 150 Hours – SOC Code 49-3023

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 =	24
P-2 =	16
P-3 =	11
Total	51

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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 NATEF Master Certified (MAST) and the instructors be A1-A8 ASE Master and Advanced Engine Performance (L1) ASE Certified.

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Automotive Performance Technician**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T400740
CIP Number	0647060426
Grade Level	30, 31
Standard Length	1050 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 9

Purpose

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

For institutions using this framework, the National Automotive Technicians Education Foundation (NATEF) highly recommends the Master Automotive Service Technology (MAST) program Certification/Accreditation. Florida Statute (F.S.) 1004.925 – Automotive service technology education programs; certification. – requires all automotive service technology education programs shall be industry certified in accordance with rules adopted by the State Board of Education.

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

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	SOC Code
A	AER0014	Automobile Services Assistor	AUTO IND @7 %7 %G AUTO MECH @7 7G	300 hours	49-3023
B	AER0360	Automotive Electrical/Electronic System Technician		300 hours	49-3023
C	AER0110	Engine Repair Technician		150 hours	49-3023
D	AER0503	Automotive Engine Performance Technician		300 hours	49-3023

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 engines, cylinder heads, valve train, engine block, lubrication and cooling systems.
06.0 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: Automotive Performance Technician
Career Certificate Program Number: T400740

Course Number: AER0014
Occupational Completion Point: A
Automotive Services Assistor – 300 Hours – SOC Code 49-3023

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.

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.	
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.	

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks	Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: AER0360
Occupational Completion Point: B
Automotive Electrical/Electronic System Technician – 300 Hours – SOC Code 49-3023

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**

CTE Standards and Benchmarks		**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

CTE Standards and Benchmarks		Priority Number
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 re-initialization 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

CTE Standards and Benchmarks	Priority Number
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, 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
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

CTE Standards and Benchmarks		Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: AER0110
Occupational Completion Point: C
Engine Repair Technician – 150 Hours – SOC Code 49-3023

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 =	24
P-2 =	16
P-3 =	11
Total	51

CTE Standards and Benchmarks		Priority Number
05.0	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)		
05.01	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P-1
05.02	Research vehicle service information including fluid type, internal engine operation, vehicle service history, service precautions, and technical service bulletins.	P-1
05.03	Verify operation of the instrument panel engine warning indicators.	P-1
05.04	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action.	P-1
05.05	Install engine covers using gaskets, seals, and sealers as required.	P-1
05.06	Verify engine mechanical timing.	P-1
05.07	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
05.08	Inspect, remove and/or replace engine mounts.	P-2

CTE Standards and Benchmarks		Priority Number
05.09	Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.	P-2
05.10	Remove and reinstall engine on a newer vehicle equipped with OBD; reconnect all attaching components and restore the vehicle to running condition.	P-3
05.11	Identify and interpret engine concern; determine necessary action.	
05.12	Locate and interpret vehicle and major component identification numbers.	
05.13	Diagnose engine noises and vibrations; determine necessary action.	
05.14	Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.	
05.15	Perform engine vacuum tests; determine necessary action.	
05.16	Perform cylinder power balance tests; determine necessary action.	
05.17	Perform cylinder cranking and running compression tests; determine necessary action.	
05.18	Perform cylinder leakage tests; determine necessary action.	
Cylinder Head and Valve Train Diagnosis and Repair		
05.19	Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure.	P-1
05.20	Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1
05.21	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-2
05.22	Adjust valves (mechanical or hydraulic lifters).	P-1
05.23	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
05.24	Establish camshaft position sensor indexing.	P-1
05.25	Inspect valve springs for squareness and free height comparison; determine needed action.	P-3
05.26	Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action.	P-3
05.27	Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action.	P-3
05.28	Inspect valves and valve seats; determine needed action.	P-3
05.29	Check valve spring assembled height and valve stem height; determine needed action.	P-3
05.30	Inspect valve lifters; determine needed action.	P-2
05.31	Inspect and/or measure camshaft for runout, journal wear and lobe wear.	P-3

CTE Standards and Benchmarks		Priority Number
05.32	Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action.	P-3
Engine Block Assembly Diagnosis and Repair		
05.33	Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-1
05.34	Disassemble engine block; clean and prepare components for inspection and reassembly.	P-1
05.35	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.	P-2
05.36	Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.	P-2
05.37	Deglaze and clean cylinder walls.	P-2
05.38	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.	P-3
05.39	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
05.40	Inspect main and connecting rod bearings for damage and wear; determine needed action.	P-2
05.41	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.	P-3
05.42	Inspect and measure piston skirts and ring lands; determine needed action.	P-2
05.43	Determine piston-to-bore clearance.	P-2
05.44	Inspect, measure, and install piston rings.	P-2
05.45	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
05.46	Assemble engine block.	P-1
05.47	Remove and replace piston pin; where applicable.	
Lubrication and Cooling Systems Diagnosis and Repair		
05.48	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
05.49	Identify causes of engine overheating.	P-1
05.50	Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
05.51	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
05.52	Inspect, remove, and replace water pump.	P-2

CTE Standards and Benchmarks		Priority Number
05.53	Remove and replace radiator.	P-2
05.54	Remove, inspect, and replace thermostat and gasket/seal.	P-1
05.55	Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.	P-1
05.56	Perform oil pressure tests; determine needed action.	P-1
05.57	Perform engine oil and filter change; use proper fluid type per manufacturer specification.	P-1
05.58	Inspect auxiliary coolers; determine needed action.	P-3
05.59	Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
05.60	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.	P-2
05.61	Inspect and replace engine cooling and heater system hoses.	

Florida Department of Education
Student Performance Standards

Course Number: AER0503
Occupational Completion Point: D
Automotive Engine Performance Technician – 300 Hours – SOC Code 49-3023

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	**21**
P-2	**20**
P-3	**2**
Total	**43**

CTE Standards and Benchmarks		**Priority Number**
06.0	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		
06.01	Identify and interpret engine performance concerns; determine needed action.	P-1
06.02	Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.	P-1
06.03	Diagnose abnormal engine noises or vibration concerns; determine needed action.	P-3
06.04	Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.	P-2
06.05	Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action.	P-1
06.06	Perform cylinder power balance test; determine needed action.	P-2
06.07	Perform cylinder cranking and running compression tests; determine needed action.	P-1
06.08	Perform cylinder leakage test; determine needed action.	P-1

CTE Standards and Benchmarks		Priority Number
06.09	Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.	P-2
06.10	Verify engine operating temperature; determine needed action.	P-1
06.11	Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT).	P-1
06.12	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	
06.13	Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.	
06.14	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		
06.15	Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable.	P-1
06.16	Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1
06.17	Perform active tests of actuators using a scan tool; determine needed action.	P-1
06.18	Describe the use of OBD monitors for repair verification.	P-1
06.19	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
06.20	Diagnose emissions or drive-ability concerns without stored or active diagnostic trouble codes; determine needed action.	P-1
06.21	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
06.22	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
06.23	Check for module communication (including CAN/BUS systems) errors using a scan tool.	
Ignition System Diagnosis and Repair		
06.24	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
06.25	Inspect and test crankshaft and camshaft position sensor(s); determine needed action.	P-1
06.26	Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as needed.	P-3
06.27	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1
06.28	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		

CTE Standards and Benchmarks		Priority Number
06.29	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
06.30	Check fuel for contaminants; determine needed action.	P-2
06.31	Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; perform needed action.	P-1
06.32	Replace fuel filter(s) where applicable.	P-2
06.33	Inspect, service, or replace air filters, filter housings, and intake duct work.	P-1
06.34	Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2
06.35	Inspect, test, and/or replace fuel injectors.	P-2
06.36	Verify idle control operation.	P-1
06.37	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
06.38	Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.	P-1
06.39	Perform exhaust system back-pressure test; determine needed action.	P-2
06.40	Check and refill diesel exhaust fluid (DEF).	P-2
06.41	Test the operation of turbocharger/supercharger systems; determine needed action.	P-2
Emissions Control Systems Diagnosis and Repair		
06.42	Diagnose oil leaks, emissions, and drive-ability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.	P-3
06.43	Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform needed action.	P-2
06.44	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
06.45	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
06.46	Diagnose emissions and drive-ability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.	P-1
06.47	Diagnose emission and drive-ability concerns caused by catalytic converter system; determine needed action.	P-2
06.48	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.	P-2

CTE Standards and Benchmarks		Priority Number
06.49	Inspect and test mechanical components of secondary air injection systems; perform necessary action.	
06.50	Adjust valves on engines with mechanical or hydraulic lifters; as applicable.	
06.51	Remove and replace timing belt; verify correct camshaft timing.	
06.52	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	
06.53	Inspect engine oil and/or filter for condition and determine necessary action.	
06.54	Identify hybrid 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 NATEF Master Certified (MAST) and the instructors be A1-A8 ASE Master and Advanced Engine Performance (L1) ASE Certified.

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Automotive Service Technology 2**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T400800
CIP Number	0647060412
Grade Level	30, 31
Standard Length	750 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 9

Purpose

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

For institutions using this framework, the National Automotive Technicians Education Foundation (NATEF) highly recommends the Master Automotive Service Technology (MAST) program Certification/Accreditation. Florida Statute (F.S.) 1004.925 – Automotive service technology education programs; certification. – requires all automotive service technology education programs shall be industry certified in accordance with rules adopted by the State Board of Education.

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

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	SOC Code
A	AER0503	Automotive Engine Performance Technician	AUTO IND @7 %7 %G AUTO MECH @7 7G	300 hours	49-3023
B	AER0257	Automatic Transmission and Transaxle Technician		150 hours	49-3023
C	AER0274	Manual Drivetrain and Axle Technician		150 hours	49-3023
D	AER0172	Automotive Heating and Air Conditioning Technician		150 hours	49-3023

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 Number: AER0503
Occupational Completion Point: A
Automotive Engine Performance Technician – 300 Hours – SOC Code 49-3023

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 =	21
P-2 =	20
P-3 =	2
Total	43

CTE Standards and Benchmarks		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	Identify and interpret engine performance concerns; determine needed action.	P-1
01.02	Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.	P-1
01.03	Diagnose abnormal engine noises or vibration concerns; determine needed action.	P-3
01.04	Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.	P-2
01.05	Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action.	P-1
01.06	Perform cylinder power balance test; determine needed action.	P-2
01.07	Perform cylinder cranking and running compression tests; determine needed action.	P-1

CTE Standards and Benchmarks		Priority Number
01.08	Perform cylinder leakage test; determine needed action.	P-1
01.09	Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.	P-2
01.10	Verify engine operating temperature; determine needed action.	P-1
01.11	Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT).	P-1
01.12	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	
01.13	Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.	
01.14	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		
01.15	Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable.	P-1
01.16	Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1
01.17	Perform active tests of actuators using a scan tool; determine needed action.	P-1
01.18	Describe the use of OBD monitors for repair verification.	P-1
01.19	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
01.20	Diagnose emissions or drive-ability concerns without stored or active diagnostic trouble codes; determine needed action.	P-1
01.21	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
01.22	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
01.23	Check for module communication (including CAN/BUS systems) errors using a scan tool.	
Ignition System Diagnosis and Repair		
01.24	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
01.25	Inspect and test crankshaft and camshaft position sensor(s); determine needed action.	P-1
01.26	Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as needed.	P-3
01.27	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1
01.28	Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.	

CTE Standards and Benchmarks		Priority Number
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair		
01.29	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
01.30	Check fuel for contaminants; determine needed action.	P-2
01.31	Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; perform needed action.	P-1
01.32	Replace fuel filter(s) where applicable.	P-2
01.33	Inspect, service, or replace air filters, filter housings, and intake duct work.	P-1
01.34	Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2
01.35	Inspect, test, and/or replace fuel injectors.	P-2
01.36	Verify idle control operation.	P-1
01.37	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
01.38	Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.	P-1
01.39	Perform exhaust system back-pressure test; determine needed action.	P-2
01.40	Check and refill diesel exhaust fluid (DEF).	P-2
01.41	Test the operation of turbocharger/supercharger systems; determine needed action.	P-2
Emissions Control Systems Diagnosis and Repair		
01.42	Diagnose oil leaks, emissions, and drive-ability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.	P-3
01.43	Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform needed action.	P-2
01.44	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
01.45	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
01.46	Diagnose emissions and drive-ability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.	P-1
01.47	Diagnose emission and drive-ability concerns caused by catalytic converter system; determine needed action.	P-2

CTE Standards and Benchmarks		Priority Number
01.48	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.	P-2
01.49	Inspect and test mechanical components of secondary air injection systems; perform necessary action.	
01.50	Adjust valves on engines with mechanical or hydraulic lifters; as applicable.	
01.51	Remove and replace timing belt; verify correct camshaft timing.	
01.52	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	
01.53	Inspect engine oil and/or filter for condition and determine necessary action.	
01.54	Identify hybrid vehicle internal combustion engine service precautions.	

Florida Department of Education
Student Performance Standards

Course Number: AER0257
Occupational Completion Point: B
Automatic Transmission and Transaxle Technician – 150 Hours – SOC Code 49-3023

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 =	**17**
P-2 =	**19**
P-3 =	**3**
Total	**39**

CTE Standards and Benchmarks		**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

CTE Standards and Benchmarks		Priority Number
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 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	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
02.18	Diagnose electronic transmission control systems using a scan tool; determine necessary action.	
Off-Vehicle Transmission and Transaxle Repair		
02.19	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
02.20	Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings.	P-1
02.21	Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.	P-2
02.22	Describe the operational characteristics of a continuously variable transmission (CVT).	P-3
02.23	Describe the operational characteristics of a hybrid vehicle drive train.	P-3
02.24	Disassemble, clean, and inspect transmission/transaxle.	P-1
02.25	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
02.26	Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine needed action.	P-2
02.27	Assemble transmission/transaxle.	P-1
02.28	Inspect, measure, and reseal oil pump assembly and components.	P-2
02.29	Measure transmission/transaxle end play and/or preload; determine needed action.	P-1
02.30	Inspect, measure, and/or replace thrust washers and bearings.	P-2

CTE Standards and Benchmarks		Priority Number
02.31	Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.	P-2
02.32	Inspect bushings; determine needed action.	P-2
02.33	Inspect and measure planetary gear assembly components; determine needed action.	P-2
02.34	Inspect case bores, passages, bushings, vents, and mating surfaces; determine needed action.	P-2
02.35	Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform needed action.	P-2
02.36	Inspect measure, repair, adjust or replace transaxle final drive components.	P-2
02.37	Inspect clutch drum, piston, check-balls, springs, retainers, seals, friction plates, pressure plates, and bands; determine needed action.	P-2
02.38	Measure clutch pack clearance; determine needed action.	P-1
02.39	Air test operation of clutch and servo assemblies.	P-1
02.40	Inspect one-way clutches, races, rollers, sprags, springs, cages, retainers; determine needed action.	P-2
02.41	Install and seat torque converter to engage drive/splines.	
02.42	Inspect bands and drums; determine necessary action.	

Florida Department of Education
Student Performance Standards

Course Number: AER0274
Occupational Completion Point: C
Manual Drivetrain and Axle Technician – 150 Hours – SOC Code 49-3023

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 = 18
	P-2 = 16
	P-3 = 16
Total	**50**

CTE Standards and Benchmarks		**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
03.05	Diagnose fluid loss, level, and condition concerns; determine necessary action.	
Clutch Diagnosis and Repair		
03.06	Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action.	P-1

CTE Standards and Benchmarks		Priority Number
03.07	Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform needed action.	P-1
03.08	Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable).	P-1
03.09	Bleed clutch hydraulic system.	P-1
03.10	Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.	P-1
03.11	Inspect flywheel and ring gear for wear, cracks, and discoloration; determine needed action.	P-1
03.12	Measure flywheel runout and crankshaft end play; determine needed action.	P-2
03.13	Describe the operation and service of a system that uses a dual mass flywheel.	P-3
03.14	Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.	
03.15	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		
03.16	Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers.	P-2
03.17	Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.	P-2
03.18	Diagnose noise concerns through the application of transmission/transaxle power-flow principles.	P-2
03.19	Diagnose hard shifting and jumping out of gear concerns; determine needed action.	P-2
03.20	Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action.	P-3
03.21	Disassemble, inspect clean, and reassemble internal transmission/transaxle components.	P-2
03.22	Remove and reinstall manual transmission/transaxle.	
03.23	Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action.	
03.24	Inspect, replace, and align powertrain mounts.	
03.25	Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.	
03.26	Remove and replace transaxle final drive.	
03.27	Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.	
03.28	Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action.	
03.29	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.	
03.30	Inspect lubrication devices (oil pump or slingers); perform necessary action.	

CTE Standards and Benchmarks	Priority Number
03.31 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)	
03.32 Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action.	P-1
03.33 Diagnose universal joint noise and vibration concerns; perform needed action.	P-2
03.34 Inspect, remove, and/or replace bearings, hubs, and seals.	P-1
03.35 Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.	P-1
03.36 Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.	P-2
03.37 Inspect, service, and replace shaft center support bearings.	
Drive Axle Diagnosis and Repair – Ring and Pinion Gears and Differential Case Assembly	
03.38 Clean and inspect differential case; check for leaks; inspect housing vent.	P-1
03.39 Check and adjust differential case fluid level; use proper fluid type per manufacturer specifications.	P-1
03.40 Drain and refill differential case; use proper fluid type per manufacturer specifications.	P-1
03.41 Diagnose noise and vibration concerns; determine needed action.	P-2
03.42 Inspect and replace companion flange and/or pinion seal; measure companion flange runout.	P-2
03.43 Inspect ring gear and measure runout; determine needed action.	P-3
03.44 Remove, inspect, reinstall and/or drive pinion and ring gear, spacers, sleeves, and bearings.	P-3
03.45 Measure and adjust drive pinion depth.	P-3
03.46 Measure and adjust drive pinion bearing preload.	P-3
03.47 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
03.48 Check ring and pinion tooth contact patterns; perform needed action.	P-3
03.49 Disassemble, inspect, measure, adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.	P-3
03.50 Reassemble and reinstall differential case assembly; measure runout; determine needed action.	P-3
03.51 Diagnose noise and vibration concerns; determine necessary action.	
Drive Axle Diagnosis and Repair – Limited Slip Differential	
03.52 Diagnose noise, slippage, and chatter concerns; determine needed action.	P-3
03.53 Measure rotating torque; determine needed action.	P-3

CTE Standards and Benchmarks	Priority Number
03.54 Inspect and reinstall limited slip differential components.	
Drive Axle Diagnosis and Repair – Drive Axles	
03.55 Inspect and replace drive axle wheel studs.	P-1
03.56 Remove and replace drive axle shafts.	P-1
03.57 Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2
03.58 Measure drive axle flange runout and shaft end play; determine needed action.	P-2
03.59 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	
03.60 Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-3
03.61 Inspect locking hubs; determine needed action.	P-3
03.62 Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P-3
03.63 Identify concerns related to variations in tire circumference and/or final drive ratios.	P-2
03.64 Diagnose noise, vibration, and unusual steering concerns; determine needed action.	P-3
03.65 Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive/all-wheel drive systems.	P-2
03.66 Disassemble, service, and reassemble transfer case and components.	P-2
03.67 Remove and reinstall transfer case.	

Florida Department of Education
Student Performance Standards

Course Number: AER0172
Occupational Completion Point: D
Automotive Heating and Air Conditioning Technician – 150 Hours – SOC Code 49-3023

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

CTE Standards and Benchmarks		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	Identify and interpret heating and air conditioning problems; determine needed action.	P-1
04.02	Research vehicle service information including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.	P-1
04.03	Performance test A/C system; identify problems.	P-1
04.04	Identify abnormal operating noises in the A/C system; determine needed action.	P-2
04.05	Identify refrigerant type; select and connect proper gauge set/test equipment; record temperature and pressure readings.	P-1
04.06	Leak test A/C system; determine needed action.	P-1
04.07	Inspect condition of refrigerant oil removed from A/C system; determine needed action.	P-2

CTE Standards and Benchmarks		Priority Number
04.08	Determine recommended oil and oil capacity for system application.	P-1
04.09	Using a scan tool, observe and record related HVAC data and trouble codes.	P-3
Refrigeration System Component Diagnosis and Repair		
04.10	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
04.11	Inspect, test, service and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.	P-2
04.12	Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity.	P-2
04.13	Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	P-2
04.14	Determine need for an additional A/C system filter; perform needed action.	P-3
04.15	Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform needed action.	P-2
04.16	Inspect for proper A/C condenser airflow; determine needed action.	P-1
04.17	Remove, inspect, and replace receiver/drier or accumulator/drier; determine recommended oil type and quantity.	P-2
04.18	Remove, inspect, and install expansion valve or orifice (expansion) tube.	P-1
04.19	Inspect evaporator housing water drain; perform needed action.	P-1
04.20	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
04.21	Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.	P-2
04.22	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		
04.23	Inspect engine cooling and heater systems hoses and pipes; perform needed action.	P-1
04.24	Inspect and test heater control valve(s); perform needed action.	P-2
04.25	Diagnose temperature control problems in the HVAC system; determine needed action.	P-2
04.26	Determine procedure to remove, inspect, reinstall, and/or replace heater core.	P-2
04.27	Inspect, test, and replace thermostat and gasket/seal.	
04.28	Determine coolant condition and coolant type for vehicle application; drain and recover coolant.	
04.29	Flush system; refill system with recommended coolant; bleed system.	
04.30	Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.	

CTE Standards and Benchmarks		Priority Number
04.31	Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.	
Operating Systems and Related Controls Diagnosis and Repair		
04.32	Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.	P-1
04.33	Diagnose A/C compressor clutch control systems; determine needed action.	P-2
04.34	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
04.35	Inspect and test HVAC system control panel assembly; determine needed action.	P-3
04.36	Inspect and test HVAC system control cables, motors, and linkages; perform needed action.	P-3
04.37	Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; perform needed action.	P-1
04.38	Identify the source of HVAC system odors.	P-2
04.39	Check operation of automatic or semi-automatic HVAC control systems; determine needed action.	P-2
Refrigerant Recovery, Recycling, and Handling		
04.40	Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.	P-1
04.41	Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.	P-1
04.42	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 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 NATEF Master Certified (MAST) and the instructors be A1-A8 ASE Master and Advanced Engine Performance (L1) ASE Certified.

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from

meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Automotive Customer Service Advisor**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T400910
CIP Number	0647060427
Grade Level	30, 31
Standard Length	600 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	41-2022 – Parts Salespersons 41-2031 – Retail Salespersons 43-1011 – First-Line Supervisors of Office and Administrative Support Workers 43-4051 – Customer Service Representatives 43-5081 – Stock Clerks and Order Fillers
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 courses that culminate in 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	SOC Code
	AER0075	Introduction to Automotive Service Advisor	AUTO MECH @7 7G CUST SERV 7G MKTG 1 @2 MKTG MGMT @7 7G RETAILING @7 7G	75 hours	43-5081
	AER0076	Introduction to Automotive Customer Service		75 hours	43-4051
	AER0077	Dealership Policies and Protocols		90 hours	43-1011
A	AER0946	Dealership Service Advisor Internship		210 hours	41-2031
B	AER0078	Service Advisor Parts Analyst		150 hours	41-2022

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 Describe the differences between aftermarket and original equipment manufacturers (OEM) in a global economy.
02.0 Identify, explain and list the tasks/duties assigned to the service consultant.
03.0 Explain the importance of professional image, employability skills and ethics.
04.0 Explain the team structure and task associated with each team position; identify the major responsibilities of the team leader.
05.0 Describe and outline the procedures for closing out both manual and computerized work orders, and notifying the customer.
06.0 Explain the various team approaches used in the automotive service industry to offer superior customer service
07.0 Demonstrate how to properly identify and document customer concerns and requests in person or over the phone and confirm accuracy of all information.
08.0 Demonstrate how to properly open a repair order, using identifying characteristics of the vehicle, and confirm accuracy for both computerized and paper repair orders.
09.0 Identify, and recommend service and maintenance needs to the customer in a timely, professional and friendly manner.
10.0 Present a plan to manage customer appointments.
11.0 Describe methods of promoting the service profit center (provide examples).
12.0 Explain how a positive, team-based work environment is related to productivity and job satisfaction.
13.0 Explain why customer expectations, effectiveness and efficiency are critical to a business.
14.0 Explain and demonstrate safety and environmental regulation compliance related to the automotive service industry
15.0 Describe and diagram automotive related organizational structures.
16.0 Explain the legal importance of accurate written communications using a repair order and describe how information is recorded and stored.
17.0 Describe the legal and financial importance of accurate repair order history.
18.0 Explain the legal and ethical consideration of proper repair order authorization.
19.0 Identify and complete financial measures, forms and documents that are required as part of the service consultant's duties.
20.0 Locate and use reference information such as: service bulletins, electronic service manuals, warranty procedures manuals, owner's manuals, and electronic dealership proprietary systems.
21.0 Define and use warranty policies and procedures/parameters.
22.0 Explain and demonstrate how to maximize the capability of the service facility by effective scheduling of workflow through collaborative groupware applications.
23.0 Demonstrate the proper procedure and condition for delivery of the vehicle back to the customer.
24.0 Demonstrate how to respond to difficult customer situations.
25.0 Demonstrate proficiency in identifying and recording automotive elements for routine pre/post maintenance and customer services**.**
26.0 Identify marketing and business fundamentals related to the automotive industry.

Florida Department of Education
Student Performance Standards

Program Title: Automotive Service Advisor and Consultant
Career Certificate Program Number: T400910

Course Number: AER0075
Occupational Completion Point: A (1 of 4)
Introduction to Automotive Service Advisor – 75 Hours – SOC Code 43-5081

Course Description:
The Introduction to Automotive Service Advisor course prepares students for entry into the automotive service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study aftermarket and original equipment manufacturers, duties of a service consultant, professional image, employability skills, ethics, team structures, closing manual and computerized work orders.

CTE Standards and Benchmarks	
01.0	Describe the differences between aftermarket and original equipment manufacturers (OEM) in a global economy.-The student will be able to:
01.01	Describe the nature and types of business organizations.
01.02	Explain the impact of the global economy on business organizations.
01.03	Employ leadership skills to accomplish organizational goals and objectives.
01.04	Identify and define career opportunities in the automotive service industry.
01.05	Identify and apply communication skills used in automotive careers.
02.0	Identify, explain and list the tasks/duties assigned to the service consultant.-The student will be able to:
02.01	List and describe quality control systems and/or practices common to the workplace.
02.02	Identify task/duties of a service consultant.
02.03	Explain the significance of each task/duty assigned to the service consultant.
03.0	Explain the importance of professional image, employability skills and ethics.-The student will be able to:
03.01	Identify employment requirements for an automotive career.
03.02	Complete a job application form correctly.
03.03	Identify and adopt acceptable work habits.
03.04	Conduct a job search.
03.05	Demonstrate competence in job interview techniques.

CTE Standards and Benchmarks	
	03.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
	03.07 Demonstrate knowledge of how to make job changes appropriately.
	03.08 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	03.09 Explain the effects of chemical/substance abuse.
	03.10 Demonstrate principles of stress management.
	03.11 Demonstrate acceptable industry dress code.
	03.12 Identify and demonstrate proper customer relation skills.
04.0	Explain team structure and the major responsibilities of the team leader.-The student will be able to:
	04.01 Identify and describe team structures within a dealership service department.
	04.02 Identify responsibilities required of the team leader.
05.0	Describe and outline the procedures for closing out both manual and computerized work orders, and notifying the customer.-The student will be able to:
	05.01 Write percents, add fractions, and decimals.
	05.02 Solve number word problems.
	05.03 Find the percent of a number.
	05.04 Operate a calculator.
	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 Write percents, add fractions and decimals.

