Florida Department of Education
Curriculum Framework

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

PSAV – Career Preparatory	
Program Number	l470608
CIP Number	0647060405
Grade Level	30, 31
Standard Length	1800 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml
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 nine occupational completion points.

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

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 PSAV program structure:

A	AER0014	Automobile Services Assistor		300 hours	49-3023
B	AER0110	Engine Repair Technician		150 hours	49-3023
C	AER0257	Automatic Transmission and Transaxle Technician	AUTO IND @7 %7 %G AUTO MECH @7 7G	150 hours	49-3023
D	AER0274	Manual Drivetrain and Axle Technician		150 hours	49-3023
E	AER0453	Automobile Suspension and Steering Technician		150 hours	49-3023
F	AER0418	Automotive Brake System Technician		150 hours	49-3023
G	AER0360	Automotive Electrical/Electronic System Technician		300 hours	49-3023
H	AER0172	Automotive Heating and Air Conditioning Technician		150 hours	49-3023
I	AER0503	Automotive Engine Performance Technician		300 hours	49-3023

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Automotive Service Technology program can be found using the following link: http://www.natef.org/Achieving-Accreditation/Program-Standards.aspx

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Proficiently explain and apply required shop and personal safety tasks relating to the automotive industry.
02.0 Explain and apply required tasks associated with the proper use and handling of tools and equipment relating to the automotive industry.
03.0 Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services.
04.0 Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, engine block, lubrication and cooling systems.
05.0 Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles.
06.0 Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/ transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive.
07.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions systems, wheel alignment, and wheels and tires.
08.0 Explain and apply proficiently the diagnosis, service and repair of drum\disc brake, hydraulics, power assist units, electronic brakes, traction control, stability control systems and miscellaneous (wheel bearings, parking brake, electrical, etc.) systems.
09.0 Explain and apply proficiently the diagnosis, service and repair of electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems.
10.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling.
11.0 Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems.
12.0

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Student Performance Standards

Program Title: **Automotive Service Technology**
PSAV Number: **I470608**

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.	
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	02.01	Identify tools and equipment and their appropriate usage in automotive applications.	ASE
	02.02	Identify and use standard and metric measurement skills and designation.	ASE
	02.03	Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	ASE
	02.04	Demonstrate proper use of precision-measuring tools (i.e. micrometer, digital/dial-indicator, digital/dial-caliper) and torque methods.	ASE
03.0	Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services --The student will be able to:		
	03.01	Identify information needed and the service requested on a repair order.	ASE
	03.02	Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.	
	03.03	Identify purpose and demonstrate proper use of fender covers, floor mats and other vehicle protection equipment.	ASE
	03.04	Demonstrate use of the three C's (Concern, Cause, and Correction).	ASE
	03.05	Review vehicle service history.	ASE
	03.06	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	ASE
	03.07	Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.	
	03.08	Determine the presence of a Tire Pressure Monitoring System (TPMS).	
	03.09	Determine the presence of wheel locks.	
	03.10	Determine the presence of an air suspension system.	
	03.11	Check operation and status of instrument panel warning lights and gauges.	
	03.12	Locate and use Vehicle identification Number (VIN) vehicle information placards, decals, tags, as required.	
	03.13	Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.	

03.14	Use proper chemicals for cleaning and lubrication.	
03.15	Reset maintenance indicators; as applicable.	
03.16	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).	ASE
03.17	Inspect underhood area for leaks, damage, and unusual conditions.	
03.18	Determine fluid type requirements and identify fluid.	
03.19	Check engine oil level and condition; service as required.	
03.20	Check engine coolant level and condition; service as required.	
03.21	Check power steering fluid level and condition; service as required.	
03.22	Check brake fluid level and condition; service as required.	
03.23	Check hydraulic clutch fluid and condition; service as required.	
03.24	Check windshield washer fluid level and condition; service as required.	
03.25	Check automatic transmission fluid level and condition; service as required.	
03.26	Inspect undercar area for leaks, damage, and unusual conditions.	
03.27	Check differential/transfer case fluid level; note unusual conditions; service as required.	
03.28	Check manual transmission fluid level; note unusual conditions; service as required.	
03.29	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.	
03.30	Lubricate driveline, suspension and steering systems; as applicable.	
03.31	Inspect cooling system pipes and hoses for wear, damage, and proper routing.	
03.32	Change engine oil and filter.	
03.33	Inspect and replace fuel filters; as applicable.	
03.34	Inspect and replace air filter.	
03.35	Inspect and replace cabin air filter.	
03.36	Inspect, replace and adjust drive belts; inspect tensioners and pulleys.	
03.37	Document observed damage, unusual conditions, and concerns.	
03.38	Inspect struts, springs, and related components; service as required.	
03.39	Inspect stabilizer bar, bushings, brackets, and links; service as required.	
03.40	Inspect springs, torsion bars, and related components; service as required.	
03.41	Inspect shock absorbers and related components.	
03.42	Inspect constant velocity (CV) axle shaft boots; service as required.	
03.43	Identify service considerations when equipped with a Tire Pressure Monitoring System (TPMS).	
03.44	Identify nitrogen-filled tires.	
03.45	Inspect tires, diagnose tire wear patterns, inspect spare and mounting system; check and adjust tire pressure; where applicable.	
03.46	Rotate tires according to manufacturer’s recommendations.	
03.47	Balance wheel and tire assembly (static, dynamic and road force balance); where applicable.	
03.48	Dismount, inspect, and remount tire on wheel.	
03.49	Repair tire according to industry standards.	
03.50	Reinstall wheel; torque wheel fasteners to specification.	
03.51	Check wheel bearings for play and other signs of wear.	

