Florida Department of Education
Curriculum Framework

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

PSAV – Career Preparatory	
Program Number	T400800
CIP Number	0647060412
Grade Level	30, 31
Standard Length	750 hours
Teacher Certification	AUTO IND @7 %7%G AUTO MECH @7 7G
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) 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 NATEF tasks. NATEF requires that a minimum of 95% of P-1 tasks, 80% of P-2 tasks, and 50% of P-3 tasks are to be accomplished.

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.

The following table illustrates the **PSAV** program structure:

OCP	Course Number	Course Title	Course Length	SOC Code
A	AER0503	Automotive Engine Performance Technician	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

National Standards

Programs identified as having 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 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 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**
PSAV 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 =	**17**
P-3 =	**9**
Total	**47**

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:	
01.01	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	
01.02	Identify and interpret engine performance concern; determine necessary action.	P-1
01.03	Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1
01.04	Locate and interpret vehicle and major component identification numbers.	
01.05	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	
01.06	Diagnose abnormal engine noise or vibration concerns; determine necessary action.	P-3
01.07	Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine necessary action.	P-2

CTE Standards and Benchmarks		Priority Number
01.08	Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.	P-1
01.09	Perform cylinder power balance test; determine necessary action.	P-2
01.10	Perform cylinder cranking and running compression tests; determine necessary action.	P-1
01.11	Perform cylinder leakage test; determine necessary action.	P-1
01.12	Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action.	P-2
01.13	Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings, and determine necessary action.	
01.14	Verify engine operating temperature; determine necessary action.	P-1
01.15	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.	
01.16	Verify correct camshaft timing.	P-1
01.17	Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.	P-1
01.18	Diagnose the causes of emissions or driveability concerns with stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data.	P-1
01.19	Diagnose emissions or driveability concerns without stored diagnostic trouble codes; determine necessary action.	P-1
01.20	Check for module communication (including CAN/BUS systems) errors using a scan tool.	
01.21	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
01.22	Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1
01.23	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
01.24	Perform active tests of actuators using a scan tool; determine necessary action.	P-2
01.25	Describe the importance of running all OBDII monitors for repair verification.	P-1
01.26	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
01.27	Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.	
01.28	Inspect and test crankshaft and camshaft position sensor(s); perform necessary action.	P-1
01.29	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1

CTE Standards and Benchmarks		Priority Number
01.30	Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary.	P-3
01.31	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
01.32	Check fuel for contaminants; determine necessary action.	P-2
01.33	Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.	P-1
01.34	Replace fuel filters.	P-1
01.35	Inspect, service or replace air filters, filter housing and intake duct work.	P-1
01.36	Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2
01.37	Inspect and test fuel injectors.	P-2
01.38	Verify idle control operation.	P-1
01.39	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
01.40	Inspect condition of exhaust system hangers, brackets, clamps and heat shields; repair or replace as needed.	P-1
01.41	Perform exhaust system back-pressure test; determine necessary action.	P-2
01.42	Check and refill diesel exhaust fluid (DEF).	P-3
01.43	Test the operation of turbocharger/supercharger systems; determine necessary action.	P-3
01.44	Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action.	P-3
01.45	Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.	P-2
01.46	Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action.	P-3
01.47	Diagnose emissions and driveability concerns caused by the secondary injection and catalytic converter systems; determine necessary action.	P-2
01.48	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
01.49	Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.	P-2
01.50	Inspect and test mechanical components of secondary air injection systems; perform necessary action.	
01.51	Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.	P-3
01.52	Inspect and test catalytic converter efficiency.	P-2