Course Number: AER0076
Occupational Completion Point: A (2 of 4)
Introduction to Automotive Customer Service – 75 Hours – SOC Code 43-4051

Course Description:
The Introduction to Automotive Customer Service course is designed to build on the skills and knowledge students learned in the Introduction to Automotive Service Advisor course for entry into the automotive service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study team approaches to customer service, documentation of customer concerns, opening repair orders, service and maintenance recommendations, manage customer appointments, promotions, job satisfaction and productivity, customer expectations, safety, and environmental regulation.

CTE Standards and Benchmarks	
06.0	Explain the various team approaches used in the automotive service industry to offer superior customer service.-The student will be able to:
06.01	Employ critical thinking skills independently and in teams to solve problems and make decisions.
06.02	Employ critical thinking and interpersonal skills to resolve conflicts.
06.03	Employ collaborative/groupware applications to facilitate group work.
06.04	Participate in meetings to accomplish work tasks.
07.0	Demonstrate how to properly identify and document customer concerns and requests in person or over the phone and confirm accuracy of all information.-The student will be able to:
07.01	Present information formally and informally for specific purposes and audiences.
07.02	Demonstrate appropriate telephone/communication skills.
07.03	Read and follow written and oral instructions.
08.0	Demonstrate how to properly open a repair order, using identifying characteristics of the vehicle, and confirm accuracy for both computerized and paper repair orders.-The student will be able to:
08.01	Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary.
08.02	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
08.03	Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.
08.04	Determine the presence of a Tire Pressure Monitoring System (TPMS).
08.05	Determine the presence of wheel locks.
08.06	Determine the presence of an air suspension system.
08.07	Check operation and status of instrument panel warning lights and gauges.
08.08	Locate and use the Vehicle Identification Number (VIN).

CTE Standards and Benchmarks	
	08.09 Locate and use vehicle information placards, decals, tags, as required.
09.0	Identify, and recommend service and maintenance needs to the customer in a timely, professional and friendly manner.-The student will be able to:
	09.01 Demonstrate appropriate telephone, electronic and in-person communication skills.
10.0	Present a plan to manage customer appointments.-The student will be able to:
	10.01 Develop a plan to schedule customer appointments.
	10.02 Present a plan outlining the procedure for managing customer appointments.
11.0	Describe methods of promoting the service profit center (provide examples).-The student will be able to:
	11.01 Identify and describe various methods of promoting service.
	11.02 Create a promotional flyer for the service profit center that would be mailed to potential customers.
12.0	Explain how a positive, team-based work environment is related to productivity and job satisfaction.-The student will be able to:
	12.01 Identify positive attributes of teams in relation to productivity and job satisfaction.
	12.02 Describe and model positive attributes related to team production.
13.0	Explain why customer expectations, effectiveness and efficiency are critical to a business.-The student will be able to:
	13.01 Identify and describe customer expectation related to business success.
	13.02 Identify how efficiency is related to business success.
14.0	Explain and demonstrate safety and environmental regulation compliance related to the automotive service industry.-The student will be able to:
	14.01 Apply shop safety rules, EPA and OSHA standards.
	14.02 Identify and use appropriate emergency first aid procedures.
	14.03 Identify and describe typical automotive lubricants and lubricant properties
	14.04 Interpret the "Right-to-Know" Law as recorded in (29 CFR-1910.1200).
	14.05 Describe and identify supplemental restraint systems (SRS).
	14.06 Demonstrate acceptable employee health habits; including infection control of blood borne pathogens.
	14.07 Locate and use Safety Data Sheets (SDS).
	14.08 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	14.09 Explain emergency procedures to follow in response to workplace accidents.

Course Number: AER0077
Occupational Completion Point: A (3 of 4)
Dealership Policies and Protocols - 90 Hours – SOC Code 43-1011

Course Description:
The Dealership Policies and Protocols course is designed to build on the skills and knowledge students learned in the Introduction to Automotive Customer Service course for entry into the automotive service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study organizational structures, and legal and ethical importance of order accuracy.

CTE Standards and Benchmarks	
15.0	Describe and diagram automotive related organizational structures.-The student will be able to:
15.01	Explain the effect of key organizational systems on performance and quality.
15.02	Interpret and explain written organizational policies and procedures.
15.03	Demonstrate working knowledge and proficiency of policies and procedures based on assigned work place (Dealer).
16.0	Explain the legal importance of accurate written communications using a repair order and describe how information is recorded and stored.-The student will be able to:
16.01	Locate, comprehend and evaluate key elements of oral and written information.
16.02	Answer and ask questions coherently and concisely.
16.03	Read critically by recognizing assumptions and implications and by evaluating ideas.
16.04	Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
17.0	Describe the legal and financial importance of accurate repair order history.-The student will be able to:
17.01	Research and describe legal precedence related to repair orders.
17.02	Identify and describe the financial importance of accurate repair order history.
18.0	Explain the legal and ethical consideration of proper repair order authorization.-The student will be able to:
18.01	Evaluate and justify decisions based on ethical reasoning.
18.02	Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities and employer policies.

Course Number: AER0945
Occupational Completion Point: A (4 of 4)
Dealership Service Advisor Internship - 210 Hours – SOC Code 43-2031

Course Description:
The Dealership Service Advisor Internship course is designed to build on the skills and knowledge students learned in the Dealership Policies and Protocols course for entry into the automotive service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study financial measures, forms and documentation, reference information, warranty policies, effective scheduling, collaborative groupware applications, and customer relations.

CTE Standards and Benchmarks	
19.0	Identify and complete financial measures, forms and documents that are required as part of the service consultant's duties.-The student will be able to:
19.01	Describe the effect of money management on personal and career goals.
19.02	Develop a personal budget and financial goals.
19.03	Complete financial instruments for making deposits and withdrawals.
19.04	Maintain financial records.
19.05	Identify and define payroll deductions (taxes, insurance, and social security) employee benefits and pay systems.
19.06	Demonstrate principles of time management.
20.0	Locate and use reference information such as: service bulletins, electronic service manuals, warranty procedures manuals, owner's manuals, and electronic dealership proprietary systems.-The student will be able to:
20.01	Use computer and operate keyboard.
20.02	Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.
20.03	Utilize flat rate manuals, service manuals, service bulletins, parts manuals and electronic service information.
20.04	Employ critical thinking skills independently and in teams to solve problems and make decisions.
20.05	Conduct technical research to gather information necessary for decision-making.
20.06	Identify information needed for the service requested on a repair order.
20.07	Locate and use paper and electronic manuals.
20.08	Locate and use technical service bulletins (TSBs).
20.09	Use personal information management (PIM) applications to increase workplace efficiency.
20.10	Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
20.11	Employ computer operations applications to access, create, manage, integrate, and store information.

CTE Standards and Benchmarks	
	20.12 Demonstrate proficiency in the use of dealership proprietary systems (based on site utilization).
21.0	Define and use warranty policies and procedures/parameters.-The student will be able to:
	21.01 Explain the difference between first time warranty, repeat repair, fleet, and customer pay at a service facility.
	21.02 Identify policies and procedures associated with new vehicle sold in the United States.
	21.03 Identify policies and procedures related to an individual OEM.
	21.04 Identify and describe the procedure for submitting a work order under warranty conditions.
	21.05 Determine the proper procedure associated with warranty parts and claims.
22.0	Explain and demonstrate how to maximize the capability of the service facility by effective scheduling of workflow through collaborative groupware applications.-The student will be able to:
	22.01 Identify and document workplace performance goals and monitor progress toward those goals.
23.0	Demonstrate the proper procedure and condition for delivery of the vehicle back to the customer.-The student will be able to:
	23.01 Identify purpose and demonstrate proper use of fender covers, floor mats and other vehicle protection equipment.
	23.02 Ensure vehicle is prepared to return to customer per company policy (floor mats, steering wheel cover, etc.).
24.0	Demonstrate how to respond to difficult customer situations.-The student will be able to:
	24.01 Identify scenarios when dealing with difficult customer situations.
	24.02 Identify and describe appropriate actions related to customer satisfaction.

Florida Department of Education
Student Performance Standards

Course Number: AER0078
Occupational Completion Point: B
Service Advisor Parts Analyst – 150 Hours – SOC Code 41-2022

Course Description:
The Service Advisor Parts Analyst course is designed to assist students in acquiring a basic understanding of the key elements essential to the development and utilization of appropriate terminology and industry-specific knowledge of internal and external automotive components.

CTE Standards and Benchmarks	
25.0	Demonstrate proficiency in identifying and recording automotive elements for routine pre/post maintenance and customer services.-The student will be able to
25.01	Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.
25.02	Review vehicle service history.
25.03	Identify information needed and the service requested on a repair order.
25.04	Identify purpose and demonstrate proper use of fender covers, floor mats and other vehicle protection equipment.
25.05	Use computer and operate keyboard to perform tasks typically required at a dealership.
25.06	Ensure vehicle is prepared to be returned to customer per company policy (floor mats, steering wheel cover, etc.).
25.07	Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.
25.08	Document observed damage, unusual conditions, and concerns.
25.09	Demonstrate retrieving stored diagnostic trouble codes.
25.10	Reset product specific service indicator.
25.11	Identify acceptable customer relations.
25.12	Identify and demonstrate proper customer relations skills.
25.13	Identify steps to research part numbers using manual and computerized cataloging, interchanges, and price sheets.
26.0	Identify marketing and business fundamentals related to the automotive industry.-The student will be able to:
26.01	Explain elements in automotive marketing (price, product, promotion, place, and people).
26.02	Explain concept of service vs. product marketing strategies.
26.03	Identify niche markets (customer segmentation).
26.04	Identify specialty markets (product segmentation).

CTE Standards and Benchmarks	
26.05	Discuss the role of federal, state and local regulatory agencies as it relates to the automotive industry.
26.06	Identify methods of gathering customer feedback.

Additional Information

Laboratory Activities

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

Special Notes

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(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 a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Automotive CNG / LPG Technology**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T401100
CIP Number	0647060420
Grade Level	30, 31
Standard Length	1200 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 CNG-LPG 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	SOC Code
A	AER0014	Automobile Services Assistor	AUTO IND @7 %7G AUTO MECH @7 7G	300 hours	49-3023
B	AER0360	Automotive Electrical/Electronic System Technician		300 hours	49-3023
C	AER0503	Automotive Engine Performance Technician		300 hours	49-3023
D	AER0871	Automotive Compressed Natural Gas Technician		150 hours	49-3023
E	AER0872	Automotive Liquid Propane Gas Technician		150 hours	49-3023

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 engines, ignition, fuel, air induction, exhaust, computer, engine and emission control systems.
06.0 Explain and apply proficiently the diagnosis, service and repair of Compressed Natural Gas systems.
07.0 Explain and apply proficiently the diagnosis, service and repair of Liquid Propane Gas systems.

Florida Department of Education
Student Performance Standards

Program Title: Automotive CNG / LPG Technology
Career Certificate Program Number: T401100

Course Number: AER0014
Occupational Completion Point: A
Automotive Services Assistor – 300 Hours – SOC Code 49-3023

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 = Automotive Service Excellence task

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.

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.	
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.	

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks	Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: AER0360
Occupational Completion Point: B
Automotive Electrical/Electronic System Technician – 300 Hours – SOC Code 49-3023

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 =	**30**
P-2 =	**16**
P-3 =	**1**
Total	**47**

CTE Standards and Benchmarks		**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

CTE Standards and Benchmarks		Priority Number
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 re-initialization 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

CTE Standards and Benchmarks		Priority Number
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, 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
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

CTE Standards and Benchmarks		Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: AER0503
Occupational Completion Point: C
Automotive Engine Performance Technician – 300 Hours – SOC Code 49-3023

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 =	**21**
P-2 =	**20**
P-3 =	**2**
Total	**43**

CTE Standards and Benchmarks		**Priority Number**
05.0	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		
05.01	Identify and interpret engine performance concerns; determine needed action.	P-1
05.02	Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.	P-1
05.03	Diagnose abnormal engine noises or vibration concerns; determine needed action.	P-3
05.04	Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.	P-2
05.05	Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action.	P-1
05.06	Perform cylinder power balance test; determine needed action.	P-2
05.07	Perform cylinder cranking and running compression tests; determine needed action.	P-1
05.08	Perform cylinder leakage test; determine needed action.	P-1

CTE Standards and Benchmarks		Priority Number
05.09	Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.	P-2
05.10	Verify engine operating temperature; determine needed action.	P-1
05.11	Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT).	P-1
05.12	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	
05.13	Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.	
05.14	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		
05.15	Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable.	P-1
05.16	Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1
05.17	Perform active tests of actuators using a scan tool; determine needed action.	P-1
05.18	Describe the use of OBD monitors for repair verification.	P-1
05.19	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
05.20	Diagnose emissions or drive-ability concerns without stored or active diagnostic trouble codes; determine needed action.	P-1
05.21	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
05.22	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
05.23	Check for module communication (including CAN/BUS systems) errors using a scan tool.	
Ignition System Diagnosis and Repair		
05.24	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
05.25	Inspect and test crankshaft and camshaft position sensor(s); determine needed action.	P-1
05.26	Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as needed.	P-3
05.27	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1
05.28	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		

CTE Standards and Benchmarks		Priority Number
05.29	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
05.30	Check fuel for contaminants; determine needed action.	P-2
05.31	Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; perform needed action.	P-1
05.32	Replace fuel filter(s) where applicable.	P-2
05.33	Inspect, service, or replace air filters, filter housings, and intake duct work.	P-1
05.34	Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2
05.35	Inspect, test, and/or replace fuel injectors.	P-2
05.36	Verify idle control operation.	P-1
05.37	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
05.38	Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.	P-1
05.39	Perform exhaust system back-pressure test; determine needed action.	P-2
05.40	Check and refill diesel exhaust fluid (DEF).	P-2
05.41	Test the operation of turbocharger/supercharger systems; determine needed action.	P-2
Emissions Control Systems Diagnosis and Repair		
05.42	Diagnose oil leaks, emissions, and drive-ability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.	P-3
05.43	Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform needed action.	P-2
05.44	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
05.45	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
05.46	Diagnose emissions and drive-ability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.	P-1
05.47	Diagnose emission and drive-ability concerns caused by catalytic converter system; determine needed action.	P-2
05.48	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.	P-2

CTE Standards and Benchmarks		Priority Number
05.49	Inspect and test mechanical components of secondary air injection systems; perform necessary action.	
05.50	Adjust valves on engines with mechanical or hydraulic lifters; as applicable.	
05.51	Remove and replace timing belt; verify correct camshaft timing.	
05.52	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	
05.53	Inspect engine oil and/or filter for condition and determine necessary action.	
05.54	Identify hybrid vehicle internal combustion engine service precautions.	

Florida Department of Education
Student Performance Standards

Course Number: AER0871
Occupational Completion Point: C
Automotive Compressed Natural Gas Technician – 150 Hours – SOC Code 49-3023

Course Description:
The Automotive Compressed Natural Gas 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, maintenance, installation, and repair of automotive compressed natural gas systems.

For every task in Automotive Compressed Natural Gas 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.

CTE Standards and Benchmarks	
06.0	Explain and apply proficiently the diagnosis, service and repair of Compressed Natural Gas systems.-The student will be able to:
06.01	Interpret and verify complaint, determine needed repairs for Supplemental Systems.
06.02	Analyze symptoms and perform diagnostic procedures on vehicles with supplemental on-board diagnostic computer support systems.
06.03	Diagnose and repair no starting, hard starting, engine misfire, poor drivability, power loss, poor mileage, and emissions problems on vehicle's OEM and supplemental sensors (e.g., manifold skin temperature, intake air temperature, and natural gas tank temperature).
06.04	Diagnose and repair no-starting, hard starting, engine misfire, poor drivability, power loss, poor mileage, and emissions problems on vehicles with supplemental computer support systems.
06.05	Diagnose and repair intermittent or complete failure of electric, electronic or mechanical devices (e.g., hour meters, fuel level indicators, fuel selection devices).
06.06	Interpret and verify complaint; determine needed repairs to Fuel Storage and Delivery systems.
06.07	Check all fuel system components to include fuel lock-off, valves, solenoids, manual shutoff, connections, fittings, hoses, and tubing for leaks, wear, installation and proper operation: repair/replace as needed.
06.08	Diagnose the cause of abnormal fuel flow through fuel carrying component.
06.09	Diagnose the cause of fuel odor or fuel loss by inspecting or testing the fuel supply system components such as valves, fuel supply container, pressure relief device (PRD), tubing and hoses; repair or replace as needed.
06.10	Diagnose the cause of inaccurate fuel level indicator reading; service, adjust, repair as needed.

CTE Standards and Benchmarks	
06.11	Perform cylinder leakage test; determine necessary action.
06.12	Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action.
06.13	Interpret and verify complaint; determine needed repairs AIF Management system.
06.14	Verify engine operating temperature; determine necessary action.
06.15	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.
06.16	Diagnose hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine, misfire, power loss, stalling, poor mileage, and lean or rich mixture, problems on vehicles with variable or fixed venturi type fuel, and fumigation or infection type fuel systems; determine needed repairs.
06.17	Inspect and test cold enrichment system components; adjust or replace as needed.
06.18	Inspect and test fuel injectors; service or replace as needed.
06.19	Inspect and test vacuum and electrical components and connections of fuel system; repair or replace as needed.
06.20	Perform diagnostic procedures on vehicles with on-board computer/electronic fuel system support.
06.21	Follow manufacturer's maintenance schedule to ensure fluids and lubricants are at proper levels and serviced with recommended products.
06.22	Identify the process of recertification or replacement of fuel supply container(s) according to most current regulations (e.g., NGV-2, DOT); complete documentation; remove and replace fuel supply container, if required.
06.23	Inspect fuel supply container(s) and brackets as it relates to certification: data plate, working pressures, fuel supply container damage, valves, bolts, torque specifications, and all sealing and venting equipment.
06.24	Inspect air filters and fuel filter; service or replace as needed.
06.25	Inspect and ensure that all required emission control devices are present and functional.
06.26	Inspect, adjust, and test manual shut-off valve, service valve, check-valves, and solenoid valves; repair or replace as needed.
06.27	Empty fuel supply container according to manufacturer's procedures and all local, state and federal regulations. (Local procedures will vary and extreme care must be exercised if using actual fuel. Use of inert gas is recommended for this task.).
06.28	Inspect and test fuel selection system components; repair or replace as needed.
06.29	Select and install swage, compression, flare, captive 0-ring, NPT, and other fittings using manufacturer's recommended sealants when required.
06.30	Check for fuel system problems caused by fuel contamination.
06.31	Check air/fuel system integrity (e.g., fuel leaks, air leaks, components compatibility/application); determine needed repairs.
06.32	Inspect and test fuel pressure regulation system components; adjust, repair or replace as needed.
06.33	Remove, clean, and reinstall throttle assemblies; adjust related linkages as needed.
06.34	Check/adjust idle speed and fuel mixtures according to manufacturer's procedures.

CTE Standards and Benchmarks	
06.35	Perform safe fueling procedures and determine fuel level.
06.36	Identify working pressures and demonstrate an understanding of fuel characteristics as they relate to temperature and fill procedures.
06.37	Inspect the vehicle for pre-existing conditions that may adversely affect the performance of the vehicle.
06.38	Document pre-conversion conditions and complete all necessary reports.
06.39	Prepare vehicle for conversion according to manufacturer's directions.
06.40	Install fuel supply container with mounting hardware, valving, shielding, fuel level indicator, and remote fill assembly, as needed, using manufacturer's specifications and required local, state and federal regulations.
06.41	Install pressure relief device (PRD) and venting system.
06.42	Install gas tight enclosure around valves and fittings, vent to the outside of the vehicle.
06.43	Determine routing and protection of fuel line components according to industry standards.
06.44	Prepare tubing using proper techniques for cutting, deburring, cleaning, and bending.
06.45	Install tubing, piping, hose, and valves using appropriate chafing protection, mounting hardware, and protective shields, according to industry safety standards.
06.46	Determine appropriate location and mounting of the regulators; install the regulators using mounting brackets, fuel lock, fittings, starting aids, control valves, cooling lines, and thermostat as required and according to manufacturer's specifications.
06.47	Install fuel injection/carburetion or other fuel control components according to manufacturer's instructions.
06.48	Install electrical/electronic components using OEM or manufacturer's wire connections and wiring diagrams, applying all safety precautions.
06.49	Determine location of electrical components considering safety, serviceability, function, component protection, and esthetics according to manufacturer's specifications (when available).
06.50	Inspect and test each installed component to ensure it is connected and positioned in a safe and effective manner.
06.51	Purge and pressurize fuel system and check for system integrity through its maximum working pressure (leak test).
06.52	Perform system setup procedures according to manufacturer's specifications.
06.53	Fabricate brackets, shields, and braces according to accepted industry standards.
06.54	Complete and affix required safety/information labels.
06.55	Test vehicle for acceptable drivability and operation (on each fuel for dual fuel vehicles).
06.56	Inspect and ensure that all required emissions control devices are present and functional; confirm that the vehicle emissions meet applicable local, state, and federal requirements.
06.57	Perform pre and post conversion emissions evaluation.

Florida Department of Education
Student Performance Standards

Course Number: AER0872
Occupational Completion Point: E
Automotive Liquid Propane Gas Technician – 150 Hours – SOC Code 49-3023

Course Description:
The Automotive Liquid Propane Gas Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics, maintenance, installation, and repair of automotive liquid propane gas systems.

For every task in Liquid Propane Gas 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.

CTE Standards and Benchmarks	
07.0	Explain and apply proficiently the diagnosis, service and repair of Liquid Propane Gas systems.-The student will be able to:
07.01	Analyze symptoms and perform diagnostic procedures on vehicles with supplemental on-board diagnostic computer support systems.
07.02	Diagnose and repair no starting, hard starting, engine misfire, poor drivability, power loss, poor mileage, and emissions problems on vehicle's OEM and supplemental sensors (e.g., manifold skin temperature, intake air temperature, etc.).
07.03	Diagnose and repair no-starting, hard starting, engine misfire, poor drivability, power loss, poor mileage, and emissions problems on vehicles with supplemental computer support systems (e.g., timing modification devices, ignition interrupt).
07.04	Diagnose and repair intermittent or complete failure of electric, electronic or mechanical devices (e.g., hour meters, fuel level indicators, fuel selection devices).
07.05	Check all fuel system components to include fuel lock-off, valves, solenoids, manual shutoff, connections, fittings, hoses and tubing for leaks, wear, installation and proper operation; repair or replace as needed.
07.06	Diagnose the cause of abnormal fuel flow through fuel carrying component.
07.07	Diagnose engine noises and vibrations; determine necessary action.
07.08	Diagnose the cause of fuel odor or fuel loss by inspecting or testing the fuel supply system components such as valves, fuel supply container, pressure relief device (PRD), tubing and hoses; repair or replace as needed.
07.09	Diagnose the cause of inaccurate fuel level indicator reading; service, adjust, repair or replace as needed.
07.10	Diagnose hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine

CTE Standards and Benchmarks	
	misfire, power loss, stalling, poor mileage, and lean or rich mixture problems on vehicles with fumigation or injection type fuel systems; determine needed repairs.
07.11	Inspect and test cold enrichment system components; adjust or replace as needed.
07.12	Inspect and test fuel injectors; service or replace as needed.
07.13	Inspect and test vacuum and electrical components and connections of fuel system; repair or replace as needed.
07.14	Remove and reinstall engine in an OBDII or newer vehicle; reconnect all attaching components and restore the vehicle to running condition.
07.15	Perform diagnostic procedures on vehicles with on-board computer/electronic fuel system support.
07.16	Follow manufacturer's maintenance schedule to ensure fluids and lubricants are at proper levels and serviced with recommended products.
07.17	Identify the process of recertification or replacement of fuel supply container(s) according to most current regulations (e.g., DOD complete documentation; remove and replace fuel supply container, if required.
07.18	Inspect fuel supply container(s) and brackets as it relates to certification: data plate, pressures, supply container fuel damage, valves, bolts, torque specifications, and all sealing and venting equipment.
07.19	Inspect air filters and fuel filter; service or replace as needed.
07.20	Inspect and ensure that all required emission control devices are present and functional.
07.21	Inspect, adjust, and test manual shut-off valve, service valve, check-valves, and solenoid valves; repair or replace as needed.
07.22	Empty fuel supply container according to manufacturer's procedures and all local, state and federal regulations. (Local procedures will vary and extreme care must be exercised.)
07.23	Inspect and test fuel selection system components; repair or replace as needed.
07.24	Select and install flare, NPT, and other fittings using required sealants for LPG according to manufacturer's specifications.
07.25	Check for fuel system problems caused by fuel contamination.
07.26	Check air/fuel system integrity (e.g., fuel leaks, air leaks, components compatibility/application); determine needed repairs.
07.27	Inspect and test fuel pressure regulation system components; Adjust, repair or replace as needed.
07.28	Remove, clean, and reinstall throttle assemblies; adjust related linkages as needed.
07.29	Check/adjust idle speed and fuel mixtures according to manufacturer's procedures.
07.30	Perform safe fueling procedures and determine fuel level.
07.31	Identify working pressures and demonstrate an understanding of fuel characteristics as they relate to temperature and fill procedures.
07.32	Empty fuel system using industry practices or manufacturer's procedures and all local, state and federal regulations. (Local procedures will vary and extreme care must be exercised.)
07.33	Inspect the vehicle for pre-existing conditions that may adversely affect the performance of the vehicle.

CTE Standards and Benchmarks	
07.34	Document pre-conversion conditions and complete all necessary reports.
07.35	Prepare vehicle for conversion according to manufacturer's directions.
07.36	Install fuel supply container with mounting hardware, valving, shielding, fuel level indicator, and remote fill assembly as needed, using manufacturer's specifications and required local, state and federal regulations.
07.37	Install pressure relief device (PRD) and venting system.
07.38	Select and install flare, NPT, and other fittings using sealants for LPG according to manufacturer's specifications.
07.39	Install gas tight enclosure around valves and fittings, vent to the outside of vehicle as required.
07.40	Determine routing and protection of fuel line components according to industry standards.
07.41	Prepare tubing using proper techniques for cutting, deburring cleaning, and bending.
07.42	Install tubing, piping, hose, and valves using appropriate chafing protection, mounting hardware, and protective shields, according to industry safety standards.
07.43	Determine appropriate location and mounting of the converter/regulator; install the converter/regulator using mounting brackets, fuel lock, fittings, starting aids, control valves, cooling lines, and thermostat as required and according to manufacturer's specifications.
07.44	Install fuel injection/carburetion or other fuel control components according to manufacturer's instructions.
07.45	Install electrical/electronic components using OEM or manufacturer's wire connections and wiring diagrams, applying all safety precautions.
07.46	Determine location of electrical components considering safety, serviceability, function, component protection, and esthetics according to manufacturer's specifications (when available).
07.47	Inspect and test each installed component to ensure it is connected and positioned in a safe and effective manner.
07.48	Purge and pressurize fuel system and check for system integrity through its maximum working pressure (leak test).
07.49	Perform system setup procedures according to manufacturer's specifications.
07.50	Fabricate brackets, shields, and braces according to accepted industry standards.
07.51	Complete and affix required safety/information labels.
07.52	Test vehicle for acceptable drivability and operation (on each fuel for dual fuel vehicles).
07.53	Inspect and ensure that all required emissions control devices are present and functional; confirm that the vehicle emissions meet applicable local, state, and federal requirements.
07.54	Perform pre and post conversion emissions evaluation.

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.