03.52	Perform a visual inspection of a brake drum system.	
03.53	Perform a visual inspection of a disc brake system.	
03.54	Check parking brake operation; check parking brake components for unusual conditions.	
03.55	Check wiper blades, inserts, and arms; replace wiper blades or inserts.	
03.56	Lubricate door latches and hinges.	
03.57	Inspect fuel tank, fuel cap and seal; inspect and replace fuel lines, fittings, and hoses; as applicable.	
03.58	Perform slow/fast battery charge.	
03.59	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.	
03.60	Perform battery, starting, and charging system tests using appropriate tester.	
03.61	Start a vehicle using jumper cables or a battery auxiliary power supply (jump box).	
03.62	Maintain or restore electronic memory functions if required.	
03.63	Inspect and test fusible links, circuit breakers, and fuses; confirm proper circuit operation; replace as needed.	
03.64	Inspect and replace exterior and courtesy lamps.	

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.

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:	
04.01	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P-1
04.02	Identify and interpret engine concern; determine necessary action.	
04.03	Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins.	P-1
04.04	Verify operation of the instrument panel engine warning indicator.	P-1
04.05	Locate and interpret vehicle and major component identification numbers.	
04.06	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	P-1
04.07	Diagnose engine noises and vibrations; determine necessary action.	
04.08	Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.	
04.09	Perform engine vacuum tests; determine necessary action.	
04.10	Perform cylinder power balance tests; determine necessary action.	
04.11	Remove and replace timing belt; verify correct camshaft timing.	P-1
04.12	Perform cylinder cranking and running compression tests; determine necessary action.	

04.13	Perform cylinder leakage tests; determine necessary action.	
04.14	Remove and reinstall engine in an OBDII or newer vehicle; reconnect all attaching components and restore the vehicle to running condition.	P-3
04.15	Install engine covers using gaskets, seals and sealers as required.	P-1
04.16	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
04.17	Inspect, remove and replace engine mounts.	P-2
04.18	Identify hybrid vehicle internal combustion engine service precautions.	P-3
04.19	Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specifications and procedures.	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 valve springs for squareness and free height comparison; determine necessary action.	P-3
04.22	Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine necessary action.	P-3
04.23	Inspect valve guides for wear; check valve stem-to-guide clearance; determine necessary action.	P-3
04.24	Inspect valves and valve seats; determine necessary action.	P-3
04.25	Check valve spring assembled height and valve stem height; determine necessary action.	P-3
04.26	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action.	P-2
04.27	Inspect valve lifters; determine necessary action.	P-2
04.28	Adjust valves (mechanical or hydraulic lifters).	P-1
04.29	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
04.30	Inspect and/or measure camshaft for run out, journal wear and lobe wear.	P-2
04.31	Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine necessary action.	P-3
04.32	Establish camshaft position sensor indexing.	P-1
04.33	Remove, inspect, or replace crankshaft vibration damper (harmonic balancer).	P-2
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 necessary action.	P-2
04.36	Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine necessary 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 necessary 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 necessary action.	P-1
04.40	Inspect main and connecting rod bearings for damage and wear; determine necessary action.	P-2