CTE Standards and Benchmarks		Priority Number
01.53	Diagnose emissions and driveability concerns caused by the evaporative emissions control system; determine necessary action.	P-2
01.54	Inspect and test components and hoses of the evaporative emissions control system; perform necessary action.	P-1
01.55	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action.	P-3
01.56	Adjust valves on engines with mechanical or hydraulic lifters.	
01.57	Remove and replace timing belt; verify correct camshaft timing.	
01.58	Remove and replace thermostat and gasket/seal.	
01.59	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	
01.60	Perform common fastener and thread repairs, to include: remove broken bolt, restore internal and external threads, and repair internal threads with a threaded insert.	
01.61	Perform engine oil and filter change.	
01.62	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	**15**
P-2	**20**
P-3	**4**
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:	
02.01	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	
02.02	Identify and interpret transmission/transaxle concern, differentiate between engine performance and transmission/transaxle concerns; determine necessary action.	P-1
02.03	Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
02.04	Locate and interpret vehicle and major component identification numbers.	
02.05	Diagnose fluid loss and condition concerns; determine necessary action.	P-1
02.06	Check fluid level in a transmission or a transaxle equipped with a dipstick.	P-1
02.07	Check fluid level in a transmission or a transaxle not equipped with a dipstick.	P-1
02.08	Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine necessary action.	P-1

CTE Standards and Benchmarks		Priority Number
02.09	Perform stall test; determine necessary action.	P-3
02.10	Perform lock-up converter system tests; determine necessary action.	P-3
02.11	Diagnose noise and vibration concerns; determine necessary action.	P-2
02.12	Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.	P-1
02.13	Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).	P-2
02.14	Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.	P-1
02.15	Inspect, adjust, and replace manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.	P-2
02.16	Inspect for leakage; replace external seals, gaskets, and bushings.	P-2
02.17	Inspect, test, adjust, repair, or replace electrical/electronic components and circuits, including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses.	P-1
02.18	Diagnose electronic transmission control systems using a scan tool; determine necessary action.	
02.19	Inspect, replace, and align powertrain mounts.	P-2
02.20	Drain and replace fluids and filter(s).	P-1
02.21	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
02.22	Disassemble, clean, and inspect transmission/transaxle.	P-2
02.23	Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, sleeves, retainers, brackets, check valves/balls, screens, spacers, and gaskets).	P-2
02.24	Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine necessary action.	P-2
02.25	Assemble transmission/transaxle.	P-2
02.26	Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings.	P-1
02.27	Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.	P-2
02.28	Install and seat torque converter to engage drive/splines.	
02.29	Inspect, measure, and reseal oil pump assembly and components.	P-2
02.30	Measure transmission/transaxle end play or preload; determine necessary action.	P-1
02.31	Inspect, measure, and replace thrust washers and bearings.	P-2
02.32	Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.	P-2

CTE Standards and Benchmarks		Priority Number
02.33	Inspect bushings; determine necessary action.	P-2
02.34	Inspect and measure planetary gear assembly components; determine necessary action.	P-2
02.35	Inspect case bores, passages, bushings, vents, and mating surfaces; determine necessary action.	P-2
02.36	Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform necessary action.	P-2
02.37	Inspect, measure, repair, adjust or replace transaxle final drive components.	P-2
02.38	Inspect clutch drum, piston, check-balls, springs, retainers, seals, and friction and pressure plates; determine necessary action.	P-2
02.39	Measure clutch pack clearance; determine necessary action.	P-1
02.40	Air test operation of clutch and servo assemblies.	P-1
02.41	Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, and retainers; determine necessary action.	P-2
02.42	Inspect bands and drums; determine necessary action.	
02.43	Describe the operational characteristics of a continuously variable transmission (CVT).	P-3
02.44	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: 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 = 17
	P-2 = 12
	P-3 = 20
Total	**49**

CTE Standards and Benchmarks		**Priority Number**
03.0	Explain and apply proficiently the 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:	
03.01	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	
03.02	Identify and interpret drive train concern; determine necessary action.	P-1
03.03	Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1
03.04	Check fluid condition; check for leaks; determine necessary action.	P-1
03.05	Locate and interpret vehicle and major component identification numbers.	
03.06	Diagnose fluid loss, level, and condition concerns; determine necessary action.	
03.07	Drain and refill manual transmission/transaxle and final drive unit.	P-1
03.08	Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action.	P-1