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Alternative Fuels Technology**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T401200
CIP Number	0647060421
Grade Level	30, 31
Standard Length	750 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
Basic Skills Level	Mathematics: 10 Language: 10 Reading: 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers 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 (Alternative Fuel Maintenance Technician)** and/or demonstrate mastery of the outcomes in **OCP-A (Alternative Fuel Maintenance Technician)** prior to enrolling in additional Alternative Fuels Technology courses. **The sequence of OCP's, after completing and/or demonstrating mastery of OCP-A (Alternative Fuel Maintenance Technician), is at the discretion of the instructor.**

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	SOC Code
A	AER0875	Alternative Fuels Maintenance Technician	AUTO MECH @7 7G	300 hours	49-3023
B	AER0876	Advanced Alternative Fuels Technician		300 hours	49-3023
C	AER0877	CNG Fuel System Inspector		150 hours	49-3023

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 and truck industry.
02.0 Identify principles, assemblies, and systems of engine operation.
03.0 Proficiently identify different types of alternative fuels.
04.0 Identify methods and strategies for using hybrid and electric vehicles (EV).
05.0 Demonstrate proficiency in preparing an alternative fuels and EV for routine maintenance and customer services.
06.0 Explain and apply proficiently for diagnosis, service, and repair of hybrid and EV electrical/electronic system components, battery, and charging systems.
07.0 Diagnose and repair for general alternative fueled vehicles.
08.0 Explain and apply methods for using natural gas fuel system.
09.0 Demonstrate and apply methods for alternative fuels conversion.
10.0 Demonstrate methods for inspecting compressed natural gas storage containers.
11.0 Demonstrate methods for inspecting compressed natural gas components.

Florida Department of Education
Student Performance Standards

Program Title: Alternative Fuels Technology
Career Certificate Program Number: T401200

Course Number: AER0875
Occupational Completion Point: A
Alternative Fuels Maintenance Technician – 300 Hours – SOC Code 49-3023

Course Description:
The Alternative Fuels Maintenance Technician course prepares students for entry into the Alternative Fuels Service Industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study facility and personal safety, engine operation, types of alternative fuels, hybrid, and electric vehicles. Alternative fuel and electric vehicle maintenance and customer service are included.

CTE Standards and Benchmarks	
01.0	Proficiently explain and apply required shop and personal safety tasks relating to the automotive and truck industry.-The student will be able to:
01.01	Identify and apply general shop safety rules and procedures, EPA and OSHA standards.
01.02	Identify and use appropriate emergency first aid procedures.
01.03	Identify and use proper placement of floor jacks and jack stands.
01.04	Identify and use proper procedures for safe lift operation.
01.05	Utilize proper ventilation procedures for working within the lab/shop area.
01.06	Identify and use proper procedures for safe pit usage.
01.07	Identify marked safety areas.
01.08	Identify the location and the types of fire extinguishers and other fire safety equipment.
01.09	Demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.
01.10	Identify the location and use of eye wash stations.
01.11	Identify the location of the posted evacuation routes.
01.12	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
01.13	Secure hair and jewelry for lab/shop activities.
01.14	Use proper handling procedures for automotive fluids.
01.15	Identify and describe the proper procedure to apply and remove automotive fasteners, including thread inserts.

CTE Standards and Benchmarks	
01.16	Identify and wear appropriate clothing for lab/shop activities.
01.17	Identify and describe typical automotive lubricants and lubricant properties.
01.18	Identify and describe typical automotive seals and gaskets.
01.19	Identify and define career opportunities in the automotive service industry.
01.20	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID)) battery packs, and charging systems.
01.21	Locate and demonstrate knowledge of safety data sheets (SDS).
01.22	Demonstrate knowledge of various industry related certifications.
01.23	Demonstrate awareness of the safety aspects of hybrid vehicle high voltage circuits.
02.0	Identify principles, assemblies, and systems of engine operation.-The student will be able to:
02.01	Explain the basic principles in the operation of the two-stroke-cycle engines.
02.02	Identify engine assemblies and systems for four-stroke-cycle engines.
02.03	Explain the operating principles of four-stroke-cycle engines.
02.04	Identify the equipment of four-stroke-cycle engines.
02.05	Identify governor types and their operating principles.
02.06	Identify hybrid vehicle internal combustion engine service precautions.
02.07	Describe the operational characteristics of a hybrid vehicle drive train.
02.08	Identify hybrid vehicle power electrical motors, circuits and safety precautions.
02.09	Describe the operational characteristics of electric drive.
02.10	Explain the operating principles of battery electric vehicles (BEV).
02.11	Explain the operating principles of hybrid electric vehicles (HEV).
02.12	Explain the operating principles of fuel cell electric vehicles (FCV).
02.13	Explain the operating principles of safety precautions for working on EV's.
03.0	Proficiently identify different types of alternative fuels.-The student will be able to:
03.01	Research and identify developments in industry regarding alternative fuels.
03.02	Evaluate systems used in alternatively fueled converted vehicles (CNG, LNG, LPG, hydrogen, and electric).
03.03	Research and examine the history of gaseous fuels.
03.04	Compare and differentiate between types of alternative fuel systems.

CTE Standards and Benchmarks	
03.05	Research and examine the history and characteristics of natural gas.
03.06	Compare the advantages and disadvantages of dual-fuel systems.
03.07	Explain the interrelationship of EFI alternative fuel systems.
03.08	Explain the process of converting engines to run on alternative fuels.
03.09	Research and examine the operational theory of natural gas systems.
03.10	Research the proper operation of conversion spark ignited heavy duty engines.
03.11	Explain the effects of various conversion computer controlled systems on heavy duty vehicles.
03.12	Research the maintenance of gaseous fuel equipped vehicles.
03.13	Analyze the effectiveness of conversion system repairs and procedures.
03.14	Examine and investigate a variety of common conversion problem failures.
03.15	Analyze various federal, state, and regulatory agency rules and relate them to converted vehicle installations.
03.16	Determine the composition of gaseous fuels.
03.17	Identify the different types of gaseous fuels.
03.18	Read and interpret units of pressure for gaseous fuels.
03.19	Use instruments that measure pressure for gaseous fuels.
03.20	Determine the flash point and flammability for gaseous fuels.
03.21	Identify auto ignition temperature for different types of gaseous fuels.
03.22	Identify types of leakage for the different types of gaseous fuels.
03.23	Identify the mechanical differences for the different types of gaseous fuels.
03.24	Identify the fuel management system for the different types of gaseous fuels.
03.25	Locate and demonstrate knowledge of proper personal safety equipment.
03.26	Identify and use proper procedures for tools and equipment for working with different types of gaseous fuels.
03.27	Identify and apply general shop safety rules and procedures, EPA, OSHA, and NFAP 52 standards.
03.28	Identify and apply safe working practices with different types of gaseous fuel systems.
03.29	Research and explain the different types of gaseous fuel containers.
04.0	Identify methods and strategies for using hybrid and electric vehicles (EV).-The student will be able to:
04.01	Research and categorize the different types of advanced electric vehicles.

CTE Standards and Benchmarks	
04.02	Describe the different types of advanced technology used in electric vehicles.
04.03	Research the design and performance of OEM EV's.
04.04	Research the design and performance of EV conversions.
04.05	Identify the appropriate energy requirements for a specific OEM EV; including motor size, voltage/ampere-hour requirements, and battery charging systems.
04.06	Explain electric vehicle safety procedures.
04.07	Demonstrate safety procedures required for electric vehicles.
04.08	Research high voltage systems.
04.09	Identify fire prevention methods.
04.10	Identify the different types of short circuits.
04.11	Research shock prevention techniques.
04.12	Demonstrate proper high pressure fitting installation.
04.13	Identify electrical/electronic problems with an OEM EV or advanced technology/hybrid-EV conversion.
04.14	Explain electrical theory basics.
04.15	Explain electrical terms.
04.16	Explain the different types of conductors and insulators.
04.17	Identify the different types of circuit components.
04.18	Explain the theory of electromagnetism.
04.19	Demonstrate electrical systems components.
04.20	Identify the different types of motors and generators.
04.21	Demonstrate knowledge of motor operation basics.
04.22	Explain the principles of the DC motors.
04.23	Explain the principles of the AC motors.
04.24	Explain the principles of the generators.
04.25	Demonstrate knowledge of electrical diagnostic procedures.
04.26	Identify the different types of EV controllers.
04.27	Demonstrate knowledge of battery basics.
04.28	Identify the different battery types.

CTE Standards and Benchmarks	
	04.29 Demonstrate knowledge of the different types of ultra-capacitors.
	04.30 Demonstrate how to properly maintain a battery.
05.0	Demonstrate proficiency in preparing an alternative fuel and EV for routine maintenance and customer service.-The student will be able to:
	05.01 Identify vehicle according to engine location, cylinders, types of drive system, purpose, etc.
	05.02 Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels and calibration decals).
	05.03 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
	05.04 Review alternative vehicle service history.
	05.05 Identify information needed and the service requested on a repair order.
	05.06 Identify purpose and demonstrate proper use of fender covers, floor mats and other vehicle protection equipment.
	05.07 Identify and interpret hybrid electrical/electronic system concerns; determine necessary action.
	05.08 Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.
	05.09 Document observed damage, unusual conditions, and concerns.
	05.10 Demonstrate retrieving stored diagnostic trouble codes.
	05.11 Reset product specific service indicator.
	05.12 Identify acceptable customer relations.
	05.13 Identify and demonstrate proper customer relation skills.
	05.14 Identify principles of time management.
	05.15 Utilize flat rate manuals, service manuals, service bulletins, parts numbers, and electronic service information.
	05.16 Locate and use technical service bulletins (TSB's).
	05.17 Use proper chemicals for cleaning and lubrication.
	05.18 Check operation and status of instrument panel warning lights and gauges.
	05.19 Inspect under hood area for leaks, damage, and unusual conditions.
	05.20 Inspect undercar area for leaks, damage, and unusual conditions.
	05.21 Inspect engine assembly for fuel, oil, coolant, and other leaks.
	05.22 Determine fluid type requirements and identify fluid.
	05.23 Check engine oil level and condition; service as required.
	05.24 Change oil and filter.

CTE Standards and Benchmarks
05.25 Check engine filter condition; service as required.
05.26 Inspect, replace and adjust drive belts; inspect tensioners and pulleys.
05.27 Demonstrate how to check and inspect the batteries.
05.28 Demonstrate how to replace batteries.
05.29 Check and inspect the charging system.
05.30 Compile a list of components for an electric vehicle conversion sorted by manufacturer.

Florida Department of Education
Student Performance Standards

Course Number: AER0876
Occupational Completion Point: B
Advanced Alternative Fuels Technician – 300 Hours – SOC Code 49-3023

Course Description:
The Advanced Alternative Fuels Technician course includes the diagnosis, service, and repair of hybrid, electric vehicle system components, battery, charging systems, and general alternative fuel vehicles. Methods for using natural gas fuel systems and alternative fuel conversions are included.

CTE Standards and Benchmarks	
06.0	Explain and apply proficiently for diagnosis, service, and repair of hybrid and EV electrical/electronic system components, battery, and charging systems.-The student will be able to:
06.01	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
06.02	Identify and interpret hybrid electrical/electronic system concern; determine necessary action.
06.03	Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
06.04	Locate and interpret vehicle and major component identification numbers.
06.05	Diagnose and demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
06.06	Use wiring diagrams during diagnosis (troubleshooting) of electrical/electronic circuit problems.
06.07	Demonstrate the proper use of digital multi-meter (DMM) when measuring source, voltage drop (including grounds), current flow, and resistance.
06.08	Check operation of electrical circuits with a test light.
06.09	Differentiate between electrical and engine mechanical problems
06.10	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
06.11	Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
06.12	Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action.
06.13	Replace electrical connectors and terminal ends.
06.14	Identify location of hybrid vehicle high voltage circuit disconnects (service plug) location and safety procedures.
06.15	Perform battery state-of-charge test; determine necessary action.

CTE Standards and Benchmarks	
06.16	Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action.
06.17	Maintain or restore electronic memory functions.
06.18	Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.
06.19	Perform slow/fast battery charge according to manufacturer's recommendations.
06.20	Jump-start vehicle using jumper cables and booster battery or an auxiliary power supply.
06.21	Identify high voltage circuits of electric or hybrid electric vehicle and related safety precautions.
06.22	Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures.
06.23	Perform battery conductance test; determine necessary action.
06.24	Inspect and test switches, connectors, and control circuits; perform necessary action.
06.25	Perform charging system output test; determine necessary action.
06.26	Diagnose (troubleshoot) charging system for the cause of undercharge, no-charge, and overcharge conditions.
06.27	Inspect, adjust, or replace generator (alternator) drive belts, check pulleys, and tensioners for wear; check pulley and belt alignment.
06.28	Remove, inspect, and re-install generator (alternator).
06.29	Perform charging circuit voltage drop test; determine necessary action.
06.30	Check for module communication (including CAN/BUS systems) using a scan tool.
06.31	Describe the process for software transfers, software updates, or flash reprogramming on electronic modules.
06.32	Service and repair hybrid product specific electrical/electronic systems.
06.33	Perform hybrid product specific diagnostic procedures.
07.0	Diagnose and repair for general alternative fuel vehicles.-The student will be able to:
07.01	Inspect fuel, oil, and coolant levels and condition, and consumption; determine needed action.
07.02	Diagnose causes of engine fuels, oil, coolant, air, and other leaks; determine needed action.
07.03	Interpret engine noises; determine needed action.
07.04	Observe engine exhaust smoke color and quantity; determine needed action.
07.05	Perform air intake system restriction and leakage tests; determine needed action.
07.06	Perform intake manifold pressure (boost) test; determine needed action.
07.07	Perform exhaust back pressure test; determine needed action.
07.08	Perform crankcase pressure test; determine needed action.

CTE Standards and Benchmarks	
07.09	Diagnose a no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action.
07.10	Diagnose surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action.
07.11	Determine engine vibration problems; determine needed action.
07.12	Check, record, and clear electronic diagnostic (fault) codes; monitor electronic data; determine needed action.
07.13	Perform cylinder compression test; determine needed action.
07.14	Check air induction system: piping, hoses, clamps, and mounting; check for air restrictions and leaks; service or replace air filter as needed.
07.15	Inspect intake manifold, gaskets, and connections; replace as needed.
07.16	Inspect, clean, and test charge air cooler assemblies; replace as needed.
07.17	Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed.
07.18	Check alternative fuel level, quality, and consumption; determine needed action.
07.19	Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action.
07.20	Check alternative fuel system for leaks; determine needed action.
07.21	Perform on-engine inspections, tests, adjustments to alternative fuel system; check and adjust pressure; determine needed action.
07.22	Inspect and adjust throttle control linkage; determine needed action.
07.23	Inspect air/fuel ratio control systems; determine needed action.
07.24	Inspect, test, and adjust engine fuel shut-down devices and controls; determine needed action.
07.25	Inspect alternative fuel high pressure injection lines, hold downs, fittings and seals; determine needed action.
07.26	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.
07.27	Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (to include PC based software and/or data scan tools); determine needed action.
07.28	Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams.
07.29	Inspect and replace electrical connector terminals, seals, and locks.
07.30	Inspect and test alternative fuel system switches, sensors, controls, actuator components, and circuits; adjust or replace as needed.
07.31	Perform cylinder contribution test utilizing recommended electronic diagnostic tool.
07.32	Demonstrate the proper use of a high pressure gas meter when measuring operating pressure.
07.33	Inspect the general over-all-state of alternative fuel system.

CTE Standards and Benchmarks	
08.0	Explain and apply methods for using natural gas fuel system.-The student will be able to:
08.01	Research CNG transportation vehicles.
08.02	Analyze the future of alternative transportation.
08.03	Explain the basics of physics and power.
08.04	Demonstrate CNG safety practices.
08.05	Assess the various federal, state, and regulatory agency rules for specific vehicle installations.
08.06	Research NFPA-52, DOT and EPA regulations.
08.07	Locate and interpret the CNG codes and standards.
08.08	Locate and interpret the CNG cylinder labeling on containers.
08.09	Research applicable CNG cylinder requirements.
08.10	Identify proper safe practices when servicing and installing the CNG tank.
08.11	Research applicable valve requirements for CNG container.
08.12	Demonstrate valve adjustments on a CNG container.
08.13	Explain the need for external CNG venting.
08.14	Research pressure relief device requirements CNG container.
08.15	Explain the safety use for vehicle CNG markings.
08.16	Analyze venting system requirements for defueling and refueling for CNG.
08.17	Analyze the proper installation of a CNG system.
08.18	Examine the proper operation of a CNG system.
08.19	Check the operation and maintenance of advanced emission control devices.
08.20	Evaluate how computer controls effect vehicle emissions.
08.21	Develop a diagnostic strategy using a hand-held scanner to diagnose.
08.22	Demonstrate the proper use of a DVOM in diagnosing computer systems.
08.23	Perform diagnostic routines and analysis on vehicles and emissions system.
08.24	Prepare to properly diagnose and analyze vehicles average exhaust emissions.
08.25	Demonstrate the process to diagnose OEM engines that run on alternative fuel.
08.26	Organize and collect the proper engine diagnostic procedures.

CTE Standards and Benchmarks	
08.27	Demonstrate the effects of computer controlled systems on heavy duty vehicles.
08.28	Assess the effectiveness of OEM system repairs and procedures.
08.29	Examine, investigate and repair a variety of common OEM problem failures.
09.0	Demonstrate and apply methods for alternative fuel conversion.-The student will be able to:
09.01	Demonstrate shop safety aspects while installing and working with CNG.
09.02	Research CNG conversions and locations for each part of the system.
09.03	Locate and interpret valve ratings & classifications.
09.04	Set up and perform adjustment procedures to various CNG systems.
09.05	Identify and apply conversion components to engines.
09.06	Demonstrate the ability to install correct after market system on vehicle.
09.07	Explain tank design, fabrication & testing methods.
09.08	Illustrate the correct use of soldering wires and benefits of using the Versus Plug & Play system.
09.09	Locate and read diagrams of the OEM schematic.
09.10	Locate correct wires on the OEM system for a CNG conversion.
09.11	Demonstrate wiring the OBD monitoring.
09.12	Demonstrate the correct technique to solder the wires system.
09.13	Install gas injection ports and injector adapters.
09.14	Demonstrate the proper tightening of adapters to avoid vacuum leaks.
09.15	Identify the appropriate CNG regulator and sensor areas for secure mounting.
09.16	Demonstrate proper procedures for bending stainless steel high pressure gas lines.
09.17	Check and inspect pressure release devices.
09.18	Secure and safe mount CNG tank installation.
09.19	Check and inspect tank shield installation.
09.20	Check and verify tank valve position on CNG container.
09.21	Installation of high pressure parts to lines from the tank to the regulator.
09.22	Install and check in-line quarter turn emergency shut-off valve.
09.23	Check and inspect high pressure tank and line installation.

CTE Standards and Benchmarks	
09.24	Check and inspect under-the-hood CNG component installation.
09.25	Demonstrate the proper use of CNG inspection equipment.
09.26	Determine procedure to calibrate vehicle & computer to CNG conversion kit.
09.27	Check and verify CNG working pressure and tank expiration.
09.28	Demonstrate fueling a vehicle with CNG fuel.
09.29	Identify typical problems and solutions when diagnosing CNG systems.
09.30	Demonstrate a leak tests in high and low pressure lines.
09.31	Check and verify any leaks and unusual engine noise; determine necessary action.
09.32	Evaluate and test CNG system to determine any repair procedures.
09.33	Demonstrate the ability to troubleshoot a variety of common problem failures.
09.34	Demonstrate installing, servicing, and/or repairing a CNG conversion assembly sequences, understanding the individual parts and programming.

Florida Department of Education
Student Performance Standards

Course Number: AER0877
Occupational Completion Point: C
CNG Fuel System Inspector – 150 Hours – SOC Code 49-3023

Course Description:
The CNG Fuel System Inspector course includes methods for inspecting CNG storage containers, and CNG components. Students study safety inspection methods for compressed natural gas storage containers, system installations, vehicle components, fuel delivery systems and types of potential damage.

CTE Standards and Benchmarks	
10.0	Demonstrate methods for inspecting CNG storage containers.-The student will be able to:
10.01	Identify the different container design types and descriptions.
10.02	Locate installation and mounting areas for NGV fuel containers.
10.03	Explain the different container labeling information.
10.04	Demonstrate container and installation knowledge.
10.05	Demonstrate and explain container inspection knowledge.
10.06	Demonstrate gas and technical knowledge.
10.07	Check equipment inspection for mounting containers.
10.08	Demonstrate the use of equipment inspection for containers.
10.09	Research and examination intervals techniques.
10.10	Explain the preparation for inspecting different container types.
10.11	Explain additional inspections of metal containers – Type 1 and metallic portions of Type 2.
10.12	Explain the differences in all steel and steel composite containers – Type 1 and Type 2.
10.13	Explain the differences in all aluminum and aluminum composite containers – Types 1,2,3.
10.14	Explain the advantages of a full composite container – Type 4
10.15	Explain additional inspections composite containers (Type 2, 3, 4).
10.16	Demonstrate how to examine valves and relief devices – all container types.
10.17	Identify different container labeling – all container types.

CTE Standards and Benchmarks	
10.18	Demonstrate the inspection of record/check list – all container types.
10.19	Check and examine final disposition – all container types.
10.20	Check and examine final disposition – all equipment.
10.21	Identify alternative methods to visual inspections.
10.22	Research and explain In-situ acoustic emission testing.
10.23	Research and explain traditional nondestructive testing methods.
10.24	Identify methods of disposing condemned containers.
10.25	Demonstrate knowledge of NFAP-52.
11.0	Demonstrate methods for inspecting compressed natural gas components.-The student will be able to:
11.01	Check and inspect the construction of CNG containers.
11.02	Identify CNG cylinder valve requirements.
11.03	Explain the use of pressure relief valves and location.
11.04	Research and identify CNG fitting requirements.
11.05	Research and identify CNG hose requirements.
11.06	Explain the guidelines for fuel lines, tubing, and fittings in CNG systems.
11.07	Research manual shut-off valve requirements for CNG.
11.08	Research check valves requirements for CNG.
11.09	Research fuel lock-off device requirements for CNG.
11.10	Research pressure regulatory requirements for CNG.
11.11	Identify fuel injection system requirements for CNG.
11.12	Demonstrate CNG maintenance and repair on system.
11.13	Explain pressure relief devices and construction.
11.14	Demonstrate knowledge of CNG standards and labels.
11.15	Explain applicable cylinder standards from cylinder labels.
11.16	Demonstrate CNG cylinder defueling procedures.
11.17	Explain emergency defueling procedures to the atmosphere.
11.18	Research how to develop scheduled defueling procedures.

CTE Standards and Benchmarks
11.19 Demonstrate CNG cylinder inspections.
11.20 Explain the conditions requiring immediate inspection.
11.21 Research and explain the different types of testing for CNG containers.
11.22 Explain the guidelines for visual inspections.
11.23 Utilize the tools used for visual inspections.
11.24 Explain the types of surface damage that can occur to a CNG container.
11.25 Identify the different types of corrosion CNG containers may be exposed to.
11.26 Identify heat and fire damage to CNG containers.
11.27 Explain how to inspect pressure relief devices.
11.28 Explain how to inspect CNG fuel line piping.
11.29 Explain how to inspect CNG vent lines.
11.30 Demonstrate how to classify visual damage.
11.31 Identify methods to decommission CNG cylinders.
11.32 Demonstrate how to perform inspection reports.

Additional Information

Laboratory Activities

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

Special Notes

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(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 a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 10.0, and Reading 10.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program – Career Preparatory	
Program Number	T401300
CIP Number	0647060306
Grade Level	30, 31
Standard Length	1400 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3021 - Automotive Body and Related Repairers 51-4122 - Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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	SOC Code
A	ARR0140	Automotive Collision Repair and Refinishing Helper/Assistant	AUTO IND @7 %7%G AUTO BODY @7 7G	150 hours	49-3021
B	ARR0141	Automotive Collision Refinishing Technician		450 hours	49-3021
C	ARR0312	Non-Structural Damage Repair Technician		300 hours	49-3021
D	ARR0022	Damage Analysis and Estimating		75 hours	49-3021
E	ARR0112	Automotive Collision Welding, Cutting and Joining		75 hours	51-4122
F	ARR0295	Structural Damage Repair Technician		350 hours	49-3021

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 Number: ARR0140
Occupational Completion Point: A
Automotive Collision Repair and Refinishing Helper/Assistant – 150 Hours – SOC Code 49-3021

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.

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-1910.1200).	
01.04	Identify and use appropriate emergency first aid procedures.	
01.05	Utilize and demonstrate safe procedures for handling of hand tools, lifting tools, jack stands, and related equipment.	ASE
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 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	Charge battery as needed.	
03.15	Inspect and clean battery and battery cable clamp connections.	
03.16	Perform battery, starting, and charging system tests using appropriate tester.	
03.17	Start vehicle using an auxiliary power supply.	
03.18	Maintain or restore electronic memory functions if required.	