04.41	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine necessary action.	P-3
04.42	Inspect and measure piston skirts and ring lands; determine necessary action.	P-2
04.43	Remove and replace piston pin; where applicable.	
04.44	Determine piston-to-bore clearance.	P-2
04.45	Inspect, measure, and install piston rings.	P-2
04.46	Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance or silencer); inspect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time.	P-2
04.47	Assemble engine block.	P-1
04.48	Perform oil pressure tests; determine necessary action.	P-1
04.49	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform necessary action.	P-2
04.50	Perform cooling system pressure and dye test to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core and gallery plugs; determine necessary action.	P-1
04.51	Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
04.52	Inspect and replace engine cooling and heater system hoses.	
04.53	Remove, inspect, and replace thermostat and gasket/seal.	P-1
04.54	Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.	P-1
04.55	Inspect, remove and replace water pump.	P-2
04.56	Remove and replace radiator.	P-2
04.57	Inspect, and test fans(s) (electrical or mechanical), fan clutch, fan shroud, and air dams.	P-1
04.58	Inspect auxiliary coolers; determine necessary action.	P-3
04.59	Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
04.60	Perform engine oil and filter change.	P-1
04.61	Identify causes of engine overheating.	P-1

Florida Department of Education
Student Performance Standards

Course Number: AER0257
Occupational Completion Point: C
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.

CTE Standards and Benchmarks		Priority Number
05.0	Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles -- The student will be able to:	
05.01	Identify and interpret transmission/transaxle concern, differentiate between engine performance and transmission/transaxle concerns; determine necessary action.	P-1
05.02	Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
05.03	Diagnose fluid loss and condition concerns; determine necessary action.	P-1
05.04	Check fluid level in a transmission or a transaxle equipped with a dipstick.	P-1
05.05	Check fluid level in a transmission or a transaxle not equipped with a dipstick.	P-1
05.06	Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine necessary action.	P-1
05.07	Perform stall test; determine necessary action.	P-3
05.08	Perform lock-up converter system tests; determine necessary action.	P-3
05.09	Diagnose noise and vibration concerns; determine necessary action.	P-2
05.10	Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.	P-1
05.11	Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).	P-2

05.12	Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.	P-1
05.13	Inspect, adjust, and replace manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.	P-2
05.14	Inspect for leakage; replace external seals, gaskets, and bushings.	P-2
05.15	Inspect, test, adjust, repair, or replace electrical/electronic components and circuits, including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses.	P-1
05.16	Diagnose electronic transmission control systems using a scan tool; determine necessary action.	
05.17	Inspect, replace, and align powertrain mounts.	P-2
05.18	Drain and replace fluids and filter(s).	P-1
05.19	Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces.	P-1
05.20	Disassemble, clean, and inspect transmission/transaxle.	P-2
05.21	Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, sleeves, retainers, brackets, check valves/balls, screens, spacers, and gaskets).	P-2
05.22	Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine necessary action.	P-2
05.23	Assemble transmission/transaxle.	P-2
05.24	Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings.	P-1
05.25	Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.	P-2
05.26	Install and seat torque converter to engage drive/splines.	
05.27	Inspect, measure, and reseal oil pump assembly and components.	P-2
05.28	Measure transmission/transaxle end play or preload; determine necessary action.	P-1
05.29	Inspect, measure, and replace thrust washers and bearings.	P-2
05.30	Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.	P-2
05.31	Inspect bushings; determine necessary action.	P-2
05.32	Inspect and measure planetary gear assembly components; determine necessary action.	P-2
05.33	Inspect case bores, passages, bushings, vents, and mating surfaces; determine necessary action.	P-2
05.34	Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform necessary action.	P-2
05.35	Inspect, measure, repair, adjust or replace transaxle final drive components.	P-2
05.36	Inspect clutch drum, piston, check-balls, springs, retainers, seals, and friction and pressure plates; determine necessary action.	P-2
05.37	Measure clutch pack clearance; determine necessary action.	P-1
05.38	Air test operation of clutch and servo assemblies.	P-1
05.39	Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, and retainers; determine necessary action.	P-2
05.40	Inspect bands and drums; determine necessary action.	
05.41	Describe the operational characteristics of a continuously variable transmission (CVT).	P-3

05.42 Describe the operational characteristics of a hybrid vehicle drive train.	P-3

Florida Department of Education
Student Performance Standards

Course Number: AER0274
Occupational Completion Point: D
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.