Florida Department of Education
Student Performance Standards

Course Number: ARR0141
Occupational Completion Point: B
Automotive Collision Refinishing Technician – 450 Hours – SOC Code 49-3021

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

CTE Standards and Benchmarks		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 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
04.05	Select and identify a NIOSH approved supplied air (Fresh Air Make-up) respirator system. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.	HP-I
04.06	Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (gloves, suits, hoods, eye and ear protection, etc.).	HP-I
Surface Preparation		
04.07	Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants.	HP-1
04.08	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
04.09	Remove paint finish as needed.	HP-I
04.10	Dry or wet sand areas to be refinished.	HP-I
04.11	Featheredge areas to be refinished.	HP-I
04.12	Apply suitable metal treatment or primer in accordance with total product systems.	HP-I
04.13	Creatively identify, mask and protect other areas that will not be refinished.	HP-I
04.14	Creatively demonstrate different masking techniques (recess/back masking, foam door type, etc.).	HP-G
04.15	Creatively mix primer, primer-surfacer or primer-sealer.	HP-I
04.16	Artistically identify a complimentary color or shade of undercoat to improve coverage.	HP-G
04.17	Artistically apply primer onto surface of repaired area.	HP-I
04.18	Artistically apply two-component finishing filler to minor surface imperfections.	HP-I
04.19	Block sand area to which primer-surfacer has been applied.	HP-I
04.20	Dry sand area to which finishing filler has been applied.	HP-I
04.21	Remove dust from area to be refinished, including cracks or moldings of adjacent areas.	HP-I
04.22	Clean area to be refinished using a final cleaning solution.	HP-I
04.23	Remove, with a tack rag, any dust or lint particles from the area to be refinished.	HP-I
04.24	Artistically apply suitable primer sealer to the area being refinished.	HP-I
04.25	Creatively scuff sand to remove nibs or imperfections from a sealer.	HP-I
04.26	Creatively and artistically apply stone chip resistant coating.	HP-G
04.27	Restore caulking and seam sealers to repaired areas.	HP-G
04.28	Prepare panels for blending as needed.	HP-I

CTE Standards and Benchmarks		Priority Number
04.29	Identify the types of rigid, semi-rigid or flexible plastic parts to be refinished; determine the materials needed, preparation, and refinishing procedures.	HP-I
04.30	Identify metal parts to be refinished; determine the materials needed, preparation, and refinishing procedures.	HP-I
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	Artistically 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	Artistically apply selected product on test or let-down panel; check for color match.	HP-I
04.39	Artistically apply single stage topcoat.	HP-G
04.40	Artistically apply basecoat/clearcoat for panel blending and panel refinishing.	HP-I
04.41	Artistically 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	Artistically refinish plastic parts.	HP-I
04.45	Artistically 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	Creatively and artistically 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

CTE Standards and Benchmarks		Priority Number
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		

CTE Standards and Benchmarks		Priority Number
04.78	Apply decals, transfers, tapes, woodgrains, pinstripes (painted and taped), etc.	HP-G
04.79	Sand, buff and polish fresh or existing finish to remove defects as required.	HP-I
04.80	Clean interior, exterior, and glass.	HP-I
04.81	Clean body openings (door jambs and edges, etc.).	HP-I
04.82	Remove overspray.	HP-I
04.83	Perform vehicle clean-up; complete quality control using a checklist.	HP-I
04.84	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).	HP-I

Florida Department of Education
Student Performance Standards

Course Number: ARR0312
Occupational Completion Point: C
Non-Structural Damage Repair Technician – 300 Hours – SOC Code 49-3021

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

CTE Standards and Benchmarks		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 procedures and precautions that may apply to the vehicle being repaired.	HP-I
05.03	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
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
Preparation		

CTE Standards and Benchmarks		Priority Number
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.	
05.16	Determine the presence of an air suspension system.	
05.17	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)	
05.18	Identify procedures to reset maintenance indicators.	
05.19	Verify status of instrument panel warning lights and gauges.	
05.20	Test and replace fuses; confirm proper circuit operation.	
05.21	Inspect and replace exterior and courtesy lamps.	
05.22	Document damage, unusual conditions, and concerns.	
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

CTE Standards and Benchmarks		Priority Number
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
Metal Finishing and Body Filling		
05.39	Prepare a panel for body filler by abrading or removing the coatings; featheredge and refine scratches before the application of body filler.	HP-I
05.40	Locate and repair surface irregularities on a damaged body panel using power tools, hand tools, and weld-on pulling attachments.	HP-I
05.41	Demonstrate hammer and dolly techniques.	HP-I
05.42	Identify procedures to Hot or cold shrink stretched panel areas to proper contour.	HP-I
05.43	Identify body filler defects; correct the cause and condition. (Pin-holing, ghosting, staining, over catalyzing, etc.)	HP-I
05.44	Identify different types of body fillers.	HP-G
05.45	Shape body filler to contour; finish sand.	HP-I
05.46	Identify the processes to perform proper metal finishing techniques for ferrous and non-ferrous metals.	HP-G
05.47	Straighten contours of damaged panels to a suitable condition for body filling or metal finishing using power tools, hand tools, and weld-on pulling attachments.	HP-I
Moveable Glass and Hardware		
05.48	Inspect, adjust, repair or replace window regulators, run channels, glass, power mechanisms, and related controls.	HP-I
05.49	Inspect, adjust, repair, remove, reinstall or replace weather-stripping.	HP-G
05.50	Inspect, repair or replace, and adjust removable power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs.	HP-G
05.51	Inspect, remove, reinstall, and align convertible top and related mechanisms.	HP-G

CTE Standards and Benchmarks		Priority Number
05.52	Identify procedures to initialize electrical components as needed.	HP-G
Plastics and Adhesives		
05.53	Identify the types of plastics; determine repair-ability.	HP-I
05.54	Clean and prepare the surface of plastic parts; identify the types of plastic repair procedures.	HP-I
05.55	Repair rigid, semi-rigid, or flexible plastic panels.	HP-I
05.56	Remove or repair damaged areas from rigid exterior composite panels.	HP-G
05.57	Identify procedures to replace bonded rigid exterior composite body panels; straighten or align panel supports.	HP-G
05.58	Inspect, remove, and reinstall repairable plastics and other components for off-vehicle repair.	HP-I
Electrical		
05.59	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
05.60	Identify processes and procedures to repair wiring and connectors.	HP-I
05.61	Identify processes and procedures to inspect, test, and replace fusible links, circuit breakers, and fuses.	HP-I
05.62	Identify processes and procedures to perform battery state-of-charge test and slow/fast battery charge.	HP-I
05.63	Identify processes and procedures to inspect, clean, repair or replace battery, battery cables, connectors and clamps.	HP-I
05.64	Dispose of batteries and battery acid according to local, state, and federal requirements.	HP-G
05.65	Identify programmable electrical/electronic components and check for malfunction indicator lamp (MIL) and fault codes; record data for reprogramming before disconnecting battery.	HP-I
05.66	Identify processes and procedures to inspect alignment, adjust, remove and replace alternator (generator), drive belts, pulleys, and fans.	HP-I
05.67	Check operation and aim headlamp assemblies and fog/driving lamps; determine needed repairs.	HP-I
05.68	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
05.69	Identify processes and procedures to remove and replace horn(s); check operation.	HP-I
05.70	Identify processes and procedures to check operation of wiper/washer systems; determine needed repairs.	HP-I
05.71	Identify processes and procedures to check operation of power side and tailgate window; determine needed repairs.	HP-I
05.72	Identify processes and procedures to inspect, remove and replace power seat, motors, linkages, cables, etc.	HP-G
05.73	Identify processes and procedures to inspect, remove and replace components of electric door and hatch/trunk lock.	HP-G
05.74	Identify processes and procedures to inspect, remove and replace components of keyless lock/unlock devices	HP-G

CTE Standards and Benchmarks		Priority Number
	and alarm systems.	
05.75	Identify processes and procedures to inspect, remove and replace components of electrical sunroof and convertible/retractable hard top.	HP-G
05.76	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
05.77	Identify processes and procedures to demonstrate the proper self-grounding procedures (anti-static) for handling electronic components.	HP-I
05.78	Identify processes and procedures to check for module communication errors using a scan tool.	HP-G
05.79	Identify processes and procedures to use wiring diagrams, component location, and diagnostic flow charts during diagnosis of electrical circuit problems.	HP-G
05.80	Identify processes and procedures to identify safe disabling techniques of high voltage systems on hybrid/electric vehicles.	HP-G
05.81	Identify processes and procedures to identify potential safety and material handling concerns associated with high voltage hybrid/electric vehicle battery systems.	HP-G
Brakes		
05.82	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
05.83	Identify processes and procedures to replace hoses, fittings, seals, and supports.	HP-I
05.84	Identify processes and procedures to identify, handle, store, and fill with appropriate brake fluids.	HP-G
05.85	Identify processes and procedures to bleed (manual, pressure, or vacuum) hydraulic brake system.	HP-I
05.86	Identify processes and procedures to pressure test brake hydraulic system; determine necessary action.	HP-G
05.87	Identify processes and procedures to adjust brake shoes or pads; remove and reinstall brake drums or drum/hub assemblies.	HP-I
05.88	Identify processes and procedures to remove, clean and inspect caliper and rotor assembly and mountings for wear and damage; reinstall.	HP-I
05.89	Identify processes and procedures to inspect parking brake system operation; repair or adjust as necessary; verify operation.	HP-I
05.90	Identify processes and procedures to identify the proper procedures for handling brake dust.	HP-G
05.91	Identify processes and procedures to check for bent or damaged brake system components.	HP-G
05.92	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

Florida Department of Education
Student Performance Standards

Course Number: ARR0022
Occupational Completion Point: D
Damage Analysis and Estimating – 75 Hours – SOC Code 49-3021

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

CTE Standards and Benchmarks		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 procedures and precautions that may apply to the vehicle being repaired.	HP-I
06.03	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
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
Damage Analysis		
06.05	Prepare vehicle for inspection by providing access to damaged areas.	HP-G
06.06	Analyze damage to determine appropriate methods for overall repairs.	HP-I

CTE Standards and Benchmarks		Priority Number
06.07	Determine the direction, point(s) of impact, and extent of direct, indirect, and inertia damage.	HP-G
06.08	Gather details of the incident/accident necessary to determine the full extent of vehicle damage.	HP-G
06.09	Identify and record pre-existing damage.	HP-I
06.10	Identify and record prior repairs.	HP-G
06.11	Perform visual inspection of structural components.	HP-G
06.12	Identify structural damage using measuring tools and equipment.	HP-I
06.13	Perform visual inspection of non-structural components.	HP-I
06.14	Determine parts, components, material type(s) and procedures necessary for a proper repair.	HP-I
06.15	Identify type and condition of finish; determine if refinishing is required.	HP-I
06.16	Identify suspension, electrical, and mechanical component physical damage.	HP-G
06.17	Identify safety systems physical damage.	HP-G
06.18	Identify interior component damage.	HP-I
06.19	Identify damage to add-on accessories and modifications.	HP-G
06.20	Identify single (one time) use components.	HP-G
06.21	Inspect under-hood area for leaks, damage, and unusual conditions.	
06.22	Determine fluid type requirements and identify fluid.	
Estimating		
06.23	Determine and record customer/vehicle owner information.	HP-I
06.24	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
06.25	Identify and record vehicle options, including trim level, paint code, transmission, accessories, and modifications.	HP-I
06.26	Identify safety systems; determine replacement items.	HP-G
06.27	Apply appropriate estimating and parts nomenclature (terminology).	HP-I
06.28	Determine and apply appropriate estimating sequence.	HP-I
06.29	Utilize estimating guide procedure pages.	HP-I
06.30	Apply estimating guide footnotes and headnotes as needed.	HP-I
06.31	Identify operations requiring labor value judgment.	HP-G
06.32	Select appropriate labor value for each operation (structural, non-structural, mechanical, and refinish).	HP-I
06.33	Select and price OEM parts; verify availability, compatibility, and condition.	HP-G

CTE Standards and Benchmarks		Priority Number
06.34	Locate and use technical service bulletins (TSBs).	
06.35	Utilize flat rate manuals, service manuals, service bulletins, parts manuals and electronic service information.	
06.36	Select and price alternative/optional OEM parts; verify availability, compatibility and condition.	HP-G
06.37	Select and price alternative/optional OEM parts, aftermarket parts, used, recycled, rebuilt or remanufactured parts; verify availability, compatibility and condition.	HP-G
06.38	Determine price and source of necessary sublet operations.	HP-G
06.39	Determine labor value, prices, charges, allowances, or fees for non-included operations and miscellaneous items.	HP-G
06.40	Recognize and apply overlap deductions, included operations, and additions.	HP-I
06.41	Determine additional material and charges.	HP-G
06.42	Determine refinishing material and charges.	HP-I
06.43	Apply math skills to establish charges and totals.	HP-I
06.44	Identify procedural differences between computer generated and manually written estimates.	HP-G
06.45	Identify procedures to restore corrosion protection; establish labor values, and material charges.	HP-G
06.46	Determine the cost effectiveness of the repair and determine the approximate vehicle retail, and repair value.	HP-G
06.47	Recognize the differences in estimation procedures when using different information provider systems.	HP-G
06.48	Verify accuracy of estimate compared to the actual repair and replacement operations.	HP-G
06.49	Document observed damage, unusual conditions, and concerns.	
Vehicle Construction and Parts Identification		
06.50	Identify type of vehicle construction (space frame, unibody, body-over-frame).	HP-G
06.51	Recognize the different damage characteristics of space frame, unibody, and body-over-frame vehicles.	HP-G
06.52	Identify impact energy absorbing components.	HP-G
06.53	Identify steel types; determine repair-ability.	HP-G
06.54	Identify aluminum/magnesium components; determine repair-ability.	HP-G
06.55	Identify plastic/composite components; determine repair-ability.	HP-G
06.56	Identify vehicle glass components and repair/replacement procedures.	HP-G
06.57	Identify add-on accessories.	HP-G
06.58	Visually inspect suspension, steering and related components.	
Customer Relations and Sales Skills		
06.59	Acknowledge and/or greet customer/client.	HP-I

CTE Standards and Benchmarks		Priority Number
06.60	Listen to customer/client; collect information and identify customers/client's concerns, needs and expectations.	HP-I
06.61	Establish cooperative attitude with customer/client.	HP-I
06.62	Identify yourself to customer/client; offer assistance.	HP-I
06.63	Deal with angry customer/client.	HP-I
06.64	Identify customer/client preferred communication method; follow up to keep customer/client informed about parts and the repair process.	HP-G
06.65	Recognize basic claims handling procedures; explain to customer/client.	HP-G
06.66	Project positive attitude and professional appearance.	HP-I
06.67	Provide and review warranty information.	HP-I
06.68	Provide and review technical and consumer protection information.	HP-G
06.69	Estimate and explain duration of out-of-service time.	HP-G
06.70	Demonstrate negotiation skills to obtain a mutual agreement.	HP-G
06.71	Interpret and explain manual or computer-assisted estimate to customer/client.	HP-I

Florida Department of Education
Student Performance Standards

Course Number: ARR0112
Occupational Completion Point: E
Automotive Collision Welding, Cutting and Joining – 75 Hours – SOC Code 51-9198

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

CTE Standards and Benchmarks		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 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
Metal Welding, Cutting, and Joining		
07.05	Identify the considerations for cutting, removing, and welding various types of steel, aluminum, and other metals.	HP-G

CTE Standards and Benchmarks		Priority Number
07.06	Determine the correct GMAW welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation.	HP-I
07.07	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
07.08	Store, handle, and install high-pressure gas cylinders; test for leaks.	HP-I
07.09	Determine the proper angle of the gun to the joint and direction of gun travel for the type of weld being made.	HP-G
07.10	Protect adjacent panels, glass, vehicle interior, etc., from welding and cutting operations.	HP-I
07.11	Identify hazards; foam coatings and flammable materials prior to welding/cutting procedures.	HP-G
07.12	Protect computers and other electronics/wires during welding procedures.	HP-I
07.13	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
07.14	Determine the joint type (butt weld with backing, lap, etc.) for weld being made.	HP-I
07.15	Determine the type of weld (continuous, stitch weld, plug, etc.) for each specific welding operation.	HP-I
07.16	Perform the following welds: plug, butt weld with and without backing, and fillet, etc., in the flat, horizontal, vertical, and overhead positions.	HP-I
07.17	Perform visual evaluation and destructive test on each weld type.	HP-I
07.18	Identify the causes of various welding defects; make necessary adjustments.	HP-I
07.19	Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments.	HP-I
07.20	Identify cutting process for different substrates and locations; perform cutting operation	HP-I
07.21	Identify different methods of attaching structural components (squeeze type resistance spot welding (STRSW), riveting, structural adhesive, MIG bronze, etc.).	HP-G

Florida Department of Education
Student Performance Standards

Course Number: ARR0295
Occupational Completion Point: F
Structural Damage Repair Technician – 350 Hours – SOC Code 49-3021

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

CTE Standards and Benchmarks		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 procedures and precautions that may apply to the vehicle being repaired.	HP-I
08.03	Identify vehicle system hazard types (supplemental restraint system (SRS), hybrid/electric/alternative fuel vehicles), locations and recommended procedures before inspecting or replacing components.	HP-I
08.04	Select and use a NIOSH approved air purifying respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA regulation 1910.134 and applicable state and local regulation.	HP-I

CTE Standards and Benchmarks		Priority Number
Frame Inspection and Repair		
08.05	Measure and diagnose structural damage using a tram gauge.	HP-I
08.06	Identify processes and procedures to Attach vehicle to anchoring devices.	HP-G
08.07	Identify processes and procedures to Analyze, straighten and align mash (collapse) damage.	HP-G
08.08	Identify processes and procedures to Analyze, straighten and align sag damage.	HP-G
08.09	Identify processes and procedures to Analyze, straighten and align side sway damage.	HP-G
08.10	Identify processes and procedures to Analyze, straighten and align twist damage.	HP-G
08.11	Identify processes and procedures to Analyze, straighten and align diamond frame damage.	HP-G
08.12	Identify processes and procedures to Remove and replace damaged structural components.	HP-G
08.13	Identify processes and procedures to Replace protective coatings, restore corrosion protection to repaired or replaced frame areas and anchoring locations.	HP-G
08.14	Identify processes and procedures to Analyze and identify misaligned or damaged steering, suspension, and powertrain mounting points.	HP-G
08.15	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
08.16	Identify heat limitations and monitoring procedures for structural components.	HP-G
08.17	Demonstrate an understanding of foam applications.	HP-G
08.18	Measure and diagnose structural damage using a measuring system (mechanical, electronic, laser), etc.	HP-G
08.19	Determine the extent of the direct and indirect damage and the direction of impact; document the methods and sequence of repair.	HP-I
08.20	Analyze and identify crush/collapse zones.	HP-I
Unibody and Unitized Structure Inspection, Measurement, and Repair		
08.21	Analyze, identify and understand procedures to replace and align misaligned or damaged steering, suspension, and powertrain mounting points that can cause vibration, steering, and chassis alignment problems.	HP-G
08.22	Measure and diagnose unibody damage using tram gauge.	HP-I
08.23	Measure and diagnose unibody vehicles using a dedicated (fixture) measuring system.	HP-G
08.24	Diagnose and measure unibody vehicles using a three-dimensional measuring system (mechanical, electronic, and laser, etc.).	HP-G
08.25	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
08.26	Attach anchoring devices to vehicle; remove or reposition components as necessary.	HP-I

CTE Standards and Benchmarks		Priority Number
08.27	Identify processes and procedures to straighten and align roof rails/headers and roof panels.	HP-G
08.28	Straighten and align rocker panels and pillars.	HP-G
08.29	Straighten and align vehicle openings, and floor pans.	HP-G
08.30	Straighten and align quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/powertrain mounting points).	HP-G
08.31	Straighten and align front-end sections (aprons, strut towers, upper and lower rails, steering, and suspension/powertrain mounting points).	HP-G
08.32	Identify substrate and repair or replacement recommendations.	HP-I
08.33	Identify proper cold stress relief methods.	HP-I
08.34	Repair damage using power tools and hand tools to restore proper contours and dimensions.	HP-I
08.35	Determine sectioning procedures of a steel body structure.	HP-I
08.36	Identify processes and procedures to restore corrosion protection to repaired or replaced structural areas, and anchoring locations.	HP-G
08.37	Identify processes and procedures to determine the extent of damage to aluminum structural components; repair, weld, or replace.	HP-I
08.38	Analyze and identify crush/collapse zones.	HP-I
Fixed Glass		
08.39	Identify considerations for removal, handling, and installation of advanced glass systems (rain sensors, navigation, cameras, and collision avoidance systems).	HP-G
08.40	Identify processes and procedures to remove and reinstall or replace modular glass using recommended materials.	HP-G
08.41	Check for water leaks, dust leaks, and wind noise.	HP-G
Suspension and Steering		
08.42	Perform visual inspection and measuring checks to identify steering and suspension collision damage.	HP-G
08.43	Identify one–time use fasteners.	HP-I
08.44	Clean, inspect, and prepare reusable fasteners.	HP-I
08.45	Identify processes and procedures to remove, replace, inspect or adjust power steering pump, pulleys, belts, hoses, fittings and pump mounts.	HP-G
08.46	Identify processes and procedures to remove and replace power steering gear (non-rack and pinion type).	HP-G
08.47	Identify processes and procedures to inspect, remove, and replace power rack and pinion steering gear and related components.	HP-G
08.48	Identify processes and procedures to inspect and replace parallelogram steering linkage components.	HP-G

CTE Standards and Benchmarks		Priority Number
08.49	Identify processes and procedures to inspect, remove and replace upper and lower control arms and related components.	HP-G
08.50	Identify processes and procedures to inspect, remove and replace steering knuckle/spindle/hub assemblies (including bearings, races, seals, etc.).	HP-G
08.51	Identify processes and procedures to inspect, remove and replace front suspension system coil springs and spring insulators (silencers).	HP-G
08.52	Identify processes and procedures to inspect, remove, replace, and adjust suspension system torsion bars, and mounts.	HP-G
08.53	Identify processes and procedures to inspect, remove and replace stabilizer bar bushings, brackets, and links.	HP-G
08.54	Identify processes and procedures to inspect, remove and replace MacPherson strut or assembly, upper bearing, and mount.	HP-G
08.55	Identify processes and procedures to inspect, remove, and replace rear suspension system transverse links, control arms, stabilizer bars, bushings, and mounts.	HP-G
08.56	Identify processes and procedures to inspect, remove, and replace suspension system leaf spring(s) and related components.	HP-G
08.57	Identify processes and procedures to inspect axle assembly for damage and misalignment.	HP-G
08.58	Identify processes and procedures to inspect, remove and replace shock absorbers.	HP-G
08.59	Identify processes and procedures to diagnose, inspect, adjust, repair or replace active suspension systems and associated lines and fittings.	HP-G
08.60	Identify processes and procedures to measure vehicle ride height and wheel base; determine necessary action.	HP-I
08.61	Identify processes and procedures to inspect, remove, replace, and align front and rear frame (cradles/sub).	HP-G
08.62	Identify processes and procedures to diagnose and inspect steering wheel, steering column, and components.	HP-G
08.63	Identify processes and procedures to verify proper operation of steering systems including electronically controlled, hydraulic and electronically assisted steering systems.	HP-G
08.64	Identify processes and procedures to diagnose front and rear suspension system noises and body sway problems; determine necessary action.	HP-G
08.65	Diagnose vehicle wandering, pulling, hard steering, bump steer, memory steering, torque steering, and steering return problems; determine necessary action.	HP-G
08.66	Demonstrate an understanding of wheel suspension and steering alignments (caster, camber, toe, SAI etc.).	HP-G
08.67	Diagnose tire wear patterns; determine cause.	HP-I
08.68	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-I
08.69	Identify processes and procedures to diagnose wheel/tire vibration, shimmy, tire pull (lead), wheel hop problems; determine needed repairs.	HP-G
08.70	Measure wheel, tire, axle, and hub runout; determine needed repairs.	HP-I

CTE Standards and Benchmarks		Priority Number
08.71	Reinstall wheels and torque lug nuts.	HP-I
08.72	Identify processes and procedures to perform initialization or calibration procedures following suspension and/or steering system repairs.	HP-G
Heating and Air Conditioning		
08.73	Identify processes and procedures to comply with environmental regulations relating to refrigerants and coolants.	HP-G
08.74	Maintain and verify correct operation of certified refrigerant recovery and recharging equipment.	HP-G
08.75	Locate and identify A/C system service ports.	HP-I
08.76	Identify processes and procedures to identify refrigerant contamination, recover, label, store, and recycle refrigerant from an A/C system.	HP-G
08.77	Identify processes and procedures to select refrigerant, evacuate, and recharge an A/C system; check for leaks.	HP-I
08.78	Identify processes and procedures to select oil type and install correct amount in A/C system.	HP-I
08.79	Identify processes and procedures to inspect, adjust, and replace A/C compressor drive belts; check pulley alignment.	HP-G
08.80	Identify processes and procedures to remove and replace A/C compressor; inspect, repair or replace A/C compressor mount.	HP-G
08.81	Identify processes and procedures to inspect, repair or replace A/C system mufflers, hoses, lines, fittings, orifice tube, expansion valve, and seals.	HP-G
08.82	Identify processes and procedures to inspect, test, and replace A/C system condenser and mounts.	HP-G
08.83	Identify processes and procedures to inspect and replace receiver/drier or accumulator/drier.	HP-G
08.84	Identify processes and procedures to inspect and repair A/C component wiring.	HP-G
08.85	Demonstrate an understanding of safe handling procedures associated with high voltage A/C compressors and wiring.	HP-G
08.86	Identify processes and procedures to inspect and protect open A/C system components from contaminants during repairs.	HP-G
Cooling Systems		
08.87	Check engine cooling and heater system hoses and belts; determine necessary action.	HP-I
08.88	Identify processes and procedures to inspect, test, remove, and replace radiator, pressure cap, coolant system components, and water pump.	HP-G
08.89	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
08.90	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
08.91	Identify processes and procedures to inspect, remove, and replace auxiliary oil/fluid coolers; check oil levels.	HP-G

CTE Standards and Benchmarks	Priority Number
08.92 Demonstrate an understanding of hybrid/electric cooling systems.	HP-G
Drive Train	
08.93 Identify processes and procedures to remove, replace, and adjust shift or clutch linkage as required.	HP-G
08.94 Identify processes and procedures to remove and replace electronic sensors, wires, and connectors.	HP-G
08.95 Identify processes and procedures to remove and reinstall powertrain assembly; inspect, replace, and align powertrain mounts.	HP-G
08.96 Identify processes and procedures to remove and replace drive axle assembly.	HP-G
08.97 Identify processes and procedures to inspect, remove and replace half shafts and axle constant velocity (CV) joints.	HP-G
08.98 Identify processes and procedures to inspect, remove and replace drive shafts and universal joints.	HP-G
08.99 Demonstrate an understanding of safe handling procedures associated with high voltage powertrain components.	HP-G
Fuel, Intake and Exhaust Systems	
08.100 Identify processes and procedures to inspect, remove and replace exhaust pipes, mufflers, converters, resonators, tail pipes, and heat shields.	HP-G
08.101 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
08.102 Identify processes and procedures to identify processes and procedures to inspect, remove and replace engine components of air intake systems.	HP-G
08.103 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	
08.104 Identify processes and procedures to inspect, remove, and replace seatbelt and shoulder harness assembly and components.	HP-G
08.105 Identify processes and procedures to inspect restraint system mounting areas for damage; repair as needed.	HP-G
08.106 Identify processes and procedures to inspect the operation of the seatbelt system.	HP-I
08.107 Identify processes and procedures to disable and enable Supplemental Restraint System (SRS).	HP-G
08.108 Identify processes and procedures to inspect, protect, remove and replace Supplemental Restraint Systems (SRS) sensors and wiring; ensure sensor orientation.	HP-G
08.109 Identify processes and procedures to verify that Supplemental Restraint System (SRS) is operational.	HP-I
08.110 Identify processes and procedures to inspect, remove, replace and dispose of deployed and non-deployed airbag(s) and pre-tensioners.	HP-G
08.111 Identify processes and procedures to use Diagnostic Trouble Codes (DTC) to diagnose and repair the Supplemental Restraint System (SRS).	HP-G

CTE Standards and Benchmarks	Priority Number
08.112 Demonstrate an understanding of advanced restraint systems.	HP-G
08.113 Identify components of Supplemental Restraint Systems (SRS).	HP-G
08.114 Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	ASE
08.115 Identify processes and procedures to disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.	

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.

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 9.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program – Career Preparatory	
Program Number	T404100
CIP Number	0647060422
Grade Level	30, 31
Standard Length	600 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 9

Purpose

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

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

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

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

The following table illustrates the secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code
	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	49-3023

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

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

Course Number: AER0025
Occupational Completion Point: A (1 of 4)
Maintenance and Light Repair Technician 1 – 150 Hours – SOC Code 49-3023

It is <u>strongly recommended</u> 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

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.	
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

CTE Standards and Benchmarks		Priority Number
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:	

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks		Priority Number
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.	
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		

CTE Standards and Benchmarks		Priority Number
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

Florida Department of Education
Student Performance Standards

Course Number: AER0026
Occupational Completion Point: A (2 of 4)
Maintenance and Light Repair Technician 2 – 150 Hours – SOC Code 49-3023

It is <u>strongly recommended</u> 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**

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, 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

CTE Standards and Benchmarks		Priority Number
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 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	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;	P-1

CTE Standards and Benchmarks		Priority Number
	check pulley and belt alignment.	
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 Number: AER0027
Occupational Completion Point: A (3 of 4)
Maintenance and Light Repair Technician 3 – 150 Hours – SOC Code 49-3023

It is <u>strongly recommended</u> 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 disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

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
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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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.	

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks	Priority Number
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 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 Number: AER0028
Occupational Completion Point: A (4 of 4)
Maintenance and Light Repair Technician 4 – 150 Hours – SOC Code 49-3023

It is <u>strongly recommended</u> 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:	
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, 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	P-1

CTE Standards and Benchmarks		Priority Number
	for signs of leaks; determine necessary action.	
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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks	Priority Number
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.

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program – Career Preparatory	
Program Number	T410300
CIP Number	0647060604
Grade Level	30,31
Standard Length	900 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3053 – Outdoor Power Equipment and Other Small Engine Mechanics
Basic Skills Level	Mathematics: 8 Language: 8 Reading: 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	SOC Code
A	SER0080	Power Equipment Service Technician 1	GASENG RPR @7 7G	300 hours	49-3053
B	SER0081	Power Equipment Service Technician 2		300 hours	49-3053
C	SER0082	Power Equipment Service Technician 3		300 hours	49-3053

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 Number: SER0080
Occupational Completion Point: A
Power Equipment Service Technician 1 – 300 Hours – SOC Code 49-3053

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.

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.

CTE Standards and Benchmarks	
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.

CTE Standards and Benchmarks	
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 as a result of temperature extremes, chemical reaction, and moisture content.
04.02	Draw conclusions or make inferences from data.
04.03	Identify health-related problems that may result from exposure to work-related chemicals and hazardous materials and know the proper precautions required for handling such materials.
04.04	Understand pressure measurement in terms of Pounds per Square Inch (PSI).
05.0	Demonstrate industry-related communication skills.-The student will be able to:

CTE Standards and Benchmarks	
	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.

CTE Standards and Benchmarks	
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.

CTE Standards and Benchmarks	
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:

CTE Standards and Benchmarks	
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.

Florida Department of Education
Student Performance Standards

Course Number: SER0081
Occupational Completion Point: B
Power Equipment Service Technician 2 – 300 Hours – SOC Code 49-3053

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.

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.

CTE Standards and Benchmarks	
	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.

CTE Standards and Benchmarks	
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:

CTE Standards and Benchmarks	
	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.

CTE Standards and Benchmarks	
	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 Number: SER0082
Occupational Completion Point: C
Power Equipment Service Technician 3 – 300 Hours – SOC Code 49-3053

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.

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.
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.

CTE Standards and Benchmarks	
27.06	Diagnose and service throttle control sensor.
27.07	Troubleshoot malfunction indicator light (MIL) air intake temperature sensor.
27.08	Troubleshoot, read and interpret wiring harness EFT diagram 6 terminal connectors.
27.09	Troubleshoot, diagnose, and service using EFI diagnostic flow diagram flowchart.
27.10	Troubleshoot, diagnose, and service using industry recognized EFI system flowchart.
27.11	Diagnose and service oxygen sensor.

Additional Information

Laboratory Activities

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

Special Notes

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 8.0, Language 8.0, and Reading 8.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Heavy Equipment Service Technician**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T440100
CIP Number	0647030201
Grade Level	30, 31
Standard Length	1800 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3031 – Bus and Truck Mechanics and Diesel Engine Specialists 49-9098 – Helpers—Installations, Maintenance, and Repair Workers
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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	SOC Code
A	DIM0101	Diesel Engine Mechanic/Technician Helper	DIESEL MECH @7 7G	150 hours	49-9098
B	DIM0102	Diesel Electrical and Electronics Technician		300 hours	49-3031
C	DIM0103	Diesel Engine Preventative Maintenance Technician		150 hours	49-3031
D	DIM0104	Diesel Engine Technician		300 hours	49-3031
E	DIM0130	Diesel Brakes/Fluid Technician		300 hours	49-3031
F	DIM0106	Diesel Heating and Air Conditioning Technician		150 hours	49-3031
G	DIM0107	Diesel Steering and Suspension Technician		150 hours	49-3031
H	DIM0108	Diesel Drivetrain Technician		150 hours	49-3031
I	DIM0110	Diesel Power Train Technician		150 hours	49-3031

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 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 Battery and starting systems
24.0 Diagnose and repair Electrical/Electronic charging systems
25.0 Diagnose and repair Lighting systems.
26.0 Diagnose and repair Air brake systems.
27.0 Diagnose and repair Hydraulic brake systems.
28.0 Diagnose and repair 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.

38.01 Fuel supply system.
38.02 Electronic fuel management system.
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 General hydraulic system diagnosis and repair.
49.0 Diagnose and repair hydraulic pumps.
50.0 Diagnose and repair hydraulic filtration/reservoirs (tanks).
51.0 Diagnose and repair hydraulic hoses, fittings, and connections.
52.0 Diagnose and repair hydraulic control valves.
53.0 Diagnose and repair hydraulic actuators.
54.0 HVAC systems diagnosis, service, and repair.
55.0 A/C system and component diagnosis, service, and repair.
56.0 Diagnose and repair Compressor and clutch.
57.0 Diagnose and repair Evaporator, condenser, and related components.
58.0 Heating and engine cooling systems diagnosis, service, and repair.
59.0 Electrical system diagnosis, service, and repair.
60.0 Air/vacuum/mechanical diagnosis, service, and repair.
61.0 Refrigerant recovery, recycling, and handling.
62.0 Steering column diagnosis, service, and repair.
63.0 Steering units diagnosis, service, and repair.
64.0 Steering linkage diagnosis, service, and repair.
65.0 Suspension systems diagnosis and repair.
66.0 Wheel alignment diagnosis, adjustment, and repair.
67.0 Wheels and tires diagnosis, service, and repair.
68.0 Frame and coupling diagnosis, service, and repair.
69.0 Clutch diagnosis and repair.
70.0 Transmission diagnosis and repair.
71.0 Driveshaft and universal joint diagnosis and repair.
72.0 Drive axle diagnosis and repair.
73.0 Demonstrate shop and occupational safety procedures.
74.0 Identify the requirements for maintaining and repairing track systems.
75.0 Maintain and repair power train systems and components.
76.0 Troubleshoot and repair differentials, final drives and drive lines.
77.0 Demonstrate the qualifications for employment.

Florida Department of Education
Student Performance Standards

Program Title: Heavy Equipment Service Technician
Career Certificate Program Number: T440100

Course Number: DIM0101
Occupational Completion Point: A
Diesel Engine Mechanic/Technician Helper – 150 Hours – SOC Code 49-9098

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.

CTE Standards and Benchmarks	
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 and use proper 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, 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.

CTE Standards and Benchmarks	
	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.
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 automotive applications.
	03.02 Identify standard and metric designation.
	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 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 Explain the operating principles of two-and-four-stroke-cycle engines.
	04.04 Identify the equipment of two-and-four-stroke-cycle engines.
	04.05 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 proper use of fender covers, mats.
	05.03 Demonstrate use of the three C’s (Concern, Cause, and Correction).
	05.04 Review vehicle service history.

CTE Standards and Benchmarks	
05.05	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
05.06	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel 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.
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.

Florida Department of Education
Student Performance Standards

Course Number: DIM0102
Occupational Completion Point: B
Diesel Electrical and Electronics Technician – 300 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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.
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 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.

CTE Standards and Benchmarks	
	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 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 Test, aim, and replace headlights.
	11.04 Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components/modules; repair or replace as needed.
	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.
	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.
	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.
	11.08 Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed.

CTE Standards and Benchmarks	
11.09	Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.
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.
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.
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) 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 side view mirror motors, heater circuit grids, relays, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.
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.
13.10	Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repair or replace as needed.
13.11	Identify causes of slow, intermittent, or no power window operation; determine needed action.

CTE Standards and Benchmarks	
13.12	Inspect and test motors, switches, relays, connectors, terminals, wires, and control components/modules of power window circuits; repair or replace as needed.
13.13	Inspect and test block heaters; determine needed repairs.
13.14	Inspect and test cruise control electrical components; repair or replace as needed.
13.15	Inspect and test switches, relays, controllers, actuator/solenoids, connectors, terminals, and wires of electric door lock circuits.
13.16	Check operation of keyless and remote lock/unlock devices; determine needed action.
13.17	Inspect and test engine cooling fan electrical control components/modules, wiring; repair or replace as needed.
13.18	Identify causes of data bus communication problems; determine needed action.

Florida Department of Education
Student Performance Standards

Course Number: DIM0103
Occupational Completion Point: C
Diesel Engine Preventative Maintenance Technician – 150 Hours – SOC Code 49-3031

Course Description:
The Diesel Engine Preventative Maintenance Technician course is designed to build on the skills and knowledge students learned in the Diesel Electrical and Electronics Technician course for entry into the Heavy Equipment industry. Content emphasizes beginning skills and concepts. Students study engine systems, cab and hood, electrical/electronics, and frame and chassis.

CTE Standards and Benchmarks	
14.0	Diagnose and repair Engine systems.-The student will be able to:
14.01	Check engine starting/operation (including unusual noises, vibrations, exhaust smoke, etc.); record idle and governed rpm.
14.02	Inspect vibration damper.
14.03	Inspect belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment.
14.04	Check engine oil level and condition; check dipstick seal.
14.05	Inspect engine mounts for looseness and deterioration.
14.06	Check engine for oil, coolant, air, fuel and exhaust leaks (Engine Off and Running).
14.07	Check engine compartment wiring harnesses, connectors, and seals for damage and proper routing.
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.
15.02	Drain water from fuel system.
15.03	Service water separator/fuel heater; replace fuel filter(s); prime and bleed fuel system.
15.04	Inspect throttle linkages and return springs.
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.
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.
16.03	Check air induction system: piping, charge air cooler, hoses, clamps, and mountings; check for air restrictions and leaks.

CTE Standards and Benchmarks	
16.04	Inspect turbocharger for leaks; check mountings and connections.
16.05	Check operation of engine compression/exhaust brake.
16.06	Service or replace air filter as needed; check and reset air filter restriction indicator.
16.07	Inspect and service crankcase ventilation system.
16.08	Inspect diesel exhaust fluid (DEF) system, to include tanks, lines, gauge pump, and filter.
16.09	Inspect selective catalyst reduction (SCR) system; including diesel exhaust fluid (DEF) for proper levels, leaks, mounting and connections.
17.0	Diagnose and repair Cooling system.-The student will be able to:
17.01	Check operation of fan clutch.
17.02	Inspect radiator (including air flow restriction, leaks, and damage) and mountings.
17.03	Inspect fan assembly and shroud.
17.04	Pressure test cooling system and radiator cap.
17.05	Inspect coolant hoses and clamps.
17.06	Inspect coolant recovery system.
17.07	Check coolant for contamination, additive package concentration, aeration, and protection level (freeze point).
17.08	Service coolant filter.
17.09	Inspect water pump.
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.
18.02	Take an engine oil sample for analysis.
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.
19.02	Check warning indicators.
19.03	Check instruments; record oil pressure and system voltage.
19.04	Check operation of electronic power take off (PTO) and engine idle speed controls (if applicable)
19.05	Check HVAC controls.
19.06	Check operation of all accessories.
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).

CTE Standards and Benchmarks	
	19.08 Check mechanical, electronic, and emergency shutdown operation.
	19.09 Check mechanical and electronic engine speed controls.
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.
	20.02 Check condition of spare fuses, safety triangles, fire extinguisher, and all required decals.
	20.03 Inspect seat belts and sleeper restraints.
	20.04 Inspect wiper blades and arms.
21.0	Diagnose and repair Hardware.-The student will be able to:
	21.01 Check operation of wiper and washer.
	21.02 Inspect windshield glass for cracks or discoloration; check sun visor.
	21.03 Check seat condition, operation, and mounting.
	21.04 Check door glass and window operation.
	21.05 Inspect steps and grab handles.
	21.06 Inspect mirrors, mountings, brackets, and glass.
	21.07 Record all observed physical damage.
	21.08 Lubricate all cab and hood grease fittings.
	21.09 Inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.
	21.10 Inspect cab mountings, hinges, latches, linkages and ride height; service as needed.
	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.
	22.02 Inspect A/C compressor and lines for condition and visible leaks; check mountings.
	22.03 Check A/C system condition and operation; check A/C monitoring system, if applicable.
	22.04 Check HVAC air inlet filters and ducts; service as needed.
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.
	23.02 Inspect battery hold-downs, connections, cables, and cable routing; service as needed.

CTE Standards and Benchmarks	
	23.03 Check/record battery state-of-charge (open circuit voltage) and condition.
	23.04 Perform battery test (load and/or capacitance).
	23.05 Inspect starter, mounting, and connections.
	23.06 Engage starter; check for unusual noises, starter drag, and starting difficulty.
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.
	24.02 Perform alternator output tests.
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.
	25.02 Check all exterior lights, lenses, reflectors, and conspicuity tape; check headlight alignment; determine needed action.
	25.03 Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s); determine needed action.
26.0	Diagnose and repair Air brake systems.-The student will be able to:
	26.01 Check operation of parking brake.
	26.02 Record air governor cut-in and cut-out setting (psi).
	26.03 Check operation of air reservoir/tank drain valves.
	26.04 Check air system for leaks (brakes released).
	26.05 Check air system for leaks (brakes applied).
	26.06 Test one-way and double-check valves.
	26.07 Check low air pressure warning devices.
	26.08 Check emergency (spring) brake control/modulator valve, if applicable.
	26.09 Check tractor protection valve.
	26.10 Test air pressure build-up time.
	26.11 Inspect coupling air lines, holders, and glad-hands.
	26.12 Check brake chambers and air lines for secure mounting and damage.
	26.13 Check operation of air drier.
	26.14 Inspect and record brake shoe/pad condition, thickness, and contamination.
	26.15 Inspect and record condition of brake drums/rotors.

CTE Standards and Benchmarks	
	26.16 Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing
	26.17 Check operation and adjustment of brake automatic slack adjusters (ASA); check and record push rod stroke.
	26.18 Lubricate all brake component grease fittings.
	26.19 Check condition and operation of hand brake (trailer) control valve, if applicable.
	26.20 Perform antilock brake system (ABS) operational system self-test.
	26.21 Drain air tanks and check for contamination.
	26.22 Check condition of pressure relief (safety) valves.
	26.23 Check air governor cut-in pressure.
	26.24 Check operation of brake manual slack adjusters; adjust as needed.
27.0	Diagnose and repair Hydraulic brake systems.-The student will be able to:
	27.01 Check master cylinder fluid level and condition.
	27.02 Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage.
	27.03 Check parking brake operation; inspect parking brake application and holding devices; adjust as needed.
	27.04 Check operation of hydraulic system: pedal travel, pedal effort, pedal feel.
	27.05 Inspect calipers for leakage, binding and damage.
	27.06 Inspect brake assist system (booster), hoses and control valves; check reservoir fluid level and condition.
	27.07 Inspect and record brake lining/pad condition, thickness, and contamination.
	27.08 Inspect and record condition of brake rotors.
	27.09 Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing.
	27.10 Adjust drum brakes.
28.0	Diagnose and repair Drive Train systems.-The student will be able to:
	28.01 Check operation of clutch, clutch brake, and gearshift.
	28.02 Check clutch linkage/cable for looseness or binding, if applicable.
	28.03 Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable.
	28.04 Check clutch adjustment; adjust as needed.
	28.05 Check transmission case, seals, filter, hoses, lines and cooler for cracks and leaks.
	28.06 Inspect transmission breather.

CTE Standards and Benchmarks	
28.07	Inspect transmission mounts.
28.08	Check transmission oil level, type, and condition.
28.09	Inspect U-joints, yokes, driveshafts, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing.
28.10	Inspect axle housing(s) for cracks and leaks.
28.11	Inspect axle breather(s).
28.12	Lubricate all drivetrain grease fittings.
28.13	Check drive axle(s) oil level, type, and condition.
28.14	Change drive axle(s) oil and filter/screen, if applicable; check and clean magnetic plugs.
28.15	Check transmission wiring, connectors, seals, and harnesses for damage and proper routing.
28.16	Change transmission oil and filter, if applicable; check and clean magnetic plugs.
28.17	Check inter-axle differential lock operation.
28.18	Check transmission range shift operation.
28.19	Check two-speed axle unit operation and oil level.
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.
29.02	Check power steering pump, mounting, and hoses for leaks, condition, and routing; check fluid level.
29.03	Change power steering fluid and filter.
29.04	Inspect steering gear for leaks and secure mounting.
29.05	Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages.
29.06	Check kingpins for wear.
29.07	Check wheel bearings for looseness and noise.
29.08	Check oil level and condition in all non-drive hubs; check for leaks.
29.09	Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators.
29.10	Inspect shock absorbers for leaks and secure mounting.
29.11	Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage.
29.12	Check and record suspension ride height.
29.13	Lubricate all suspension and steering grease fittings.

CTE Standards and Benchmarks	
	29.14 Check axle locating components (radius, torque, and/or track rods).
	29.15 Check tandem axle alignment and spacing.
	29.16 Remove and inspect wheel bearings; reassemble and adjust.
	29.17 Check toe adjustment.
30.0	Diagnose and repair Tires and wheels.-The student will be able to:
	30.01 Inspect tires for wear patterns and proper mounting.
	30.02 Inspect tires for cuts, cracks, bulges, and sidewall damage.
	30.03 Inspect valve caps and stems; determine needed action.
	30.04 Measure and record tread depth; probe for imbedded debris.
	30.05 Check and record air pressure; adjust air pressure in accordance with manufacturers' specifications.
	30.06 Check wheel mounting hardware condition; determine needed action.
	30.07 Inspect wheels for cracks, damage and proper hand hold alignment.
	30.08 Check tire matching (diameter and tread) on single and dual tire applications.
	30.09 Re-torque 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.
	31.02 Test operation of fifth wheel locking device; adjust if necessary.
	31.03 Check quarter fenders, mud flaps, and brackets.
	31.04 Check pintle hook assembly and mounting; if applicable.
	31.05 Lubricate all fifth wheel grease fittings and plate; if applicable
	31.06 Inspect frame and frame members for cracks and damage.

Florida Department of Education
Student Performance Standards

Course Number: DIM0104
Occupational Completion Point: D
Diesel Engine Technician – 300 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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; 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; 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.

CTE Standards and Benchmarks	
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.

CTE Standards and Benchmarks	
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:
36.01	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.
36.02	Check engine oil level, condition, and consumption; determine needed action.
36.03	Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action.
36.04	Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.
36.05	Inspect, clean, and test oil cooler and components; determine needed action.
36.06	Inspect turbocharger lubrication system; determine needed action.
36.07	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	Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment.
36.04	Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.
36.05	Recover coolant, flush, and refill with recommended coolant/additive package; bleed cooling system.
36.06	Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.
36.07	Inspect water pump and hoses; replace as needed.
36.08	Inspect, clean, and pressure test radiator. Pressure test cap, tank(s), and recovery systems; determine needed action.
36.09	Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.
36.10	Inspect turbo charger cooling systems; determine needed action.
37.0	Air induction and exhaust systems diagnosis and repair.-The student will be able to:
38.01	Perform air intake system restriction and leakage test; determine needed action.
38.02	Perform intake manifold pressure (boost) test; determine needed action.

CTE Standards and Benchmarks	
38.03	Check exhaust back pressure; determine needed action.
38.04	Inspect turbocharger(s), wastegate, and piping systems; determine needed action.
38.05	Inspect turbocharger(s) (variable ratio/geometry VGT), pneumatic, hydraulic, electronic controls, and actuators.
38.06	Check air induction system: piping, hoses, clamps, and mounting; service or replace air filter as needed.
38.07	Remove and reinstall turbocharger/wastegate assembly.
38.08	Inspect intake manifold, gaskets, and connections; replace as needed.
38.09	Inspect, clean, and test charge air cooler assemblies; replace as needed.
38.10	Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed.
38.11	Inspect exhaust after treatment devices; determine necessary action.
38.12	Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed action.
38.13	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
38.01.1	Check fuel level, and condition; determine needed action.
38.01.2	Perform fuel supply and return system tests; determine needed action.
38.01.3	Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action.
38.01.4	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.
38.01.5	Inspect and test pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action.
38.01.6	Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump.
38.01.7	Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time a distributor (rotary) type injection pump; determine needed action.
38.01.8	Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time an in-line type injection pump; determine needed action.
38.01.9	Inspect and adjust throttle control linkage; determine needed action.
38.01.10	Inspect air/fuel ratio control systems; determine needed action.
38.01.11	Inspect, test, and adjust engine fuel shut-down devices and controls; determine needed action.
38.02	Electronic fuel management system

CTE Standards and Benchmarks		
	38.02.1	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.
	38.02.2	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.
	38.02.3	Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; clear codes; determine further diagnosis.
	38.02.4	Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).
	38.02.5	Inspect and replace electrical connector terminals, seals, and locks.
	38.02.6	Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed.
	38.02.7	Using electronic service tool(s) access and interpret customer programmable parameters.
	38.02.8	Perform on-engine inspections, test and adjustments on electronic unit injectors (EUI); determine needed action
	38.02.9	Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable).
	38.02.10	Perform cylinder contribution test utilizing electronic service tool(s).
	38.02.11	Perform on-engine inspections and tests on hydraulic electronic unit injectors (HEUI) and system electronic controls; determine needed action.
	38.02.12	Perform on-engine inspections and tests on hydraulic electronic unit injector (HEUI) high pressure oil supply and control systems; determine needed action.
	38.02.13	Perform on-engine inspections and tests on high pressure common rail (HPCR) type injection systems; determine needed action.
	38.02.14	Inspect high pressure injection lines, hold downs, fittings and seals; determine needed action.
	38.02.15	Perform engine timing sensor calibration (if applicable).
	38.02.16	Perform on-engine inspections and tests on distributor-type injection pump electronic controls; determine needed action.
	38.02.17	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.

Florida Department of Education
Student Performance Standards

Course Number: DIM0130
Occupational Completion Point: E
Diesel Brakes/Fluid Technician – 300 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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.
40.02	Check air system build-up time; determine needed action.
40.03	Drain air reservoir/tanks; check for oil, water, and foreign material; determine needed action.
40.04	Inspect air compressor drive gear, belts and coupling; adjust or replace as needed.
40.05	Inspect air compressor inlet; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed.
40.06	Inspect and test air system pressure controls: governor, unloader assembly valves, filters, lines, hoses, and fittings; replace as needed.
40.07	Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed.
40.08	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.
40.09	Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; repair or replace as needed.
40.10	Inspect and test brake application (foot/treadle) valve, fittings, and mounts; check pedal operation; replace as needed.
40.11	Inspect and test stop light circuit switches, wiring, and connectors; repair or replace as needed.
40.12	Inspect and test hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed.
40.13	Inspect and test brake relay valve; replace as needed.
40.14	Inspect and test quick release valves; replace as needed.
40.15	Inspect and test tractor protection valve; replace as needed.
40.16	Inspect and test emergency (spring) brake control/modulator valve(s); replace as needed.
40.17	Inspect and test low pressure warning devices, wiring, and connectors; repair or replace as needed.

CTE Standards and Benchmarks	
	40.18 Inspect and test air pressure gauges, lines, and fittings; replace as needed.
	40.19 Inspect and test front and rear axle limiting (proportioning) valves; replace as needed.
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.
	41.02 Inspect and test service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed.
	41.03 Identify type, inspect and service slack adjusters; perform needed action.
	41.04 Inspect camshafts, tubes, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; replace as needed.
	41.05 Inspect, clean, and adjust air disc brake caliper assemblies; determine needed repairs.
	41.06 Inspect and measure brake shoes or pads; perform needed action.
	41.07 Inspect and measure brake drums or rotors; perform needed action.
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.
	42.02 Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed.
	42.03 Inspect and test parking (spring) brake application and release valve; replace as needed.
	42.04 Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers' recommendations.
	42.05 Identify and test anti compounding brake function.
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.
	43.02 Inspect and test master cylinder for internal/external leaks and damage; replace as needed.
	43.03 Inspect hydraulic system brake lines for leaks and damage, flexible hoses, and fittings for leaks and damage; replace as needed.
	43.04 Inspect and test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; replace as needed.
	43.05 Inspect and test brake pressure differential valve and warning light circuit switch, bulbs/LEDs, wiring, and connectors; repair or replace as needed.
	43.06 Inspect disc brake caliper assemblies; replace as needed.
	43.07 Inspect/test brake fluid; bleed and/or flush system; determine proper fluid type.
	43.08 Check and adjust brake pedal pushrod length.

CTE Standards and Benchmarks	
	43.09 Inspect and clean wheel cylinders; replace as needed.
	43.10 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.
	44.02 Inspect and measure rotors; perform needed action.
	44.03 Inspect and measure disc brake pads; inspect mounting hardware; perform needed action.
	44.04 Check parking brake operation; inspect parking brake application and holding devices; adjust and replace as needed.
	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.
	45.02 Inspect, test, repair, or replace hydraulic brake assist (booster), hoses, and control valves; determine proper fluid type.
	45.03 Check emergency (back-up, reserve) brake assist system.
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.
	46.02 Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or electronic service tool(s); determine needed action.
	46.03 Identify poor stopping and wheel lock-up caused by failure of the antilock brake system (ABS); determine needed action.
	46.04 Test and check operation of antilock brake system (ABS) air, hydraulic, electrical, and mechanical components; perform needed action.
	46.05 Test antilock brake system (ABS) wheel speed sensors and circuits; adjust or replace as needed.
	46.06 Bleed the ABS hydraulic circuits according to manufacturers' procedures.
	46.07 Observe automatic traction control (ATC) warning light operation; determine needed action.
	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.
	46.09 Verify power line carrier (PLC) operations.
	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:

CTE Standards and Benchmarks	
	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.
	47.02 Identify, inspect or replace unitized/preset hub bearing assemblies.
48.0	General hydraulic system diagnosis and repair.-The student will be able to:
	48.01 Identify system type (closed and open) and verify proper operation.
	48.02 Read and interpret system diagrams and schematics.
	48.03 Perform system temperature, pressure, flow, and cycle time tests; determine needed action.
	48.04 Verify placement of equipment /component safety labels and placards; determine needed action.
49.0	Diagnose and repair hydraulic pumps.-The student will be able to:
	49.01 Identify system fluid type.
	49.02 Identify causes of pump failure, unusual pump noises, temperature flow, and leakage problems; determine needed action.
	49.03 Determine pump type, rotation, and drive system.
	49.04 Remove and install pump; prime and/or bleed system.
	49.05 Inspect pump inlet for restrictions and leaks; determine needed action.
	49.06 Inspect pump outlet for restrictions and leaks; determine needed action.
50.0	Diagnose and repair hydraulic filtration/reservoirs (tanks).-The student will be able to:
	50.01 Identify type of filtration system; verify filter application and flow direction.
	50.02 Service filters and breathers.
	50.03 Identify causes of system contamination; determine needed action.
	50.04 Take a hydraulic oil sample for analysis.
	50.05 Check reservoir fluid level and condition; determine needed action.
	50.06 Inspect and repair or replace reservoir, sight glass, vents, caps, mounts, valves, screens, supply and return lines.
51.0	Diagnose and repair hydraulic hoses, fittings, and connections.-The student will be able to:
	51.01 Diagnose causes of component leakage, damage, and restriction; determine needed action.
	51.02 Inspect hoses and connections (length, size, routing, bend radii, and protection); repair or replace as needed.
	51.03 Assemble hoses, tubes, connectors, and fittings in accordance with manufacturers' specifications; use proper procedures to avoid contamination.
	51.04 Inspect and replace fitting seals and sealants.
52.0	Diagnose and repair hydraulic control valves.-The student will be able to:

CTE Standards and Benchmarks
52.01 Pressure test system safety relief valve; determine needed action.
52.02 Perform control valve operating pressure and flow tests; determine needed action.
52.03 Inspect, test, and adjust valve controls (electrical/electronic, mechanical, and pneumatic).
52.04 Identify causes of control valve leakage problems (internal/external); determine needed action.
52.05 Inspect pilot control valve linkages, cables, and PTO controls; adjust, repair, or replace as needed.
53.0 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.
53.01 Identify actuator type (single/double acting, multi-stage/telescopic, and motors).
53.02 Identify the cause of seal failure; determine needed repairs.
53.03 Identify the cause of incorrect actuator movement and leakage (internal and external); determine needed repairs.
53.04 Inspect actuator mounting, frame components, and hardware for looseness, cracks, and damage; determine needed action.
53.05 Remove, repair, and/or replace actuators in accordance with manufacturers' recommended procedures.
53.06 Inspect actuators for dents, cracks, damage, and leakage; determine needed action.
53.07 Purge and/or bleed system in accordance with manufacturers' recommended procedures.

Florida Department of Education
Student Performance Standards

Course Number: DIM0106
Occupational Completion Point: F
Diesel Heating and Air Conditioning Technician – 150 Hours – SOC Code 49-3031

Course Description:
The Diesel Heating and Air Conditioning Technician course is designed to build on the skills and knowledge students learned in the Diesel Brakes Technician course for entry into the Heavy Equipment industry. Content emphasizes beginning skills. Students study HVAC systems, A/C systems, heating, cooling, related controls, and recycling and recovering.