CTE Standards and Benchmarks		Priority Number
06.0	Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive- -The student will be able to:	
06.01	Identify and interpret drive train concern; determine necessary action.	P-1
06.02	Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1
06.03	Check fluid condition; check for leaks; determine necessary action.	P-1
06.04	Diagnose fluid loss, level, and condition concerns; determine necessary action.	
06.05	Drain and refill manual transmission/transaxle and final drive unit.	P-1
06.06	Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action.	P-1
06.07	Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action.	P-1
06.08	Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.	
06.09	Check and adjust clutch master cylinder fluid level; check for leaks.	P-1
06.10	Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable).	P-1

06.11	Bleed clutch hydraulic system.	P-1
06.12	Inspect flywheel and ring gear for wear and cracks; determine necessary action.	P-1
06.13	Inspect engine block, core plugs, rear main engine oil seal, clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action.	
06.14	Measure flywheel run out and crankshaft end play; determine necessary action.	P-2
06.15	Remove and reinstall manual transmission/transaxle.	
06.16	Disassemble, inspect, clean, and reassemble internal transmission/transaxle components.	P-3
06.17	Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action.	
06.18	Diagnose noise concerns through the application of transmission/transaxle powerflow principles.	P-2
06.19	Diagnose hard shifting and jumping out of gear concerns; determine necessary action.	P-2
06.20	Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers.	P-2
06.21	Inspect, replace, and align powertrain mounts.	
06.22	Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.	
06.23	Remove and replace transaxle final drive.	
06.24	Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.	
06.25	Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action.	
06.26	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.	
06.27	Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action.	P-3
06.28	Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly.	P-3
06.29	Inspect lubrication devices (oil pump or slingers); perform necessary action.	
06.30	Inspect, test, and replace transmission/transaxle sensors and switches.	
06.31	Describe the operational characteristics of an electronically controlled manual transmission/transaxle.	P-3
06.32	Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action.	P-1
06.33	Diagnose universal joint noise and vibration concerns; perform necessary action.	P-2
06.34	Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals.	P-1
06.35	Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.	P-1
06.36	Inspect, service, and replace shaft center support bearings.	
06.37	Check shaft balance and phasing; measure shaft run out; measure and adjust driveline angles.	P-2
06.38	Diagnose noise and vibration concerns; determine necessary action.	
06.39	Inspect and replace companion flange and pinion seal; measure companion flange run out.	P-2
06.40	Inspect ring gear and measure run out; determine necessary action.	P-3
06.41	Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings.	P-3
06.42	Measure and adjust drive pinion depth.	P-3
06.43	Measure and adjust drive pinion bearing preload.	P-3
06.44	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

06.45	Check ring and pinion tooth contact patterns; perform necessary action.	P-3
06.46	Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.	P-3
06.47	Reassemble and reinstall differential case assembly; measure run out; determine necessary action.	P-3
06.48	Diagnose noise, slippage, and chatter concerns; determine necessary action.	P-3
06.49	Clean and inspect differential housing; check for leaks; inspect housing vent.	P-2
06.50	Check and adjust differential housing fluid level.	P-1
06.51	Drain and refill differential housing.	P-1
06.52	Inspect and reinstall limited slip differential components.	
06.53	Measure rotating torque; determine necessary action.	P-3
06.54	Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action.	P-2
06.55	Inspect and replace drive axle wheel studs.	P-1
06.56	Remove and replace drive axle shafts.	P-1
06.57	Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2
06.58	Measure drive axle flange run out and shaft end play; determine necessary action.	P-2
06.59	Diagnose noise and vibration concerns; determine necessary action.	P-2
06.60	Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-3
06.61	Remove and reinstall transfer case.	
06.62	Disassemble, service, and reassemble transfer case and components.	P-3
06.63	Inspect front-wheel bearings and locking hubs; perform necessary action(s).	P-3
06.64	Check for leaks at drive assembly seals; check vents; check lube level.	P-3
06.65	Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems.	P-3
06.66	Diagnose noise, vibration, and unusual steering concerns; determine necessary action.	P-3
06.67	Identify concerns related to variations in tire circumference and/or final drive ratios.	P-3

Florida Department of Education
Student Performance Standards

Course Number: AER0453
Occupational Completion Point: E
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.

CTE Standards and Benchmarks		Priority Number
07.0	Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions systems, wheel alignment, and wheels and tires –The student will be able to:	
07.01	Identify and interpret suspension and steering system concerns; determine necessary action.	P-1
07.02	Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1
07.03	Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action.	P-1
07.04	Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action.	P-1
07.05	Inspect, remove, and install upper and lower control arms, bushings, shafts, and rebound and jounce bumpers.	P-3
07.06	Inspect, remove and install strut rods and bushings.	P-3
07.07	Inspect, remove and install upper and/or lower ball joints (with or without wear indicators).	P-2
07.08	Inspect, remove and install steering knuckle assemblies.	P-3
07.09	Inspect, remove and install short and long arm suspension system coil springs and spring insulators.	P-3
07.10	Inspect, remove and install torsion bars and mounts.	P-3