CTE Standards and Benchmarks	
54.0	HVAC systems diagnosis, service, and repair.-The student will be able to:
54.01	Verify the need for service or repair of HVAC systems based on unusual operating noises; determine needed action.
54.02	Verify the need for service or repair of HVAC systems based on unusual visual, smell, and touch conditions; determine needed action.
54.03	Identify system type and components (cycling clutch orifice tube - CCOT, expansion valve) and conduct performance test(s) on HVAC systems; determine needed action.
54.04	Retrieve diagnostic codes; determine needed action.
55.0	A/C system and component diagnosis, service, and repair.-The student will be able to:
55.01	Identify causes of temperature control problems in the A/C system; determine needed action.
55.02	Identify refrigerant and lubricant types; check for contamination; determine needed action.
55.03	Identify A/C system problems indicated by pressure gauge and temperature readings; determine needed action.
55.04	Identify A/C system problems indicated by visual, audible, smell, and touch procedures; determine needed action.
55.05	Perform A/C system leak test; determine needed action.
55.06	Recover, evacuate, and recharge A/C system using appropriate equipment.
55.07	Identify contamination in the A/C system components; determine needed action.
55.08	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.
55.09	Charge A/C system with refrigerant.
55.10	Identify lubricant type needed for system application.
56.0	Diagnose and repair Compressor and clutch.-The student will be able to:

CTE Standards and Benchmarks	
56.01	Identify and diagnose A/C system problems that cause protection devices (pressure, thermal, and electronic) to interrupt system operation; determine needed action.
56.02	Inspect, test, and replace A/C system pressure, thermal, and electronic protection devices.
56.03	Inspect, and replace A/C compressor drive belts, pulleys, and tensioners; adjust belt tension and check alignment.
56.04	Inspect, test, adjust, service, or replace A/C compressor clutch components or assembly.
56.05	Inspect and correct A/C compressor lubricant level (if applicable).
56.06	Inspect, test, or replace A/C compressor.
56.07	Inspect, repair, or replace A/C compressor mountings and hardware.
57.0	Diagnose and repair Evaporator, condenser, and related components.-The student will be able to:
57.01	Correct system lubricant level when replacing the evaporator, condenser, receiver/drier or accumulator/drier, and hoses.
57.02	Inspect A/C system hoses, lines, filters, fittings, and seals; determine needed action.
57.03	Inspect and test A/C system condenser. Check for proper airflow and mountings; determine needed action.
57.04	Inspect and replace receiver/drier or accumulator/drier.
57.05	Inspect and test cab/sleeper refrigerant solenoid, expansion valve(s); check placement of thermal bulb (capillary tube); determine needed action.
57.06	Remove and replace orifice tube.
57.07	Inspect and test cab/sleeper evaporator core; determine needed action.
57.08	Inspect, clean, and repair evaporator housing and water drain; inspect and service/replace evaporator air filter.
57.09	Identify and inspect A/C system service ports (gauge connections); determine needed action.
57.10	Identify the cause of system failures resulting in refrigerant loss from the A/C system high pressure relief device; determine needed action.
57.11	Inspect and test A/C system condenser and mountings; determine needed action.
58.0	Heating and engine cooling systems diagnosis, service, and repair.-The student will be able to:
58.01	Identify causes of outlet air temperature control problems in the HVAC system; determine needed action.
58.02	Diagnose window fogging problems; determine needed action.
58.03	Perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration; determine needed action.
58.04	Inspect engine cooling and heating system hoses, lines, and clamps; determine needed action.
58.05	Inspect and test radiator, pressure cap, and coolant recovery system (surge tank); determine needed action.
58.06	Inspect water pump; determine needed action.

CTE Standards and Benchmarks	
58.07	Inspect and test thermostats, by-passes, housings, and seals; determine needed repairs.
58.08	Recover, flush and refill with recommended coolant/additive package; bleed cooling system.
58.09	Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.
58.10	Inspect and test heating system coolant control valve(s) and manual shut-off valves; determine needed action.
58.11	Inspect and flush heater core; determine needed action.
59.0	Electrical system diagnosis, service, and repair.-The student will be able to:
59.01	Identify causes of HVAC electrical control system problems; determine needed action.
59.02	Inspect and test A/C heater blower motors, resistors, switches, relays, modules, wiring, and protection devices; determine needed action.
59.03	Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action.
59.04	Inspect and test A/C related electronic engine control systems; determine needed action.
59.05	Inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices; determine needed action.
59.06	Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action.
59.07	Inspect and test HVAC system electrical/electronic control panel assemblies; determine needed action.
59.08	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.
60.0	Air/vacuum/mechanical diagnostics, service, and repair.-The student will be able to:
60.01	Identify causes of HVAC air and mechanical control problems; determine needed action.
60.02	Inspect and test HVAC system air and mechanical control panel assemblies; determine needed action.
60.03	Inspect, test, and adjust HVAC system air and mechanical control cables and linkages; determine needed action.
60.04	Inspect and test HVAC system actuators and hoses; determine needed action.
60.05	Inspect, test, and adjust HVAC system ducts, doors, and outlets; determine needed action.
60.06	Inspect and test HVAC system vacuum reservoir(s), check valve(s), and restrictors; determine needed action.
61.0	Refrigerant recovery, recycling, and handling.-The student will be able to:
61.01	Maintain and verify correct operation of certified equipment.
61.02	Identify and recover A/C system refrigerant.
61.03	Recycle or properly dispose of refrigerant.

CTE Standards and Benchmarks	
61.04	Handle, label, and store refrigerant.
61.05	Test recycled refrigerant for non-condensable gases.

Florida Department of Education
Student Performance Standards

Course Number: DIM0107
Occupational Completion Point: G
Diesel Steering and Suspension Technician – 150 Hours – SOC Code 49-3031

Course Description:
The Diesel Steering and Suspension Technician course is designed to build on the skills and knowledge students learned in the Diesel Heating and Air Conditioning Technician course for entry into the Heavy Equipment industry. Content emphasizes beginning skills. Students study steering systems, suspension systems, wheel alignment, wheels and tires, and frames.

CTE Standards and Benchmarks	
62.0	Steering column diagnosis, service, and repair.-The student will be able to:
62.01	Identify and diagnose fixed and driver adjustable steering column and shaft noise, looseness, and binding problems; determine needed action.
62.02	Inspect and service steering shaft U-joint(s), slip joints, bearings, bushings, and seals; phase shaft.
62.03	Check cab mounting and adjust ride height.
62.04	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.
62.05	Disable and enable supplemental restraint system (SRS) in accordance with manufacturers' procedures.
63.0	Steering units diagnosis, service, and repair.-The student will be able to:
63.01	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.

CTE Standards and Benchmarks	
63.02	Determine recommended type of power steering fluid; check level and condition; determine needed action.
63.03	Flush and refill power steering system; purge air from system.
63.04	Perform power steering system pressure, temperature, and flow tests; determine needed action.
63.05	Inspect, service, or replace power steering reservoir including filter, seals, and gaskets.
63.06	Inspect power steering pump drive gear and coupling; replace as needed.
63.07	Inspect, adjust, or replace power steering pump, mountings, and brackets.
63.08	Inspect and replace power steering system cooler, lines, hoses, clamps/mountings, hose routings, and fittings.
63.09	Inspect, adjust, repair, or replace integral type power steering gear(s) (single and/or dual) and mountings.
63.10	Inspect, and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment.
63.11	Inspect, adjust, or replace linkage-assist type power steering cylinder or gear (dual system).
63.12	Adjust manual and automatic steering gear poppet/relief valves.
64.0	Steering linkage diagnosis, service, and repair.-The student will be able to:
64.01	Inspect and align pitman arm; replace as needed.
64.02	Check and adjust steering (wheel) stops; verify relief pressures.
64.03	Inspect and lubricate steering components.
64.04	Inspect drag link (relay rod) and tie rod ends; adjust or replace as needed.
64.05	Inspect steering arm and levers, and linkage pivot joints; replace as needed.
64.06	Inspect clamps and retainers on cross tube/relay rod/centerline/tie rod; position or replace as needed.
65.0	Suspension systems diagnosis, service, and repair.-The student will be able to:
65.01	Inspect front axles and attaching hardware; determine needed action.
65.02	Inspect and service kingpins, steering knuckle bushings, locks, bearings, seals, and covers; determine needed action.
65.03	Inspect shock absorbers, bushings, brackets, and mounts; replace as needed.
65.04	Inspect leaf springs, center bolts, clips, pins and bushings, shackles, U-bolts, insulators, brackets, and mounts; determine needed action.
65.05	Inspect axle aligning devices such as radius rods, track bars, stabilizer bars, torque arms, related bushings, mounts, shims, and cams; determine needed action.
65.06	Inspect tandem suspension equalizer components; determine needed action.
65.07	Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; adjust, repair or replace as needed.

CTE Standards and Benchmarks	
65.08	Inspect air springs, mounting plates, springs, suspension arms, and bushings; replace as needed.
65.09	Measure and adjust vehicle ride height; determine needed action.
65.10	Identify rough ride problems; determine needed action.
65.11	Inspect walking beams, center (cross) tube, bushings, mounts, load pads, and saddles/caps; replace as needed.
66.0	Wheel alignment diagnosis, adjustment, and repair.-The student will be able to:
66.01	Identify and diagnose vehicle wandering, pulling, shimmy, hard steering and off-center steering wheel problems; adjust or repair as needed.
66.02	Check camber; determine needed action.
66.03	Check caster; adjust as needed.
66.04	Check and adjust toe settings.
66.05	Check rear axle(s) alignment (thrust line/centerline) and tracking; adjust or repair as needed.
66.06	Diagnose turning/Ackerman angle (toe-out-on-turns) problems; determine needed action.
66.07	Check front axle alignment (centerline); adjust or repair as needed.
67.0	Wheels and tires diagnosis, service, and repair.-The student will be able to:
67.01	Identify and diagnose tire wear patterns; check tread depth and pressure; determine needed action.
67.02	Identify and diagnose wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action.
67.03	Remove and install steering and drive axle wheel/tier assemblies; torque mounting hardware to specifications with a torque wrench.
67.04	Inspect tire for proper application, (size, load range, position, and tread design); determine needed action.
67.05	Inspect wheel/rims for proper application, hand hold alignment, load range, and design; determine needed action.
67.06	Check operation of tire pressure monitoring system (TPMS); determine needed action if applicable.
68.0	Frame and coupling diagnosis, service, and repair.-The student will be able to:
68.01	Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, and mounting hardware.
68.02	Inspect and service sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls.
68.03	Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed repairs.
68.04	Inspect, install, or repair frame hangers, brackets, and cross members in accordance with manufacturers' recommended procedures.
68.05	Inspect, repair or replace pintle hooks and draw bars, if applicable.

Florida Department of Education
Student Performance Standards

Course Number: DIM0108
Occupational Completion Point: H
Diesel Drivetrain Technician – 150 Hours – SOC Code 49-3031

Course Description:
The Diesel Drivetrain Technician course is designed to build on the skills and knowledge students learned in the Diesel Steering and Suspension Technician course for entry into the Heavy Equipment industry. Content emphasizes beginning skills. Students study clutch, transmission, drive shaft, universal joint, and drive axle.

CTE Standards and Benchmarks	
69.0	Clutch diagnosis and repair.-The student will be able to:
69.01	Identify causes of clutch noise, binding, slippage, pulsation, vibration, grabbing, dragging, and chatter problems; determine needed action.
69.02	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.
69.03	Inspect, adjust, repair, and replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system.
69.04	Inspect, adjust, lubricate or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals.
69.05	Inspect, adjust, and replace single-disc clutch pressure plate and clutch disc.
69.06	Inspect, adjust, and replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs.
69.07	Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; perform needed action.
69.08	Inspect, adjust, and replace self-adjusting/continuous-adjusting clutch mechanisms.
69.09	Inspect and replace pilot bearing.
69.10	Remove and reinstall flywheel, inspect mounting area on crankshaft, rear main oil seal, and measure crankshaft end play; determine needed action.
69.11	Inspect flywheel, starter ring gear and measure flywheel face and pilot bore runout; determine needed action.
69.12	Inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.
70.0	Transmission diagnosis and repair.-The student will be able to:
70.01	Identify causes of transmission noise, shifting concerns, lockup, jumping-out-of-gear, overheating, and vibration problems; determine needed action.
70.02	Inspect, test, repair, or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies.

CTE Standards and Benchmarks	
70.03	Inspect and replace transmission mounts, insulators, and mounting bolts.
70.04	Inspect for leakage and replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; repair as needed.
70.05	Check transmission fluid level and condition; determine needed service; add proper type of lubricant.
70.06	Inspect, adjust, and replace transmission shift lever, cover, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires.
70.07	Remove and reinstall transmission.
70.08	Inspect input shaft, gear, spacers, bearings, retainers, and slingers; determine needed action.
70.09	Inspect transmission oil filters and coolers and related components; replace as needed.
70.10	Inspect speedometer components; determine needed action.
70.11	Inspect and adjust power take-off (P.T.O.) assemblies, controls, and shafts; determine needed action.
70.12	Inspect and test function of reverse light, neutral start, and warning device circuits; determine needed action.
70.13	Inspect and test transmission temperature gauge, wiring harnesses and sensor/sending unit; determine needed action.
70.14	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.
70.15	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.
70.16	Use appropriate electronic service tool(s) and procedures to diagnose automated mechanical transmission problems; check and record diagnostic codes, clear codes, and interpret digital multi-meter (DMM) readings; determine needed action.
70.17	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.
70.18	Inspect and test operation of automatic transmission electronic shift selectors, switches, displays and indicators, wiring harnesses.
70.19	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.
70.20	Diagnose transmission component failure cause, both before and during disassembly procedures; determine needed action.
70.21	Inspect, adjust, service, repair, or replace transmission remote shift linkages, brackets, bushings, pivots, and levers.
70.22	Inspect and adjust main shaft, gears, sliding clutches, washers, spacers, bushings, bearings, auxiliary drive assemblies, retainers, and keys; replace as needed.
70.23	Inspect countershafts, gears, bearings, retainers, and keys; adjust bearing preload and time multiple countershaft gears; replace as needed.
70.24	Inspect output shafts, gears, washers, spacers, bearings, retainers, and keys; replace as needed.
70.25	Inspect and/or replace reverse idler shafts, gears, bushings, bearings, thrust washers, and retainers; check reverse idler gear end play (where applicable).

CTE Standards and Benchmarks	
	70.26 Inspect synchronizer hub, sleeve, keys (inserts), springs, blocking rings, synchronizer plates, blocker pins, and sliding clutches; replace as needed.
	70.27 Inspect transmission cases including surfaces, bores, bushings, pins, studs, and magnets; replace as needed.
	70.28 Inspect transmission lubrication system pumps, troughs, collectors, and slingers; service or replace as needed.
71.0	Driveshaft and universal joint diagnosis and repair.-The student will be able to:
	71.01 Identify causes of driveshaft and universal joint noise and vibration problems; determine needed action.
	71.02 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.
	71.03 Inspect driveshaft center support bearings and mounts; determine needed action.
	71.04 Measure drive line angles; determine needed action.
72.0	Drive axle diagnosis and repair.-The student will be able to:
	72.01 Identify causes of drive axle(s) drive unit noise and overheating problems; determine needed action.
	72.02 Check and repair fluid leaks; inspect and replace drive axle housing cover plates, gaskets, sealants, vents, magnetic plugs, and seals.
	72.03 Check drive axle fluid level and condition; determine needed service; add proper type of lubricant.
	72.04 Remove and replace differential carrier assembly.
	72.05 Inspect and replace differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearings.
	72.06 Inspect and replace components of locking differential case assembly.
	72.07 Inspect differential carrier housing and caps, side bearing bores, and pilot (spigot, pocket) bearing bore; determine needed action.
	72.08 Measure ring gear runout; determine needed action.
	72.09 Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cages, and bearings.
	72.10 Measure and adjust drive pinion bearing preload.
	72.11 Measure and adjust drive pinion depth.
	72.12 Measure and adjust side bearing preload and ring gear backlash.
	72.13 Check and interpret ring gear and pinion tooth contact pattern; determine needed action.
	72.14 Inspect, adjust, or replace ring gear thrust block/bolt.
	72.15 Inspect power divider (inter-axle differential) assembly; determine needed action.
	72.16 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.

CTE Standards and Benchmarks	
72.17	Inspect, repair, or replace drive axle lubrication system: pump, troughs, collectors, slingers, tubes, and filters.
72.18	Inspect and replace drive axle shafts.
72.19	Remove and replace wheel assembly; check rear wheel seal and axle flange gasket for leaks; perform needed action.
72.20	Identify causes of drive axle wheel bearing noise and check for damage; perform needed action.
72.21	Inspect and test drive axle temperature gauge, wiring harnesses, and sending unit/sensor; determine needed action.
72.22	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
72.23	Inspect, adjust, repair, or replace planetary gear-type 2-speed axle assembly including: case, idler pinion, pins, thrust washers, sliding clutch gear, shift fork, pivot, seals, cover, and springs.
72.24	Inspect, repair, or replace 2-speed axle shift control system, speedometer adapters, motors, axle shift units, wires, air lines, and connectors.

Florida Department of Education
Student Performance Standards

Course Number: DIM0110
Occupational Completion Point: I
Diesel Power Train Technician – 150 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
73.0	Demonstrate shop and occupational safety procedures.-The student will be able to:
73.01	For all track system and power train technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
73.02	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.
74.0	Identify the requirements for maintenance and repairing track systems.-The student will be able to:
74.01	Identify types of track system components.
74.02	Describe common problems with track systems and components.
74.03	Explain methods for removing, installing, and aligning track assemblies.
74.04	Demonstrate methods for maintaining and repairing track systems.
74.05	Demonstrate methods for maintaining track assemblies, sprockets, bottom rollers, top rollers, and idler.
75.0	Maintain and repair power train systems and components.-The student will be able to:
75.01	Troubleshoot and repair components and assemblies of winches, clutches, and transmissions.
75.02	Describe common problems of operation of winches, clutches, and transmissions.
75.03	Remove, replace or rebuild, and adjust transmissions.
75.04	Remove, replace, and adjust push- and pull-type clutches.
75.05	Inspect flywheel surface for wear or cracks.
75.06	Replace pilot and clutch release bearing.
75.07	Rebuild and adjust manual transmission and linkage.
76.0	Maintain and repair differentials, final drives, and drivetrains.-The student will be able to:

CTE Standards and Benchmarks	
76.01	Describe procedures to troubleshoot and repair final drive assemblies.
76.02	Inspect drive shaft for correct timing.
76.03	Replace universal joints.
76.04	Rebuild differential assembly.
76.05	Overhaul differential.
77.0	Demonstrate the qualifications for employment.-The student will be able to:
77.01	Demonstrate shop organization, management, and safety requirements for a diesel power train technician.
77.02	Demonstrate the use of tools and equipment required for an electrical and electronics technician.
77.03	Demonstrate workplace communication skills required by a diesel power train technician.
77.04	Demonstrate the application of math and science principles required for a diesel power train technician’s job tasks.
77.05	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.

Special Notes

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(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 a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 9.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Heavy Equipment Operations Technician**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T440200
CIP Number	0649020201
Grade Level	30, 31
Standard Length	1200 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	47-2073 – Operating Engineers and Other Construction Equipment Operators 53-7021 – Crane and Tower Operators
Basic Skills Level	Mathematics: 8 Language: 8 Reading: 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	SOC Code
A	TRA0070	Heavy Equipment Maintenance Technician	OPER ENGR @7 7G	150 hours	47-2073
B	TRA0086	Tractor Operator		150 hours	47-2073
C	TRA0087	Off-road Equipment Operator 1		300 hours	47-2073
D	TRA0088	Off-road Equipment Operator 2		300 hours	47-2073
E	TRA0049	Crane Operator		300 hours	53-7021

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 back hoe.
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 Number: TRA0070
Occupational Completion Point: A
Heavy Equipment Maintenance Technician – 150 Hours – SOC Code 47-2073

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.

CTE Standards and Benchmarks	
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.

Florida Department of Education
Student Performance Standards

Course Number: TRA0086
Occupational Completion Point: B
Tractor Operator – 150 Hours – SOC Code 47-2073

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.

CTE Standards and Benchmarks	
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.

Florida Department of Education
Student Performance Standards

Course Number: TRA0087
Occupational Completion Point: C
Off-road Equipment Operator 1 – 300 Hours – SOC Code 47-2073

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.

CTE Standards and Benchmarks	
04.0	Operate a back hoe.-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 back hoe
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 road-bed.
05.04	Perform blue-top grade (finish).
05.05	Change blade and scarifier teeth on motor grader.

Course Number: TRA0088
Occupational Completion Point: D
Off-road Equipment Operator 2 – 300 Hours – SOC Code 47-2073

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.

CTE Standards and Benchmarks	
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.

Florida Department of Education
Student Performance Standards

Course Number: TRA0049
Occupational Completion Point: E
Crane Operator – 300 Hours – SOC Code 53-7021

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.

CTE Standards and Benchmarks	
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 (SOC 47-2073). **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.

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 8.0, Language 8.0, and Reading 8.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

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

Career Certificate Program – Career Preparatory	
Program Number	T440400
CIP Number	0647060515
Grade Level	30, 31
Standard Length	600 hours
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
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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	SOC Code
A	DIM0101	Diesel Engine Mechanic/Technician Helper	DIESEL MECH @7 7G	150 hours	49-9098
B	DIM0131	Diesel Air Brakes Technician		150 hours	49-3031
C	DIM0153	Diesel Preventive Maintenance Technician		300 hours	49-3031

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

Program Title: Diesel Preventative Maintenance Technology
Career Certificate Program Number: T440400

Course Number: DIM0101
Occupational Completion Point: A
Diesel Engine Mechanic/Technician Helper – 150 Hours – SOC Code 49-9098

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

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
01.09	Identify and comply with the required use of Personal Protection Equipment (PPE) during lab/shop activities.	ASE

CTE Standards and Benchmarks		Priority Number
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 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 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

CTE Standards and Benchmarks		Priority Number
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

Florida Department of Education
Student Performance Standards

Course Number: DIM0131
Occupational Completion Point: B
Diesel Air Brakes Technician – 150 Hours – SOC Code 49-3031

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**

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
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

CTE Standards and Benchmarks		Priority Number
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
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

CTE Standards and Benchmarks		Priority Number
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

Florida Department of Education
Student Performance Standards

Course Number: DIM0153
Occupational Completion Point: C
Diesel Preventative Maintenance Technician – 300 Hours – SOC Code 49-3031

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**

CTE Standards and Benchmarks		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

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
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	P-1

CTE Standards and Benchmarks		Priority Number
	point).	
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 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

CTE Standards and Benchmarks		Priority Number
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 (load and/or 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

CTE Standards and Benchmarks		Priority Number
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	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

CTE Standards and Benchmarks		Priority Number
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 levels, condition, determine proper type; 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; 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
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

CTE Standards and Benchmarks		Priority Number
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. 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 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	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

CTE Standards and Benchmarks	Priority Number
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 National Automotive Technicians Education Foundation (NATEF).

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(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 a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 9.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Advanced Automotive Service Technology 1**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T600100
CIP Number	0647060413
Grade Level	30, 31
Standard Length	800 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
Basic Skills Level	Mathematics: 10 Language: 10 Reading: 10

Purpose

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

For institutions using this framework, the National Automotive Technicians Education Foundation (NATEF) highly recommends the Master Automotive Service Technology (MAST) program Certification/Accreditation. Florida Statute (F.S.) 1004.925 – Automotive service technology education programs; certification. – requires all automotive service technology education programs shall be industry certified in accordance with rules adopted by the State Board of Education.

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

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	SOC Code
A	AER0011	Automotive Maintenance Technician	AUTO IND @7 %7 %G AUTO MECH @7 7G	400 hours	49-3023
B	AER0319	Advanced Automotive Electrical/Electronic System Technician		400 hours	49-3023

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: Advanced Automotive Service Technology 1
Career Certificate Program Number: T600100

Course Number: AER0011
Occupational Completion Point: A
Automotive Maintenance Technician – 400 Hours – SOC Code 49-3023

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.

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 general shop safety rules and procedures.	ASE
01.02	Utilize safe procedures for handling of tools and equipment.	ASE
01.03	Identify and use proper placement of floor jacks and jack stands.	ASE
01.04	Identify and use proper procedures for safe lift operation.	ASE
01.05	Utilize proper ventilation procedures for working within the lab/shop area.	ASE
01.06	Identify marked safety areas.	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 the location of the posted evacuation routes.	ASE
01.10	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.	ASE
01.11	Identify and wear appropriate clothing for lab/shop activities.	ASE
01.12	Secure hair and jewelry for lab/shop activities.	ASE
01.13	Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	ASE
01.14	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).	ASE
01.15	Locate and demonstrate knowledge of safety data sheets (SDS).	ASE
01.16	Identify tools and their usage in automotive applications.	ASE
01.17	Identify standard and metric designation.	ASE
01.18	Demonstrate safe handling and use of appropriate tools.	ASE
01.19	Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	ASE
01.20	Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).	ASE
01.21	Identify information needed and the service requested on a repair order.	ASE
01.22	Identify purpose and demonstrate proper use of fender covers, mats.	ASE
01.23	Demonstrate use of the three C’s (concern, cause, and correction).	ASE
01.24	Review vehicle service history.	ASE
01.25	Complete work order to include customer information, vehicle identifying information, customer concern,	ASE

CTE Standards and Benchmarks		Priority Number
	related service history, cause, and correction.	
01.26	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).	ASE
01.27	Identify appropriate emergency first aid procedures.	
01.28	Identify proper procedures for safe pit usage.	
01.29	Use proper handling procedures for automotive fluids.	
01.30	Identify and describe typical automotive lubricants and lubricant properties.	
01.31	Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).	
01.32	Identify and describe typical automotive seals and gaskets.	
01.33	Explain the effects of chemical/substance abuse.	
01.34	Identify principles of stress management.	
01.35	Identify and define career opportunities in the automotive service industry.	
01.36	Demonstrate knowledge of appropriate automotive industry certifications.	
01.37	Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.	
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.	
02.02	Locate and use Vehicle identification Number (VIN) vehicle information placards, decals, tags, as required.	
02.03	Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.	
02.04	Demonstrate retrieving stored diagnostic trouble codes.	
02.05	Reset product specific service indicator.	
02.06	Identify acceptable customer relations.	
02.07	Identify and demonstrate proper customer relations skills.	
02.08	Identify and define payroll deductions (taxes, insurance, and social security) employee benefits and pay systems.	
02.09	Identify principles of time management.	
02.10	Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.	
02.11	Use proper chemicals for cleaning and lubrication.	