07.11	Inspect, remove and install front stabilizer bar (sway bar) bushings, brackets, and links.	P-3
07.12	Inspect, remove and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.	P-3
07.13	Inspect, remove and install track bar, strut rods/radius arms and related mounts and bushings.	P-3
07.14	Inspect rear suspension system leaf spring(s), bushings, center pins/bolts and mounts.	P-1
07.15	Inspect, remove, and replace shock absorbers; inspect mounts and bushings.	P-1
07.16	Remove, inspect, and service or replace front and rear wheel bearings.	P-1
07.17	Describe the function of the power steering pressure switch.	P-3
07.18	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concern; determine necessary action.	P-1
07.19	Perform pre-alignment inspection and measure vehicle ride height; perform necessary action.	P-1
07.20	Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber and toe as required; center steering wheel.	P-1
07.21	Check toe-out-on-turns (turning radius); determine necessary action.	P-2
07.22	Check SAI (steering axis inclination) and included angle; determine necessary action.	P-2
07.23	Check rear wheel thrust angle; determine necessary action.	P-1
07.24	Check for front wheel setback; determine necessary action.	P-2
07.25	Check front and/or rear cradle (sub-frame) alignment; determine necessary action.	P-3
07.26	Reset steering angle sensor.	P-2
07.27	Disable and enable supplemental restraint system (SRS).	P-1
07.28	Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).	P-1
07.29	Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action.	P-2
07.30	Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action.	P-2
07.31	Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; perform necessary action.	P-2
07.32	Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action.	P-2
07.33	Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.	P-2
07.34	Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.	P-2
07.35	Determine proper power steering fluid type; inspect fluid level and condition.	P-1
07.36	Flush, fill, and bleed power steering system.	P-2
07.37	Inspect for power steering fluid leakage; determine necessary action.	P-1
07.38	Remove, inspect, replace, and adjust power steering pump drive belt.	P-1
07.39	Remove and reinstall power steering pump.	P-2
07.40	Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.	P-2
07.41	Inspect and replace power steering hoses and fittings.	P-2
07.42	Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.	P-2

07.43	Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.	P-1
07.44	Test and diagnose components of electronically-controlled steering systems using a scan tool; determine necessary action.	P-3
07.45	Inspect electric power-assisted steering.	P-3
07.46	Identify hybrid vehicle power steering system electrical circuits and safety precautions.	P-2
07.47	Inspect tire condition; identify tire wear patterns; check of correct tire size and application (load and speed rating) and adjust air pressure; determine necessary action.	P-1
07.48	Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.	P-2
07.49	Rotate tires according to manufacturer’s recommendations.	P-1
07.50	Measure wheel, tire, axle flange, and hub run out; determine necessary action.	P-2
07.51	Diagnose tire pull problems; determine necessary action.	P-2
07.52	Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).	P-1
07.53	Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-2
07.54	Reinstall wheel; torque lug nuts.	
07.55	Inspect tire and wheel assembly for air loss; perform necessary action.	P-1
07.56	Repair tire using internal patch.	P-1
07.57	Identify and test pressure monitor system (indirect and direct) for operation; calibrate system; verify operation of instrument panel lambs.	P-2
07.58	Demonstrate knowledge of steps required to remove and replace sensor in a tire pressure monitoring system.	P-1

Florida Department of Education
Student Performance Standards

Course Number: AER0418
Occupational Completion Point: F
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.

CTE Standards and Benchmarks		Priority Number
08.0	Explain and apply proficiently the diagnosis, service and repair of drum\disc brake, hydraulics, power assist units, electronic brakes, traction control, stability control systems and miscellaneous (wheel bearings, parking brake, electrical, etc.) systems--The student will be able to:	
08.01	Identify and interpret brake system concern; determine necessary action.	P-1
08.02	Describe procedures for performing a road test to check brake system operation; including an antilock brake system (ABS).	P-1
08.03	Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1
08.04	Install wheel and torque lug nuts.	P-1
08.05	Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals).	
08.06	Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).	P-1
08.07	Measure brake pedal height, travel, and free play (as applicable); determine necessary action.	P-1
08.08	Check master cylinder for internal/external leaks and proper operation; determine necessary action.	P-1
08.09	Remove, bench bleed, and reinstall master cylinder.	P-1
08.10	Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action.	P-3