CTE Standards and Benchmarks	Priority Number
02.12 Determine the presence of a Tire Pressure Monitoring System (TPMS).	
02.13 Identify service considerations when equipped with a Tire Pressure Monitoring System (TPMS).	
02.14 Determine the presence of wheel locks.	
02.15 Determine the presence of an air suspension system.	
02.16 Check operation and status of instrument panel warning lights and gauges.	
02.17 Inspect under hood area for leaks, damage, and unusual conditions.	
02.18 Inspect undercar area for leaks, damage, and unusual conditions.	
02.19 Inspect engine assembly for fuel, oil, coolant, and other leaks.	
02.20 Determine fluid type requirements and identify fluid.	
02.21 Check engine oil level and condition; service as required.	
02.22 Check engine coolant level and condition; service as required.	
02.23 Inspect cooling system pipes and hoses for wear, damage, and proper routing.	
02.24 Check power steering fluid level and condition; service as required.	
02.25 Lubricate driveline, suspension and steering systems as applicable.	
02.26 Inspect and replace power steering hoses and fittings.	
02.27 Inspect struts, springs, and related components; service as required.	
02.28 Inspect stabilizer bar, bushings, brackets, and links; service as required.	
02.29 Inspect springs, torsion bars, and related components; service as required.	
02.30 Inspect shock absorbers and related components.	
02.31 Check windshield washer fluid level and condition; service as required.	
02.32 Check automatic transmission fluid level and condition; service as required.	
02.33 Check differential/transfer case fluid level; note unusual conditions; service as required.	
02.34 Check manual transmission fluid level; note unusual conditions; service as required.	
02.35 Service transmission; perform visual inspection; replace fluids and filters.	
02.36 Check hydraulic clutch fluid and condition; service as required.	
02.37 Check rear axle drive assembly seals and vents; check lube level.	
02.38 Inspect constant velocity (CV) axle shaft boots; service as required.	

CTE Standards and Benchmarks		Priority Number
02.39	Remove, inspect, and service front and rear wheel bearings on non-drive axles.	
02.40	Check wheel bearings for play and other signs of wear.	
02.41	Inspect, replace and adjust drive belts; inspect tensioners and pulleys.	
02.42	Inspect and replace air filter.	
02.43	Inspect and replace cabin air filter.	
02.44	Inspect tires, diagnose tire wear patterns, inspect spare and mounting system; check and adjust tire pressure; where applicable.	
02.45	Rotate tires according to manufacturer's recommendations.	
02.46	Balance wheel and tire assembly (static, dynamic and road force balance); where applicable.	
02.47	Dismount, inspect, repair, and remount tire on wheel.	
02.48	Repair tire according to industry standards.	
02.49	Identify nitrogen-filled tires.	
02.50	Reinstall wheel; torque wheel fasteners to specification.	
02.51	Perform a visual inspection of a brake drum system.	
02.52	Perform a visual inspection of a disc brake system.	
02.53	Check parking brake operation; check parking brake components for unusual conditions.	
02.54	Check master cylinder for internal and external leaks and proper operation.	
02.55	Fill master cylinder with recommended fluid and seat pads.	
02.56	Check brake fluid level and condition; service as required.	
02.57	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.	
02.58	Identify and use the proper procedures required for cutting tubing and double and ISO flaring.	
02.59	Inspect flexible brake hoses for leaks, kinks, cracks, bulging or wear; tighten loose fittings and supports.	
02.60	Inspect fuel tank, fuel cap and seal; inspect and replace fuel lines, fittings, and hoses; as applicable.	
02.61	Inspect and replace fuel filters as applicable.	
02.62	Inspect exhaust manifold, exhaust pipes, mufflers, resonators, tail pipes, and heat shields; repair or replace as needed.	
02.63	Inspect, test head lamps, tail lamps and stop lamps. Aim headlights.	
02.64	Inspect and replace exterior and courtesy lamps.	
02.65	Check wiper blades, inserts, and arms; replace wiper blades or inserts.	

CTE Standards and Benchmarks	Priority Number
02.66 Lubricate door latches and hinges.	
02.67 Perform slow/fast battery charge.	
02.68 Inspect, clean, fill, and replace battery.	
02.69 Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.	
02.70 Perform battery, starting, and charging system tests using appropriate tester.	
02.71 Perform battery test; determine needed service.	
02.72 Start a vehicle using jumper cables or a battery auxiliary power supply (jump box).	
02.73 Demonstrate knowledge of abnormal key-off battery drain.	
02.74 Perform starter current draw and circuit voltage drop test; determine necessary action.	
02.75 Remove and replace/reinstall starter.	
02.76 Remove, inspect, and replace/reinstall alternator.	
02.77 Observe dash warning lamps during bulb check.	
02.78 Practice recommended precautions when handling static sensitive devices.	
02.79 Check 12 volt non-computer electrical circuits with a test light; determine necessary action.	
02.80 Check voltage and voltage drop in electrical circuits using a digital multi-meter (DMM).	
02.81 Obtain and interpret digital multi-meter (DMM) readings.	
02.82 Check current flow in electrical/electronic circuits and components using an ammeter.	
02.83 Check electrical circuits using fused jumper wires.	
02.84 Inspect and test fusible links, circuit breakers, and fuses; confirm proper circuit operation; replace as needed.	
02.85 Maintain or restore electronic memory functions if required.	
02.86 Inspect and test positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; service or replace as needed.	
02.87 Remove and replace valve cover gaskets.	
02.88 Return cores for rebuilt and exchange items.	
02.89 Inspect driver and passenger restraint system.	
02.90 Demonstrate knowledge of manufacturer policies and procedures.	
02.91 Perform product specific service procedures.	
02.92 Identify and maintain product specific engine systems.	

CTE Standards and Benchmarks	Priority Number
02.93 Identify and maintain product specific automatic transmission systems.	
02.94 Identify and maintain product specific manual transmission systems.	
02.95 Identify and maintain product specific electrical and electronic systems.	
02.96 Identify and maintain product specific heating and A/C systems.	
02.97 Identify and maintain product specific steering and suspension systems.	
02.98 Identify and maintain product specific brake systems.	
02.99 Identify and maintain product specific audio systems.	
02.100 Identify and maintain product specific safety systems.	
02.101 Identify and maintain product specific accessories.	
02.102 Identify product specific engine performance and emission related components	
02.103 Use manufacturer specific scan tool to retrieve P, B, C and U type diagnostic trouble codes.	

Florida Department of Education
Student Performance Standards

Course Number: AER0319
Occupational Completion Point: B
Advanced Automotive Electrical/Electronic System Technician – 400 Hours – SOC Code 49-3023

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

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks	Priority Number
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.	

CTE Standards and Benchmarks		Priority Number
03.48	Perform product specific diagnostic procedures.	
03.49	Locate and interpret vehicle major electrical/electronic components and identification numbers.	
03.50	Identify location of hybrid vehicle high voltage circuits disconnect (service plug) location and safety procedures.	
03.51	Manufacturer specific battery test; determine necessary action.	
03.52	Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.	
03.53	Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action.	
03.54	Perform product specific electrical/electronic relearning procedures	
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.	
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.	
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.	
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.	

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 NATEF 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. Program must offer EPA section 609 recognized refrigerant-recycling certification training.

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 10.0, and Reading 10.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Advanced Automotive Service Technology 2**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T600200
CIP Number	0647060414
Grade Level	30, 31
Standard Length	1600 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
Basic Skills Level	Mathematics: 10 Language: 10 Reading: 10

Purpose

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

For institutions using this framework, the National Automotive Technicians Education Foundation (NATEF) highly recommends the Master Automotive Service Technology (MAST) program Certification/Accreditation. Florida Statute (F.S.) 1004.925 – Automotive service technology education programs; certification. – requires all automotive service technology education programs shall be industry certified in accordance with rules adopted by the State Board of Education.

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

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	SOC Code
A	AER0118	Advanced Engine Repair Technician	AUTO IND @7 %7 %G AUTO MECH @7 7G	200 hours	49-3023
B	AER0258	Advanced Automatic Transmission and Transaxle Technician		200 hours	49-3023
C	AER0275	Advanced Manual Drivetrain and Axle Technician		200 hours	49-3023
D	AER0459	Advanced Automotive Suspension and Steering Technician		200 hours	49-3023
E	AER0419	Advanced Automotive Brake System Technician		200 hours	49-3023
F	AER0173	Advanced Automotive Heating and Air Conditioning Technician		200 hours	49-3023
G	AER0506	Advanced Automotive Engine Performance Technician		400 hours	49-3023

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: Advanced Automotive Service Technology 2
Career Certificate Program Number: T600200

Course Number: AER0018
Occupational Completion Point: A
Advanced Engine Repair Technician – 200 Hours – SOC Code 49-3023

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

CTE Standards and Benchmarks		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	P-1

CTE Standards and Benchmarks		Priority Number
	threads and repair internal threads with thread insert.	
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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks	Priority Number
Manufacturer Specific Engine Repair Tasks	
01.52 Inspect and replace engine cooling and heater system hoses.	
01.53 Service product specific water pumps.	
01.54 Service product specific belt drive and tensioner systems.	
01.55 Service product specific engine systems.	
01.56 Diagnose engine noises and vibrations; determine necessary action.	
01.57 Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.	
01.58 Perform engine vacuum tests; determine necessary action.	
01.59 Service product specific cam drive systems.	
01.60 Perform product specific valve adjustments.	
01.61 Perform cylinder power balance tests; determine necessary action.	
01.62 Perform cylinder cranking and running compression tests; determine necessary action.	
01.63 Perform cylinder leakage tests; determine necessary action.	
01.64 Remove and replace piston pin; where applicable.	
01.65 Service product specific engines	
01.66 Perform product specific relearn procedure	

Florida Department of Education
Student Performance Standards

Course Number: AER0258
Occupational Completion Point: B
Advanced Automatic Transmission and Transaxle Technician – 200 Hours – SOC Code 49-3023

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**

CTE Standards and Benchmarks		**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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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.	
02.41	Inspect bands and drums; determine necessary action.	
02.42	Service product specific automatic transmissions/transaxles.	
02.43	Perform product specific relearn procedure.	
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.	
02.45	Differentiate between engine performance, or other vehicle systems, and transmission/transaxle related problems; determine necessary action.	
02.46	Diagnose shift quality concerns resulting from problems in the electronic transmission control system; determine necessary action.	

Florida Department of Education
Student Performance Standards

Course Number: AER0275
Occupational Completion Point: C
Advanced Manual Drivetrain and Axle Technician – 200 Hours – SOC Code 49-3023

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**

CTE Standards and Benchmarks		**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	P-1

CTE Standards and Benchmarks		Priority Number
	springs; perform needed action.	
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

CTE Standards and Benchmarks	Priority Number
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	

CTE Standards and Benchmarks		Priority Number
03.51	Locate and interpret vehicle major drivetrain components and identification numbers.	
03.52	Diagnose fluid loss, level, and condition concerns; determine necessary action.	
03.53	Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.	
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.	
03.55	Remove and reinstall manual transmission/transaxle.	
03.56	Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action.	
03.57	Inspect, replace, and align powertrain mounts.	
03.58	Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.	
03.59	Remove and replace transaxle final drive.	
03.60	Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.	
03.61	Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action.	
03.62	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.	
03.63	Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly.	
03.64	Inspect lubrication devices (oil pump or slingers); perform necessary action.	
03.65	Inspect, test, and replace transmission/transaxle sensors and switches.	
03.66	Inspect, service, and replace shaft center support bearings.	
03.67	Diagnose noise and vibration concerns; determine necessary action.	
03.68	Inspect and reinstall limited slip differential components.	
03.69	Remove and reinstall transfer case.	
03.70	Service product specific clutch assembly	
03.71	Service product specific manual transmission/transaxles	
03.72	Service product specific driveaxles/driveshafts	
03.73	Service product specific transfer cases	

Florida Department of Education
Student Performance Standards

Course Number: AER0459
Occupational Completion Point: D
Advanced Automotive Suspension and Steering Technician – 200 Hours – SOC Code 49-3023

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

CTE Standards and Benchmarks	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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks	Priority Number
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.	
04.59 Service product specific ride height control systems.	
04.60 Locate and interpret vehicle major suspension components and identification numbers.	
04.61 Adjust non-rack and pinion worm bearing preload and sector lash.	
04.62 Reinstall wheel; torque lug nuts.	
04.63 Service product specific tire pressure monitoring systems	
04.64 Service product specific electric power steering systems	
04.65 Reset product specific steering wheel sensors	
04.66 Interpret diagnostic trouble codes (DTCs) and scan tool data related to the steering and suspension control systems; determine necessary action.	
04.67 Perform multiplex check to determine that all steering and suspension components are communicating and are performing within specifications.	

Florida Department of Education
Student Performance Standards

Course Number: AER0419
Occupational Completion Point: E
Advanced Automotive Brake System Technician – 200 Hours – SOC Code 49-3023

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**

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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	
05.58	Service product specific traction control systems.	
05.59	Locate and interpret vehicle major brake component and identification numbers (VIN, vehicle certification labels, calibration decals).	
05.60	Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.	
05.61	Install wheel, torque lug nuts, and make final checks and adjustments associated with drum brakes.	
05.62	Install wheel, torque lug nuts, and make final checks and adjustments associated with disc brakes.	
05.63	Remove and install electronic brake control system electrical/electronic and hydraulic components.	
05.64	Service product specific braking systems.	
05.65	Perform product specific brakes relearn procedures	
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.	
05.67	Perform multiplex check to determine that all brake, traction control and vehicle stability control components are communicating and are performing within specifications.	

Florida Department of Education
Student Performance Standards

Course Number: AER0173
Occupational Completion Point: F
Advanced Automotive Heating and Air Conditioning Technician – 200 Hours – SOC Code 49-3023

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

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks	Priority Number
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

CTE Standards and Benchmarks		Priority Number
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.	
06.38	Locate and interpret vehicle heating and air conditioning major components and identification numbers.	
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.	
06.40	Inspect, test, and replace thermostat and gasket/seal.	
06.41	Determine coolant condition and coolant type for vehicle application; drain and recover coolant.	
06.42	Flush system; refill system with recommended coolant; bleed system.	
06.43	Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.	
06.44	Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.	
06.45	Service product specific hybrid heating and A/C systems.	
06.46	Perform product specific heating and A/C relearn procedure	
06.47	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the Heating and Air Conditioning systems; determine necessary action.	
06.48	Perform multiplex check to determine that Heating and Air Conditioning components are communicating and are performing within specifications.	
06.49	Identify proper service precautions and procedures for R1234yf systems.	

Florida Department of Education
Student Performance Standards

Course Number: AER0506
Occupational Completion Point: G
Advanced Automotive Engine Performance Technician – 400 Hours – SOC Code 49-3023

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 =	21
P-2 =	20
P-3 =	2
Total	43

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		Priority Number
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 codes when applicable.	P-1
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

CTE Standards and Benchmarks		Priority Number
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.	
07.45	Remove and replace timing belt; verify correct camshaft timing.	
07.46	Remove and replace thermostat and gasket/seal.	

CTE Standards and Benchmarks		Priority Number
07.47	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	
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.	
07.49	Inspect engine oil and/or filter for condition and determine necessary action.	
07.50	Identify hybrid vehicle internal combustion engine service precautions.	
07.51	Demonstrate proficiency in use of computer-based information systems.	
07.52	Perform product specific OBD II drive cycle diagnostic tests.	
07.53	Service product specific ignition systems.	
07.54	Inspect and test distributor; service as needed.	
07.55	Perform exhaust system back-pressure test; determine needed action.	
07.56	Service product specific fuel injection systems.	
07.57	Locate and interpret vehicle engine performance major components and identification numbers.	
07.58	Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.	
07.59	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.	
07.60	Check for module communication (including CAN/BUS systems) errors using a scan tool.	
07.61	Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.	
07.62	Inspect and test mechanical components of secondary air injection systems; perform necessary action.	
07.63	Demonstrate knowledge of direct injection systems.	
07.64	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the engine control systems; determine necessary action.	
07.65	Perform multiplex check to determine that engine control components are communicating and are performing within specifications.	
07.66	Perform universal drive cycle to run monitors and erase permanent DTCs.	

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 NATEF 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. Program must offer EPA section 609 recognized refrigerant-recycling certification training.

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 10.0, and Reading 10.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Aviation Airframe Mechanics**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T640300
CIP Number	0647060703
Grade Level	30, 31
Standard Length	1,350 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3011 – Aircraft Mechanics and Service Technicians
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 10

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	SOC Code
A	AMT0705	Aviation Maintenance General Technician	AIR MECH @7 7G	450 hours	49-3011
	AMT0765	Aviation Maintenance Airframe Technician 1		450 hours	
B	AMT0766	Aviation Maintenance Airframe Technician 2		450 hours	49-3011

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 Number: AMT0705
Occupational Completion Point: A
Aviation Maintenance General Technician – 450 Hours – SOC Code 49-3011

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.

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		FAA FAR Part 147
	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:	

CTE Standards and Benchmarks		FAA FAR Part 147
	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

CTE Standards and Benchmarks		FAA FAR Part 147
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 in order to display the FAA Airframe and Powerplant license.	

Florida Department of Education
Student Performance Standards

Course Number: AMT0765
Occupational Completion Point: B (1 of 2)
Aviation Maintenance Airframe Technician 1 – 450 Hours – SOC Code 49-3011

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.

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		FAA FAR Part 147
	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
	20.06 Jack aircraft.	App. C, I, F, 27. 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 Inspect, check, service, and repair landing gear, retraction systems, shock struts, brakes, wheels, tires, and steering systems.	App. C, II, A, 29. Level 3
	22.02 Utilize proper safety procedures and equipment when working on aircraft with electrical or hydraulic power on.	
	22.03 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

CTE Standards and Benchmarks		FAA FAR Part 147
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 Number: AMT0766
Occupational Completion Point: B (2 of 2)
Aviation Maintenance Airframe Technician 2 – 450 Hours – SOC Code 49-3011

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.

CTE Standards and Benchmarks		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:	

CTE Standards and Benchmarks		FAA FAR Part 147
	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.	
	34.06 Identify the business skills needed to operate an Aviation Airframe 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.

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 9.0, and Reading 10.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Aviation Powerplant Mechanics**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T640400
CIP Number	0647060801
Grade Level	30, 31
Standard Length	1,350 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3011 – Aircraft Mechanics and Service Technicians
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 10

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	SOC Code
A	AMT0705	Aviation Maintenance General Technician	AIR MECH @7 7G	450 hours	49-3011
	AMT0775	Aviation Maintenance Powerplant Technician 1		450 hours	
B	AMT0776	Aviation Maintenance Powerplant Technician 2		450 hours	49-3011

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 Number: AMT0705
Occupational Completion Point: A
Aviation Maintenance General Technician – 450 Hours – SOC Code 49-3011

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.

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		FAA FAR Part 147
	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:	

CTE Standards and Benchmarks		FAA FAR Part 147
	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

CTE Standards and Benchmarks		FAA FAR Part 147
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 in order to display the FAA Airframe and Powerplant license.	

Florida Department of Education
Student Performance Standards

Course Number: AMT0775
Occupational Completion Point: B (1 of 2)
Aviation Maintenance Powerplant Technician 1 – 450 Hours – SOC Code 49-3011

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.

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		FAA FAR Part 147
	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 Number: AMT0776
Occupational Completion Point: B (2 of 2)
Aviation Maintenance Powerplant Technician 2 – 450 Hours – SOC Code 49-3011

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.

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		FAA FAR Part 147
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	

CTE Standards and Benchmarks		FAA FAR Part 147
	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.

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Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 9.0, and Reading 10.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Diesel Systems Technician 1**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T650100
CIP Number	0647061305
Grade Level	30, 31
Standard Length	1050 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3031 – Bus and Truck Mechanics and Diesel Engine Specialists
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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	SOC Code
A	DIM0101	Diesel Engine Mechanic/Technician Helper	DIESEL MECH @7 7G	150 hours	49-9098
B	DIM0102	Diesel Electrical and Electronics Technician		300 hours	49-3031
C	DIM0104	Diesel Engine Technician		300 hours	49-3031
D	DIM0105	Diesel Brakes Technician		300 hours	49-3031

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.
  20.01 Fuel supply system.
  20.02 Electronic fuel management system.
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 Number: DIM0101
Occupational Completion Point: A
Diesel Engine Mechanic/Technician Helper – 150 Hours – SOC Code 49-3031

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

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
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

CTE Standards and Benchmarks		Priority Number
	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

CTE Standards and Benchmarks		Priority Number
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

Florida Department of Education
Student Performance Standards

Course Number: DIM0102
Occupational Completion Point: B
Diesel Electrical and Electronics Technician – 300 Hours – SOC Code 49-3031

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**

CTE Standards and Benchmarks		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:	

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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	Check operation of keyless and remote lock/unlock devices; determine needed action.	P-3
13.17	Inspect and test engine cooling fan electrical control components/modules, wiring; repair or replace as needed.	P-2
13.18	Identify causes of data bus communication problems; determine needed action.	P-2

Florida Department of Education
Student Performance Standards

Course Number: DIM0104
Occupational Completion Point: C
Diesel Engine Technician – 300 Hours – SOC Code 49-3031

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

CTE Standards and Benchmarks		Priority Number
14.0	General engine diagnosis and repair.-The student will be able to:	
14.01	Inspect fuel, oil, Diesel Exhaust Fluid (DEF) and 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.	

CTE Standards and Benchmarks		Priority Number
14.11	Perform exhaust back pressure test; determine needed action.	
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 injector sleeves and seals; measure injector tip or nozzle protrusion; perform needed action.	P-3
15.05	Inspect valve train components; determine needed action.	P-1
15.06	Reassemble cylinder head.	P-3
15.07	Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash.	P-3
15.08	Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness; determine needed action.	P-1
15.09	Inspect and adjust valve bridges (crossheads); adjust valve clearances and injector settings.	P-2
15.10	Remove, clean, inspect for visible damage, and replace cylinder head(s) assembly.	
15.11	Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action.	
15.12	Inspect pushrods, rocker arms, rocker arm shafts, and blocked oil passages; perform needed action.	
15.13	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	Inspect, measure, and replace/reinstall in-block camshaft; measure/adjust end play.	P-3

CTE Standards and Benchmarks		Priority Number
16.09	Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action.	P-2
16.10	Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play.	P-2
16.11	Inspect, install, and time gear train; measure gear backlash; determine needed action.	P-2
16.12	Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action.	P-3
16.13	Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons.	P-3
16.14	Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.	P-2
16.15	Check condition of piston cooling jets (nozzles); determine needed action.	P-2
16.16	Inspect and measure crankshaft vibration damper; determine needed action.	P-3
16.17	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.	P-3
16.18	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 and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment.	P-1
18.04	Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.	P-2
18.05	Recover coolant, flush, and refill with recommended coolant/additive package; bleed cooling system.	P-1

CTE Standards and Benchmarks			Priority Number
	18.06	Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed (if equipped).	P-1
	18.07	Inspect water pump and hoses; replace as needed.	P-1
	18.08	Inspect, clean, and pressure test radiator. Pressure test cap, tank(s), and recovery systems; determine needed action.	P-1
	18.09	Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.	P-1
	18.10	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	Remove and reinstall turbocharger/wastegate assembly.	P-3
	19.08	Inspect intake manifold, gaskets, and connections; replace as needed.	P-3
	19.09	Inspect, clean, and test charge air cooler assemblies; replace as needed.	P-2
	19.10	Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed.	P-2
	19.11	Inspect exhaust after treatment devices; determine necessary action.	P-2
	19.12	Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed action.	P-2
	19.13	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	
		20.01.1 Check fuel level, and condition; determine needed action.	P-1
		20.01.2 Perform fuel supply and return system tests; determine needed action.	P-1
		20.01.3 Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action.	P-1

CTE Standards and Benchmarks			Priority Number
	20.01.4	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
	20.01.5	Inspect and test pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action.	P-1
	20.01.6	Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump.	P-1
20.02	Electronic fuel management system		
	20.02.1	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.	P-1
	20.02.2	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
	20.02.3	Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; clear codes; determine further diagnosis.	P-1
	20.02.4	Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).	P-1
	20.02.5	Inspect and replace electrical connector terminals, seals, and locks.	P-1
	20.02.6	Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed.	P-1
	20.02.7	Using electronic service tool(s) access and interpret customer programmable parameters.	P-1
	20.02.8	Perform on-engine inspections, test and adjustments on electronic unit injectors (EUI); determine needed action	P-2
	20.02.9	Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable).	P-2
	20.02.10	Perform cylinder contribution test utilizing electronic service tool(s).	P-1
	20.02.11	Perform on-engine inspections and tests on hydraulic electronic unit injectors (HEUI) and system electronic controls; determine needed action.	P-2
	20.02.12	Perform on-engine inspections and tests on hydraulic electronic unit injector (HEUI) high pressure oil supply and control systems; determine needed action.	P-2
	20.02.13	Perform on-engine inspections and tests on high pressure common rail (HPCR) type injection systems; determine needed action.	P-2
	20.02.14	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

CTE Standards and Benchmarks		Priority Number
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

Florida Department of Education
Student Performance Standards

Course Number: DIM0105
Occupational Completion Point: D
Diesel Brakes Technician – 300 Hours – SOC Code 49-3031

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

CTE Standards and Benchmarks		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 drive gear, belts and coupling; adjust or replace as needed.	P-3
22.05	Inspect air compressor inlet; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed.	P-1
22.06	Inspect and test air system pressure controls: governor, unloader assembly valves, filters, lines, hoses, and fittings; replace as needed.	P-1
22.07	Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed.	P-1
22.08	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
22.09	Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; repair or replace as needed.	P-1

CTE Standards and Benchmarks		Priority Number
22.10	Inspect and test brake application (foot/treadle) valve, fittings, and mounts; check pedal operation; replace as needed.	P-1
22.11	Inspect and test stop light circuit switches, wiring, and connectors; repair or replace as needed.	P-1
22.12	Inspect and test hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed.	P-1
22.13	Inspect and test brake relay valve; replace as needed.	P-1
22.14	Inspect and test quick release valves; replace as needed.	P-1
22.15	Inspect and test tractor protection valve; replace as needed.	P-1
22.16	Inspect and test emergency (spring) brake control/modulator valve(s); replace as needed. (as applicable)	P-1
22.17	Inspect and test low pressure warning devices, wiring, and connectors; repair or replace as needed.	P-1
22.18	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

CTE Standards and Benchmarks		Priority Number
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	Check and adjust brake pedal pushrod length.	
25.09	Inspect and clean wheel cylinders; replace as needed.	
25.10	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

CTE Standards and Benchmarks		Priority Number
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 National Automotive Technicians Education Foundation (NATEF).

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(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 a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 9.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Diesel Systems Technician 2**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T650200
CIP Number	0647061306
Grade Level	30, 31
Standard Length	750 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3031 – Bus and Truck Mechanics and Diesel Engine Specialists
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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	SOC Code
A	DIM0103	Diesel Engine Preventative Maintenance Technician	DIESEL MECH @7 7G	150 hours	49-3031
B	DIM0106	Diesel Heating and Air Conditioning Technician		150 hours	49-3031
C	DIM0107	Diesel Steering and Suspension Technician		150 hours	49-3031
D	DIM0108	Diesel Drivetrain Technician		150 hours	49-3031
E	DIM0109	Diesel Hydraulics Technician		150 hours	49-3031

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 Number: DIM0103
Occupational Completion Point: A
Diesel Engine Preventative Maintenance Technician – 150 Hours – SOC Code 49-3031

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**

CTE Standards and Benchmarks		**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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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 (load and/or 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

CTE Standards and Benchmarks		Priority Number
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 glad-hands.	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

CTE Standards and Benchmarks		Priority Number
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 inter-axle 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

CTE Standards and Benchmarks		Priority Number
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	Re-torque 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

Florida Department of Education
Student Performance Standards

Course Number: DIM0106
Occupational Completion Point: B
Diesel Heating and Air Conditioning Technician – 150 Hours – SOC Code 49-3031

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**

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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 (hydraulic, 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

CTE Standards and Benchmarks	Priority Number
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.	