08.11	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; check for loose fittings and supports; determine necessary action.	P-1
08.12	Replace brake lines, hoses, fittings, and supports.	P-2
08.13	Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).	P-2
08.14	Select, handle, store, and fill brake fluids to proper level.	P-1
08.15	Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.	
08.16	Inspect, test, and/or replace components of brake warning light system.	P-3
08.17	Identify components of brake warning light system.	P-2
08.18	Bleed and/or flush brake system.	P-1
08.19	Test brake fluid for contamination.	P-1
08.20	Diagnose poor drum brake stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.	P-1
08.21	Remove, clean, inspect, and measure brake drums; determine necessary action.	P-1
08.22	Refinish brake drum and measure final drum diameter; compare with specifications.	P-1
08.23	Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.	P-1
08.24	Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2
08.25	Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	P-2
08.26	Diagnose poor disk brake stopping, noise, vibration, pulling, grabbing, dragging or pulsation concerns; determine necessary action.	P-1
08.27	Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action.	P-1
08.28	Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.	P-1
08.29	Remove, inspect, and replace pads and retaining hardware; determine necessary action.	P-1
08.30	Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts.	
08.31	Lubricate and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks.	P-1
08.32	Clean and inspect rotor; measure rotor thickness, thickness variation, and lateral run out; determine necessary action.	P-1
08.33	Remove and reinstall rotor.	P-1
08.34	Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.	P-1
08.35	Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.	P-1
08.36	Retract and re-adjust caliper piston on an integrated parking brake system.	P-3
08.37	Check brake pad wear indicator; determine necessary action.	P-2
08.38	Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer’s recommendations.	P-1
08.39	Check brake pedal travel with, and without engine running to verify proper power booster operation.	P-2
08.40	Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.	P-1

08.41	Inspect the vacuum-type power booster unit for leaks; inspect the check valve for proper operation; determine necessary action.	P-1
08.42	Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine necessary action.	P-3
08.43	Measure and adjust master cylinder pushrod length.	P-3
08.44	Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action.	P-3
08.45	Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearings.	P-1
08.46	Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed.	P-2
08.47	Check parking brake operation and parking brake indicator light system; determine necessary action.	P-1
08.48	Check operation of brake stop light system.	P-1
08.49	Replace wheel bearing and race.	P-2
08.50	Inspect and replace wheel studs.	P-1
08.51	Remove and reinstall sealed wheel bearing assembly.	P-2
08.52	Identify and inspect electronic brake control system components; determine necessary action.	P-1
08.53	Identify traction control/vehicle stability control system components.	P-3
08.54	Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system ; determine necessary action.	P-2
08.55	Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action.	P-2
08.56	Depressurize high-pressure components of the electronic brake control system.	P-3
08.57	Bleed the electronic brake control system hydraulic circuits.	P-1
08.58	Remove and install electronic brake control system electrical/electronic and hydraulic components.	
08.59	Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).	P-3
08.60	Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).	P-3
08.61	Describe the operation of a regenerative braking system.	P-3

Florida Department of Education
Student Performance Standards

Course Number: AER0360
Occupational Completion Point: G
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.

CTE Standards and Benchmarks			Priority Number
09.0		Explain and apply proficiently the diagnosis, service and repair of electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems--The student will be able to:	
	09.01	Identify and interpret electrical/electronic system concern; determine necessary action.	
	09.02	Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1
	09.03	Diagnose and demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1
	09.04	Use wiring diagrams during diagnosis (troubleshooting) of electrical/electronic circuit problems.	P-1
	09.05	Demonstrate the proper use of a digital multimeter (DMM) when measuring source, voltage drop (including grounds), current flow, and resistance.	P-1
	09.06	Check operation of electrical circuits with a test light.	P-1
	09.07	Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.	P-2
	09.08	Check operation of electrical circuits using fused jumper wires.	P-1
	09.09	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1
	09.10	Measure and diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action.	P-1

09.11	Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.	P-1
09.12	Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action.	P-1
09.13	Replace electrical connectors and terminal ends.	P-1
09.14	Repair wiring harness.	P-1
09.15	Perform solder repair of electrical wiring.	P-1
09.16	Repair CAN/BUS wiring harness.	P-1
09.17	Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures.	
09.18	Perform battery state-of-charge test; determine necessary action.	P-1
09.19	Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action.	P-1
09.20	Maintain or restore electronic memory functions.	P-1
09.21	Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1
09.22	Perform slow/fast battery charge according to manufacturer’s recommendations.	P-1
09.23	Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1
09.24	Identify high voltage circuits of electric or hybrid electric vehicle and related safety precautions.	P-3
09.25	Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry following battery disconnect.	P-1
09.26	Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures.	P-3
09.27	Perform battery conductance test; determine necessary action.	
09.28	Perform starter current draw tests; determine necessary action.	P-1
09.29	Perform starter circuit voltage drop tests; determine necessary action.	P-1
09.30	Inspect and test starter relays and solenoids; determine necessary action.	P-2
09.31	Remove and install starter in a vehicle.	P-1
09.32	Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action.	P-2
09.33	Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition.	P-2
09.34	Perform charging system output test; determine necessary action.	P-1
09.35	Diagnose (troubleshoot) charging system for the cause of undercharge, no-charge, and overcharge conditions.	P-1
09.36	Inspect, adjust, or replace generator (alternator) drive belts, check pulleys, and tensioners for wear; check pulley and belt alignment.	P-1
09.37	Remove, inspect, and re-install generator (alternator).	P-1
09.38	Perform charging circuit voltage drop test; determine necessary action.	P-1
09.39	Diagnose (troubleshoot) the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action.	P-1
09.40	Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving light); replace as needed.	P-1
09.41	Aim headlights.	P-2
09.42	Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.	

09.43	Identify system voltage and safety precautions associated with high intensity discharge headlights.	P-2
09.44	Inspect and test gauges and gauge sending units for cause of abnormal gauge readings; determine necessary action.	P-2
09.45	Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.	
09.46	Diagnose (troubleshoot) the cause of incorrect operation of warning devices and other driver information systems; determine necessary action.	P-2
09.47	Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action.	P-1
09.48	Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.	P-2
09.49	Diagnose (troubleshoot) windshield washer problems; perform necessary action.	P-2
09.50	Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action.	P-2
09.51	Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action.	
09.52	Diagnose (troubleshoot) incorrect electric lock operation (including remote keyless entry); determine necessary action.	P-2
09.53	Diagnose (troubleshoot) incorrect operation of cruise control systems; determine necessary action	P-3
09.54	Diagnose (troubleshoot) supplemental restraint system (SRS) concerns; determine necessary action.	P-2
09.55	Disable and enable an airbag system for vehicle service; verify indicator lamp operation.	P-1
09.56	Diagnose (troubleshoot) radio static and weak, intermittent, or no radio reception; determine necessary action.	P-3
09.57	Remove and reinstall door panel.	P-1
09.58	Diagnose (troubleshoot) body electronic system circuits using a scan tool; determine necessary action.	P-3
09.59	Check for module communication (including CAN/BUS systems) using a scan tool.	P-2
09.60	Diagnose the cause(s) of false, intermittent, or no operation of anti-theft systems.	P-3
09.61	Describe the operation of keyless entry/remote-start systems.	P-3
09.62	Verify operation of instrument panel gauges and warning /indicator lights; reset maintenance indicator.	P-1
09.63	Verify windshield wiper and washer operation, replace wiper blades.	P-1
09.64	Describe the process for software transfers, software updates, or flash reprogramming on electronic modules.	P-3

Florida Department of Education
Student Performance Standards

Course Number: AER0172
Occupational Completion Point: H
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.

CTE Standards and Benchmarks		Priority Number
10.0	Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling--The student will be able to:	
10.01	Identify and interpret heating and air conditioning problems; determine necessary action.	P-1
10.02	Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1
10.03	Performance test A/C system; identify problems.	P-1
10.04	Identify abnormal operating noises in the A/C system; determine necessary action.	P-2
10.05	Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings.	P-1
10.06	Leak test A/C system; determine necessary action.	P-1
10.07	Inspect the condition of refrigerant oil removed from A/C system; determine necessary action.	P-2
10.08	Determine recommended oil and oil capacity for system application.	P-1
10.09	Using a scan tool, observe and record related HVAC data and trouble codes.	P-3
10.10	Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action.	P-2

10.11	Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action.	P-1
10.12	Inspect, test, service or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.	P-2
10.13	Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil quantity.	P-2
10.14	Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	P-2
10.15	Determine the need for an additional A/C system filter; perform necessary action.	P-3
10.16	Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action.	P-2
10.17	Inspect A/C condenser for airflow restrictions; perform necessary action.	P-1
10.18	Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine required oil quantity.	P-2
10.19	Remove, inspect, and install expansion valve or orifice (expansion) tube.	P-1
10.20	Inspect evaporator housing water drain; perform necessary action.	P-1
10.21	Determine procedure to remove and reinstall evaporator; determine required oil quantity.	P-2
10.22	Remove, inspect, and reinstall condenser; determine required oil quantity.	P-2
10.23	Diagnose temperature control problems in the heater/ventilation system; (determine PCM) to interpret system operation; determine necessary action.	P-2
10.24	Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/ vacuum), coolant recovery tank, and hoses; perform necessary action.	
10.25	Inspect engine cooling and heater system hoses; perform necessary action.	P-1
10.26	Determine procedure to remove, inspect, and reinstall heater core.	P-2
10.27	Inspect, test, and replace thermostat and gasket/seal.	
10.28	Determine coolant condition and coolant type for vehicle application; drain and recover coolant.	
10.29	Flush system; refill system with recommended coolant; bleed system.	
10.30	Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.	
10.31	Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.	
10.32	Inspect and test heater control valve(s); perform necessary action.	P-2
10.33	Inspect and test A/C-heater blower, motors, resistors, switches, relays, wiring, and protection devices; perform necessary action.	P-1
10.34	Diagnose A/C compressor clutch control systems; determine necessary action.	P-2
10.35	Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action.	P-2
10.36	Inspect and test A/C-heater control panel assembly; determine necessary action.	P-3
10.37	Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action.	P-3
10.38	Inspect A/C-heater ducts, doors, hoses, cabin filters and outlets; perform necessary action.	P-1
10.39	Identify the source of A/C system odors.	P-2
10.40	Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action.	P-2
10.41	Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer’s standards.	P-1
10.42	Identify and recover A/C system refrigerant.	P-1