Florida Department of Education
Student Performance Standards

Course Number: DIM0107
Occupational Completion Point: C
Diesel Steering and Suspension Technician – 150 Hours – SOC Code 49-3031

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

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
	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

Florida Department of Education
Student Performance Standards

Course Number: DIM0108
Occupational Completion Point: D
Diesel Drivetrain Technician – 150 Hours – SOC Code 49-3031

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

CTE Standards and Benchmarks		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 (includes push and pull-type assemblies); check pedal height and travel; perform needed action.	P-1
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

CTE Standards and Benchmarks		Priority Number
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 multi-meter (DMM) readings; determine needed action.	P-1

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks		Priority Number
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

Florida Department of Education
Student Performance Standards

Course Number: DIM0109
Occupational Completion Point: E
Diesel Hydraulics Technician – 150 Hours – SOC Code 49-3031

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

CTE Standards and Benchmarks		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

CTE Standards and Benchmarks		Priority Number
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

CTE Standards and Benchmarks	Priority Number
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 National Automotive Technicians Education Foundation (NATEF).

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(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 a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 9.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Construction Vehicle Technician**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T650500
CIP Number	0649020202
Grade Level	30, 31
Standard Length	600 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	47-2073 – Operating Engineers and Other Construction Equipment Operators 53-3033 – Light Truck or Delivery Service Drivers
Basic Skills Level	Mathematics: 8 Language: 8 Reading: 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 as Construction Vehicle Operators/dump truck drivers, (SOC 53-3033) and Construction Equipment Operators (SOC 47-2073).

The content includes but is not limited to the following: operation of construction vehicles, loading and unloading cargo; reporting delays or accidents on the road; verifying load against shipping papers; and keeping records. The course content should also include instruction in human relations, leadership, communication, 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.

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	SOC Code
A	TRA0073	Construction Vehicle Driver	COMM DRIV @7 7G OPER ENGR @7 7G	200 hours	53-3033
B	TRA0074	Construction Vehicle Maintenance Technician		150 hours	47-2073
C	TRA0075	Construction Vehicle Operator		250 hours	47-2073

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 Perform vehicle maintenance and servicing procedures.
07.0 Demonstrate basic vehicle control procedures.
08.0 Demonstrate backing skills and basic vehicle maneuvers.
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).
12.0 Demonstrate understanding of procedures.
13.0 Demonstrate understanding of operation and maintenance of mechanical systems and engines.
14.0 Operate construction equipment as applicable.

Florida Department of Education
Student Performance Standards

Program Title: Construction Vehicle Technician
Career Certificate Program Number: T650500

Course Number: TRA0073
Occupational Completion Point: A
Construction Vehicle Driver – 200 Hours – SOC Code 53-3033

Course Description:
The Construction Vehicle Driver course prepares students for entry into the construction vehicle industry. Students explore career opportunities and requirements of a construction vehicle 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.

CTE Standards and Benchmarks	
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.
01.05	Describe personal safety equipment and procedures.
01.06	Describe actions applicable for vehicle accidents.
01.07	Complete 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	Complete 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	Describe and 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	Perform 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 how to load and unload cargo safely and efficiently.
03.02	Understand legal gross weight and axle weight.
03.03	Describe cargo load to meet legal weight and safety requirements.
03.04	Understand how to secure cargo using blocking, bracing, packing, rope, cable, chains and strapping.
03.05	Identify types of hazardous cargoes.
03.06	Understand the placement of placards when carrying hazardous materials.
03.07	Understand procedure for use of common cargo handling equipment, including pallets, jacks, dollies, hand-trucks, nets, slings, poles and other equipment.
03.08	Understand categories of hazardous materials and the need for specialized training to handle hazardous materials.
03.09	Understand hazardous materials documentation requirements.
03.10	Verify nature, amount and condition of cargo on both pickup and delivery.
03.11	Verify information on bill of lading and properly record and report discrepancies and damage to the cargo.
03.12	Verify appropriate signatures on delivery receipts and other required forms.
03.13	Prepare a bill of lading/manifest.
03.14	Verify door seal number against shipping document.

	03.15 Describe the handling of C.O.D. shipments.
	03.16 Comply with inspection station procedures.
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 Arrange a secure place for vehicle on layovers, especially when transporting hazardous materials.
	04.06 Demonstrate map reading skills.
	04.07 Estimate travel time and plan rest stops and layovers.
	04.08 Estimate fuel consumption and plan fuel stops.
	04.09 Estimate expense money and obtain funds and/or credit cards.
05.0	Demonstrate vehicle inspection procedures.-The student will be able to:
	05.01 Check for previous days DVIR.
	05.02 Check general appearance and condition of vehicle.
	05.03 Check fuel, oil, water levels, automatic transmission fluid level and diesel emissions fluid (DEF).
	05.04 Check signal lights, stoplights and running lights.
	05.05 Check tires, rims and suspension.
	05.06 Check horn, windshield wipers, mirrors and reflectors.
	05.07 Check emergency bi-directional reflective triangles and fire extinguishers.
	05.08 Check instruments for normal readings.
	05.09 Check steering system, brake action and tractor protection valve.
	05.10 Check cargo blocking, bracing and tie down.
	05.11 Perform enroute inspections.
	05.12 Perform post-trip inspection of vehicle and all systems.
06.0	Perform vehicle maintenance and servicing procedures.-The student will be able to:
	06.01 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.

06.02	Check engine fuel, oil, coolant, battery and filters.
06.03	Check tire air pressure.
06.04	Check for proper tire and wheel mounting.
06.05	Drain moisture from air brake supply reservoirs.
06.06	Check brakes and related systems.
06.07	Clean and repair lights.
06.08	Check fuses and reset circuit breakers.
06.09	Clean interior and exterior of vehicle.
06.10	Check mud/rain flaps.
07.0	Demonstrate basic vehicle control procedures.-The student will be able to:
07.01	Place transmission in neutral before starting engine.
07.02	Start, warm up and shut down the engine, according to the manufacturer's specifications.
07.03	Build full pressure (120-140 PSI) in air tanks or to governed cut-out.
07.04	Test parking brake and service brake before moving/driving vehicle.
07.05	Coordinate use of accelerator and clutch to achieve smooth acceleration and avoid clutch abuse.
07.06	Maintain proper engine RPM while driving.
07.07	Properly modulate air brakes to bring vehicle to a smooth stop.
07.08	Properly shift up and down through all gears using clutch.
07.09	Double clutch non-synchronized transmissions and time shift for smooth and fuel efficient performance.
07.10	Select proper gear for speed and highway conditions.
07.11	Operate automatic and semiautomatic transmissions.
07.12	Coordinate steering, braking and acceleration to take the vehicle through a desired path forward and backward in a straight line.
07.13	Use clutch and gears to maintain proper operating range/power/RPM of the motor while slowing the vehicle.
07.14	Park the vehicle, set brakes and shut off the engine.
07.15	Properly chock/block wheels where and when required.
08.0	Demonstrate backing skills and basic vehicle maneuvers.-The student will:
08.01	Check area before and during backing.
08.02	Properly utilize guides and mirrors.

08.03	Properly back in straight line and curved paths.
08.04	Properly back into an alley dock.
08.05	Back 100 feet through an alley.
08.06	Make proper straight in approach during offset backing maneuvers.
08.07	Properly position unit for backing into a loading dock.
08.08	Properly back to a dock. (actual or simulated)
08.09	Properly stop unit within 36 inches of the dock without contacting dock. (actual or simulated)
08.10	Properly Parallel Park.
08.11	Judge side, rear and overhead clearances and path of the trailer.
08.12	Make a straight-in approach to an alley.
08.13	Drive forward through an alley for 100 feet.
09.0	Demonstrate road driving skills.-The student will be able to:
09.01	Carefully enter traffic from parked position.
09.02	Use clutch and gears properly.
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 well in advance of turn.
09.07	Check traffic conditions and turn only when intersection is clear.
09.08	Restrict traffic from passing on right when preparing to complete a right hand turn. Maintain 3 feet or less on right side of vehicle.
09.09	Execute a right hand turn maintaining 3 feet or less on right side of vehicle.
09.10	Complete a turn promptly and safely and not impede other traffic.
09.11	Select and shift to proper gear prior to beginning any turn.
09.12	Obey all traffic signals.
09.13	Plan stop in advance and adjust speed correctly.
09.14	Use 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.
09.23	Determine sufficient space required for passing.
09.24	Pass only in safe locations.
09.25	Pass on two-lane highway, only when safe to do so.
09.26	Pass on four or more lane highway.
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	Slow down 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	Use horn only when necessary.
09.38	Park only in legally permissible parking areas.
09.39	Check instruments at regular intervals.
09.40	Maintain proper engine RPM while driving.
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	Demonstrate proper procedure for expelling moisture from the air tanks after each trip.

10.03	Understand proper procedure for checking ice accumulation on brakes, slack adjuster, air hoses, electrical wiring and radiator shutters during operation.
10.04	Perform operational adjustments necessary to maintain control in all weather conditions, including speed selection, braking and following distance.
10.05	Describe procedures to check safe operation of brakes after driving through deep water.
10.06	Perform proper use of windshield wipers, washers and defrosters to maintain visibility.
10.07	Observe and evaluate changing road surface conditions.
10.08	Demonstrate or understand ability for recognizing conditions that produce low traction, including initial rainfall, ice, snow and mud.
10.09	Describe and understand procedures to avoid skidding.
10.10	Understand procedures to avoid hydroplaning and describe the road and vehicle conditions that produce it.
10.11	Understand procedures for mounting and dismounting tire chains.
10.12	Understand procedures for extricating the vehicle from snow, sand and mud by maneuvering or towing.
10.13	Demonstrate ability to adjust rate of change in speed and direction to accommodate road conditions to avoid skidding.
10.14	Describe procedures required to coordinate acceleration and shifting to overcome the resistance of snow, sand and mud.
10.15	Demonstrate ability to perform brake checks on equipment prior to mountain driving.
10.16	Understand procedures required to use right lane or special truck lane going up grades.
10.17	Understand procedures required to place transmission in appropriate gear for engine braking before starting downgrade.
10.18	Understand procedures required to use proper braking techniques and maintain proper engine braking before starting downgrades.
10.19	Understand proper use of truck escape ramp when brakes fail on a downgrade.
10.20	Understand procedure required for observing temperature gauge frequently when pulling heavy loads up long grades.
10.21	Understand the effect of vehicle weight and speed upon braking and shifting ability on long downgrades.
10.22	Identify the meaning and use of percent of grade signs.
10.23	Understand bringing the truck to a stop in the shortest possible distance while maintaining directional control on a dry surface.
10.24	Understand procedures to make an evasive turn off the roadway and return to the roadway while maintaining directional control.
10.25	Understand procedures to bring the vehicle to a stop in the event of a brake failure.
10.26	Understand procedures to maintain control of the vehicle in the event of a blowout.
10.27	Understand procedures to bring truck to a stop in the shortest possible distance while maintaining directional control when operating on a slippery surface.
10.28	Understand procedures to recover from vehicle skids induced by snow, ice, water, oil, sand, wet leaves or other slippery surfaces.
10.29	Understand procedures to counter-steer out of a skid in a way that will regain directional control and not produce another skid.

	10.30	Understand 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.

Florida Department of Education
Student Performance Standards

Course Number: TRA0074
Occupational Completion Point: B
Construction Vehicle Maintenance Technician – 150 Hours – SOC Code 47-2073

Course Description:
The Construction Vehicle Maintenance Technician course prepares students for entry into the construction vehicle operations industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study shop safety, mechanical systems, and engines.

CTE Standards and Benchmarks	
12.0	Demonstrate understanding of procedures.-The student will be able to:
12.01	Apply safety practices during operation of construction equipment.
12.02	Discuss function of each piece of heavy equipment as appropriate.
12.03	Turn and back-up equipment safely.
12.04	Operate equipment on roadway safely.
13.0	Demonstrate understanding of operation and maintenance of mechanical systems and engines.-The student will be able to:
13.01	Perform preventive maintenance on equipment including greasing, changing oil, and replacing filters.
13.02	Perform additional maintenance based on specific equipment needs.
13.03	Safety check equipment prior to operation.

Florida Department of Education
Student Performance Standards

Course Number: TRA0075
Occupational Completion Point: C
Construction Equipment Operator – 250 Hours – SOC Code 47-2073

Course Description:
The Construction Equipment Operator course is designed to build on the skills and knowledge students for entry into the construction vehicle operator and technician industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study safe tractor operations, back hoe, motor grader and dump truck operations.

CTE Standards and Benchmarks	
01.0	Operate construction equipment (operating engineer).-The student will be able to:
01.01	Apply safety procedures.
01.02	Review “Construction Industry Manufactures Association” safety manuals.
01.03	Safely load dump truck.
01.04	Operate alternative equipment as applicable.

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. Twenty percent or more of the experience will occur at night on both wet and/or dry roads. All students with a Commercial Learners Permit (CLP) must be accompanied by an instructor. Instruction in driving bob-tail, empty and loaded vehicles will be given.

Recommended student to instructor ratios:

- Classroom – 12 to 1
- Lab – Variable
- Range – 6 to 1
- Road Instruction – 4 to 1 per vehicle

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 8.0, Language 8.0, and Reading 8.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Transit Technician 1**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T660100
CIP Number	0647061307
Grade Level	30, 31
Standard Length	620 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3031 – Bus and Truck Mechanics and Diesel Engine Specialists
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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	SOC Code
A	DIM0810	Transit Equipment Preventive Maintenance Technician	DIESEL MECH @7 7G	200 hours	49-3031
B	DIM0811	Transit Basic Electrical Systems Technician		120 hours	49-3031
C	DIM0812	Transit Wheelchair Lift/Ramp Technician		60 hours	49-3031
D	DIM0813	Transit Diesel Engine Preventive Maintenance Technician		120 hours	49-3031
E	DIM0814	Transit Steering and Suspension Technician		120 hours	49-3031

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, AED, and CPR 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 forklift preventive maintenance Ref: 29CFR1910.178.
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 the Cummins Insite 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 Number: DIM0810
Occupational Completion Point: A
Transit Equipment Preventive Maintenance Technician – 200 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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, AED, and CPR 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.
03.02	Understand, set-up, and use the Automated External Defibrillator (AED).
03.03	Learn the capabilities and limitations of cardiopulmonary resuscitation (CPR).
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:
a)	Basic hand tools

CTE Standards and Benchmarks	
	b) Basic welding tools and equipment
	c) Power tools
	d) Measuring and precision tools.
	e) 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 diesel 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.

CTE Standards and Benchmarks	
	06.10 Complete accurately the required information for journals, repair orders, invoices, time cards, job sheets, and forms.
	06.11 Demonstrate telephone and interpersonal communication skills to accurately and courteously exchange information 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 forklift preventive maintenance Ref: 29CFR1910.178.-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:
	a) Air, parking, and anti-locking brake systems, Ref: FMVSS121
	b) Wheels, bearings, hubs, and tires, Ref: TMC RP618
	c) Heating and air-conditioning components, refrigerants, and system operations.
	d) Hydraulic systems, including fluids, filters, lines, and reservoirs.
	e) Tires, suspension, and drive train.
	f) 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, hubo-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.

CTE Standards and Benchmarks	
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:
a)	Quality of work
b)	Work hours and schedule
c)	Actions, initiative, teamwork, dependability, and responsible decision making
d)	Self-control, responses to criticism, and relationships with customers and supervisors
e)	Time management, cost effectiveness, and fair pricing
f)	Personal hygiene, health habits, and professional appearance
g)	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.

Florida Department of Education
Student Performance Standards

Course Number: DIM0811
Occupational Completion Point: B
Transit Basic Electrical Systems Technician – 120 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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:

CTE Standards and Benchmarks	
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.

Florida Department of Education
Student Performance Standards

Course Number: DIM0812
Occupational Completion Point: C
Transit Wheelchair Lift/Ramp Technician – 60 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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, pumps, hoses, and components
17.03	Wheelchair ramp and associated hardware
17.04	Troubleshoot and repair kneeler faults and components.
17.05	Troubleshoot and repair lift hydraulic/electrical system.
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.

Florida Department of Education
Student Performance Standards

Course Number: DIM0813
Occupational Completion Point: D
Transit Diesel Engine Preventive Maintenance Technician – 120 Hours – SOC Code 49-3031

Course Description:
The Transit Diesel 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, employability.

CTE Standards and Benchmarks	
19.0	Demonstrate shop and occupational safety procedures.-The student will be able to:
19.01	Comply with safety regulations for all diesel 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 diesel 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 remove correctly 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.

CTE Standards and Benchmarks	
22.0	Demonstrate a basic familiarity with the Cummins Insite software.-The student will be able to:
	22.01 Enter ESN and retrieve Fault Codes
	22.02 Diagnose and repair Cummins Engine Fault Code
	22.03 Retrieve current Cummins engine manuals and TSB's
	22.04 Search and locate parts using Quick Serve Online (QSOL)
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 diesel engine technician.
	23.03 Demonstrate workplace communication skills required by a diesel engine technician.
	23.04 Demonstrate the application of math and science principles required for a diesel engine technician's job tasks.
	23.05 Demonstrate employability skills as a transit diesel engine technician.

Florida Department of Education
Student Performance Standards

Course Number: DIM0814
Occupational Completion Point: E
Transit Steering and Suspension Technician – 120 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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:
a)	Conventional steering systems
b)	Hydraulic steering systems
c)	Rear-axle suspensions
d)	Front-axle suspensions
e)	Air ride suspension system
f)	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.

CTE Standards and Benchmarks	
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 National Automotive Technicians Education Foundation (NATEF).

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(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 a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 9.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Transit Technician 2**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T660200
CIP Number	0647061308
Grade Level	30, 31
Standard Length	620 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3031 – Bus and Truck Mechanics and Diesel Engine Specialists
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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	SOC Code
A	DIM0820	Transit Hydraulics Technician	DIESEL MECH @7 7G	60 hours	49-3031
B	DIM0821	Transit Diesel Electrical and Diesel Engine Electronics Technician		120 hours	49-3031
C	DIM0822	Transit Drivetrain Technician		120 hours	49-3031
D	DIM0823	Transit Intermediate Electrical Systems Technician		120 hours	49-3031
E	DIM0824	Transit Brakes/Air System Technician		200 hours	49-3031

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 diesel technology.
06.0 Identify and apply electronic principles related to diesel 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 bus 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 transit bus brake and air systems.
17.0 Demonstrate the qualifications for employment.

Florida Department of Education
Student Performance Standards

Program Title: Transit Technician 2
Career Certificate Program Number: T660200

Course Number: DIM0820
Occupational Completion Point: A
Transit Hydraulics Technician – 60 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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:
a)	Hydraulic pumps and motors
b)	Control valves
c)	Hydraulic cylinders
d)	Hydraulic accessories
e)	Hydraulic steering
f)	Hydraulic fan control assembly

CTE Standards and Benchmarks	
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.

Florida Department of Education
Student Performance Standards

Course Number: DIM0821
Occupational Completion Point: B
Transit Diesel Electrical and Diesel Engine Electronics Technician – 120 Hours – SOC Code 49-3031

Course Description:
The Transit Diesel Electrical and Diesel 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.

CTE Standards and Benchmarks	
04.0	Demonstrate shop and occupational safety procedures.-The student will be able to:
04.01	Comply with safety regulations for all diesel electrical and diesel 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 diesel 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.

CTE Standards and Benchmarks	
	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:
	a) Batteries
	b) Instruments and gauges
	07.02 Test and repair the following systems:
	a) Starting
	b) Charging
	c) Ignition
	d) 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 a diesel electrical and diesel engine electronics technician.
	08.02 Demonstrate the use of tools and equipment required for a diesel electrical and diesel engine electronics technician.
	08.03 Demonstrate workplace communication skills required by a diesel electrical and diesel engine electronics technician.
	08.04 Demonstrate the application of math and science principles required for a diesel electrical and diesel engine electronics technician's job tasks.
	08.05 Demonstrate employability skills as a diesel electrical and diesel engine electronics technician.

Florida Department of Education
Student Performance Standards

Course Number: DIM0822
Occupational Completion Point: C
Transit Drivetrain Technician – 120 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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.

Florida Department of Education
Student Performance Standards

Course Number: DIM0823
Occupational Completion Point: D
Transit Intermediate Electrical Systems Technician – 120 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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 bus 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 the following components:
	a) 50 DN Generator
	b) Niehoff Generator
13.05	Perform a Battery Equalizer test and a Diode test.
13.06	Analyze a transit component and corresponding schematic.
13.07	Build and diagnose electrical circuits utilizing the ATEC circuit simulation modules.
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.

CTE Standards and Benchmarks	
14.05	Demonstrate employability skills as a transit bus intermediate electrical systems technician.

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Florida Department of Education
Student Performance Standards

Course Number: DIM0824
Occupational Completion Point: E
Transit Brakes/Air System Technician – 200 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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 air brake systems.
16.02	Service and recondition air brake systems.
16.03	Identify the principles and components of the following brake systems.
a)	Air
b)	Parking
c)	Anti-locking (ABS)

CTE Standards and Benchmarks	
	d) Disc
	e) S-Cam
16.04	Troubleshoot brake systems.
16.05	Service and recondition air brake systems.
16.06	Service and adjust air compressors and governors.
16.07	Service and recondition parking brakes.
16.08	Troubleshoot and service hydraulic booster.
16.09	Remove, inspect, repair, and replace brake pads, shoes, linings, cams, cam bearings, springs, brake air chambers, drums, and rotors.
16.10	Troubleshoot and service air system valves, tanks, lines, and fittings.
16.11	Troubleshoot brake and air system utilizing air brake board.
16.12	Perform a brake performance test utilizing FMVSS121.
16.13	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 National Automotive Technicians Education Foundation (NATEF).

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(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 a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 9.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement

(Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Transit Technician 3**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T660300
CIP Number	0647061309
Grade Level	30, 31
Standard Length	680 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3031 – Bus and Truck Mechanics and Diesel Engine Specialists
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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	SOC Code
A	DIM0830	Transit Alternative Fuels System Technician	DIESEL MECH @7 7G	120 hours	49-3031
B	DIM0831	Transit Advanced Electrical Systems Technician		120 hours	49-3031
C	DIM0832	Transit Heating And Air-Conditioning Technician		200 hours	49-3031
D	DIM0833	Transmission Diagnosis, Rebuild And Repair Technician		120 hours	49-3031
E	DIM0834	Diesel Engine Diagnosis, Rebuild And Repair Technician		120 hours	49-3031

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 bus 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 bus transmission assemblies.
12.0 Maintain, diagnose, repair, and rebuild transit bus 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 diesel technology tasks.
17.0 Apply scientific principles common to diesel 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 Number: DIM0830
Occupational Completion Point: A
Transit Alternative Fuels System Technician – 120 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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:
	a) ESS Energy Storage System
	b) DPIM Dual Power Inverter Module
	c) TCM/VCM
	d) EP40/50
	e) BAE Electric Systems-series-battery
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 Bio-diesel, CNG, E85 Ethanol, and EP40 hybrid-electric.
02.05	Demonstrate the unique characteristics of CNG as an Alternative Fuel.
02.06	Demonstrate a working knowledge of CNG fuel systems and components.
02.07	Demonstrate proper diagnostic procedures for the CNG fuel system.

CTE Standards and Benchmarks	
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 gas safety, Maintenance, Base Engine, Combustion Air System, Fuel system & Fuel Control system, Electronic Control System.
02.11	Identify various CNG cylinders types and installations, Inspect CNG cylinders for damage and 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 fuels systems technician.
03.02	Demonstrate the use of tools and equipment required for an alternative fuels systems technician.
03.03	Demonstrate workplace communication skills required by an alternative fuels 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.

Florida Department of Education
Student Performance Standards

Course Number: DIM0831
Occupational Completion Point: B
Transit Advanced Electrical Systems Technician – 120 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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 the ATEC circuit simulation modules.-The student will be able to:
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 multiplex electrical system and 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.

Florida Department of Education
Student Performance Standards

Course Number: DIM0832
Occupational Completion Point: C
Transit Heating and Air-Conditioning Technician – 200 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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 bus 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.

CTE Standards and Benchmarks	
	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.

Florida Department of Education
Student Performance Standards

Course Number: DIM0833
Occupational Completion Point: D
Transmission Diagnosis, Rebuild and Repair Technician – 120 Hours – SOC Code 49-3031

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.

CTE Standards and Benchmarks	
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 bus 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 bus 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.

CTE Standards and Benchmarks	
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 bus transmission diagnosis, rebuild and repair technician.

Florida Department of Education
Student Performance Standards

Course Number: DIM0834
Occupational Completion Point: E
Diesel Engine Diagnosis, Rebuild and Repair Technician – 120 Hours – SOC Code 49-3031

Course Description:
The Diesel 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.

CTE Standards and Benchmarks	
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 basic principles in the operation of the four-stroke-cycle diesel engine.
15.02	Identify engine assemblies and systems.
15.03	Explain the operating principles of two-and four-stroke cycle engines.
15.04	Identify the components of two-and four-stroke-cycle engines.
16.0	Apply math skills to diesel technology tasks.-The student will be able to:
16.01	Apply math skills commonly required for performing job duties in diesel technology occupations.
a)	Recognize, identify, and make metric conversions.
b)	Solve problems for volume, weight, area, circumference, and perimeter measurements for rectangles, squares, and cylinders.
c)	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet, and inches.
d)	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 diesel technology operations.-The student will be able to:
17.01	Explain molecular action caused by temperature extremes, chemical reaction, and moisture content.

CTE Standards and Benchmarks	
	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 diesel fuel-injection systems and components.
	a) 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.
	b) Prime and bleed fuel-injection system.
	c) Remove, test, and adjust injectors and nozzles using Cummins Insite.
	d) Remove, repair, and replace individual components as needed.
18.0	Rebuild a cylinder-head assembly.-The student will be able to:
	18.01 Diagnose valve and head problems using the visual inspection method.
	18.02 Diagnose valve and head problems using the compression-tester or cylinder air-pressure method.
	18.03 Diagnose valve and head problems using the stethoscope method.
	18.04 Disassemble engines.
	18.05 Clean and inspect the heads for cracks, warping, and injector sleeves.
	18.06 Inspect the valve seat and check for warping, burns, cracks, and stem and tip wear.
	18.07 Grinds valve seats and reface valves.
	18.08 Check and inspect springs for free height, distortion, and installed height.
	18.09 Adjust the valve lash.
19.0	Remove and replace camshaft assemblies.-The student will be able to:
	19.01 Remove and inspect camshaft bearings and lifters.
	19.02 Time valve-drive assemblies.
20.0	Rebuild a block assembly.-The student will be able to:
	20.01 Remove the pistons from the rod assemblies.

CTE Standards and Benchmarks	
20.02	Measure out-of-round and cylinder taper using a dial bore gauge or inside micrometer.
20.03	Check the piston pins and boss for wear.
20.04	Measure the piston ring lands width, out-of-round, and taper.
20.05	Measure the piston ring gap in a cylinder bore.
20.06	Install and fit the piston pins.
20.07	Check the rod-and-piston assembly alignment.
20.08	Remove and replace the rod bearings.
20.09	Hone and clean the cylinders, check cross hatching.
20.10	Install rings on the pistons.
20.11	Measure and check the crankshafts with a micrometer.
20.12	Check the bearing bore with a telescope gauge.
20.13	Reassemble engines using a plastic gauge.
20.14	Install oil seals.
20.15	Check for end play on crankshaft and camshaft.
20.16	Check camshaft backlash.
21.0	Demonstrate the qualifications for employment.-The student will be able to:
21.01	Demonstrate shop organization, management, and safety requirements for a transit diesel engine diagnosis, rebuild and repair technician.
21.02	Demonstrate the use of tools and equipment required for a transit diesel engine diagnosis, rebuild and repair technician.
21.03	Demonstrate workplace communication skills required by a transit diesel engine diagnosis, rebuild and repair technician.
21.04	Demonstrate the application of math and science principles required for a transit diesel engine diagnosis, rebuild and repair technician’s job tasks.
21.05	Demonstrate employability skills as a transit bus diesel 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 National Automotive Technicians Education Foundation (NATEF).

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(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 a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 9.0, Language 9.0, and Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement

(Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

Accommodations

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

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