10.43	Recycle, label, and store refrigerant.	P-1
10.44	Evacuate and charge A/C system; add refrigerant oil as required.	P-1

Florida Department of Education
Student Performance Standards

Course Number: AER0503
Occupational Completion Point: I
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.

CTE Standards and Benchmarks		Priority Number
11.0	Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems --The student will be able to:	
11.01	Identify and interpret engine performance concern; determine necessary action.	P-1
11.02	Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1
11.03	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	
11.04	Diagnose abnormal engine noise or vibration concerns; determine necessary action.	P-3
11.05	Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine necessary action.	P-2
11.06	Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.	P-1
11.07	Perform cylinder power balance test; determine necessary action.	P-2
11.08	Perform cylinder cranking and running compression tests; determine necessary action.	P-1
11.09	Perform cylinder leakage test; determine necessary action.	P-1
11.10	Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action.	P-2
11.11	Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.	
11.12	Verify engine operating temperature; determine necessary action.	P-1

11.13	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.	
11.14	Verify correct camshaft timing.	P-1
11.15	Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.	P-1
11.16	Diagnose the causes of emissions or driveability concerns with stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data.	P-1
11.17	Diagnose emissions or driveability concerns without stored diagnostic trouble codes; determine necessary action.	P-1
11.18	Check for module communication (including CAN/BUS systems) errors using a scan tool.	
11.19	Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action.	P-2
11.20	Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1
11.21	Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, or similar systems); determine necessary action.	P-3
11.22	Perform active tests of actuators using a scan tool; determine necessary action.	P-2
11.23	Describe the importance of running all OBDII monitors for repair verification.	P-1
11.24	Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns; determine necessary action.	P-2
11.25	Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.	
11.26	Inspect and test crankshaft and camshaft position sensor(s); perform necessary action.	P-1
11.27	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1
11.28	Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary.	P-3
11.29	Diagnose (troubleshoot) hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine necessary action.	P-2
11.30	Check fuel for contaminants; determine necessary action.	P-2
11.31	Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.	P-1
11.32	Replace fuel filters.	P-1
11.33	Inspect, service or replace air filters, filter housing and intake duct work.	P-1
11.34	Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2
11.35	Inspect and test fuel injectors.	P-2
11.36	Verify idle control operation.	P-1

11.37	Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform necessary action.	P-1
11.38	Inspect condition of exhaust system hangers, brackets, clamps and heat shields; repair or replace as needed.	P-1
11.39	Perform exhaust system back-pressure test; determine necessary action.	P-2
11.40	Check and refill diesel exhaust fluid (DEF).	P-3
11.41	Test the operation of turbocharger/supercharger systems; determine necessary action.	P-3
11.42	Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action.	P-3
11.43	Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.	P-2
11.44	Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action.	P-3
11.45	Diagnose emissions and driveability concerns caused by the secondary injection and catalytic converter systems; determine necessary action.	P-2
11.46	Inspect, test, service and replace components of the EGR system, including tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action.	P-2
11.47	Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.	P-2
11.48	Inspect and test mechanical components of secondary air injection systems; perform necessary action.	
11.49	Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.	P-3
11.50	Inspect and test catalytic converter efficiency.	P-2
11.51	Diagnose emissions and driveability concerns caused by the evaporative emissions control system; determine necessary action.	P-2
11.52	Inspect and test components and hoses of the evaporative emissions control system; perform necessary action.	P-1
11.53	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action.	P-3
11.54	Adjust valves on engines with mechanical or hydraulic lifters; as applicable.	
11.55	Remove and replace timing belt; verify correct camshaft timing.	
11.56	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	
11.57	Inspect engine oil and/or filter for condition and determine necessary action.	
11.58	Identify hybrid 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. Access MyCareerShines by visiting: www.mycareershines.org.

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 PSAV programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: 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.

Additional Resources

For additional information regarding articulation agreements, Bright Futures Scholarships, Fine Arts/Practical Arts Credit and Equivalent Mathematics and Equally Rigorous Science Courses please refer to:

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