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

CTE Standards and Benchmarks		Priority Number
03.34	Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action.	P-1
03.35	Diagnose universal joint noise and vibration concerns; perform necessary action.	P-2
03.36	Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals.	P-1
03.37	Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.	P-1
03.38	Inspect, service, and replace shaft center support bearings.	
03.39	Check shaft balance and phasing; measure shaft run out; measure and adjust driveline angles.	P-2
03.40	Diagnose noise and vibration concerns; determine necessary action.	
03.41	Inspect and replace companion flange and pinion seal; measure companion flange run out.	P-2
03.42	Inspect ring gear and measure run out; determine necessary action.	P-3
03.43	Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings.	P-3
03.44	Measure and adjust drive pinion depth.	P-3
03.45	Measure and adjust drive pinion bearing preload.	P-3
03.46	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
03.47	Check ring and pinion tooth contact patterns; perform necessary action.	P-3
03.48	Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.	P-3
03.49	Reassemble and reinstall differential case assembly; measure run out; determine necessary action.	P-3
03.50	Diagnose noise, slippage, and chatter concerns; determine necessary action.	P-3
03.51	Clean and inspect differential housing; check for leaks; inspect housing vent.	P-2
03.52	Check and adjust differential housing fluid level.	P-1
03.53	Drain and refill differential housing.	P-1
03.54	Inspect and reinstall limited slip differential components.	
03.55	Measure rotating torque; determine necessary action.	P-3
03.56	Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action.	P-2
03.57	Inspect and replace drive axle wheel studs.	P-1
03.58	Remove and replace drive axle shafts.	P-1
03.59	Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2

CTE Standards and Benchmarks		Priority Number
03.60	Measure drive axle flange run out and shaft end play; determine necessary action.	P-2
03.61	Diagnose noise and vibration concerns; determine necessary action.	P-2
03.62	Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-3
03.63	Remove and reinstall transfer case.	
03.64	Disassemble, service, and reassemble transfer case and components.	P-3
03.65	Inspect front-wheel bearings and locking hubs; perform necessary action(s).	P-3
03.66	Check for leaks at drive assembly seals; check vents; check lube level.	P-3
03.67	Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems.	P-3
03.68	Diagnose noise, vibration, and unusual steering concerns; determine necessary action.	P-3
03.69	Identify concerns related to variations in tire circumference and/or final drive ratios.	P-3

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	**17**
P-2	**17**
P-3	**4**
Total	**38**

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:	
04.01	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	
04.02	Identify and interpret heating and air conditioning problems; determine necessary action.	P-1
04.03	Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1
04.04	Locate and interpret vehicle and major component identification numbers.	
04.05	Performance test A/C system; identify problems.	P-1
04.06	Identify abnormal operating noises in the A/C system; determine necessary action.	P-2
04.07	Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings.	P-1
04.08	Leak test A/C system; determine necessary action.	P-1

CTE Standards and Benchmarks		Priority Number
04.09	Inspect the condition of refrigerant oil removed from A/C system; determine necessary action.	P-2
04.10	Determine recommended oil and oil capacity for system application.	P-1
04.11	Using a scan tool, observe and record related HVAC data and trouble codes.	P-3
04.12	Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action.	P-2
04.13	Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action.	P-1
04.14	Inspect, test, service or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.	P-2
04.15	Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil quantity.	P-2
04.16	Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	P-2
04.17	Determine the need for an additional A/C system filter; perform necessary action.	P-3
04.18	Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action.	P-2
04.19	Inspect A/C condenser for airflow restrictions; perform necessary action.	P-1
04.20	Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine required oil quantity.	P-2
04.21	Remove, inspect, and install expansion valve or orifice (expansion) tube.	P-1
04.22	Inspect evaporator housing water drain; perform necessary action.	P-1
04.23	Determine procedure to remove and reinstall evaporator; determine required oil quantity.	P-2
04.24	Remove, inspect, and reinstall condenser; determine required oil quantity.	P-2
04.25	Diagnose temperature control problems in the heater/ventilation system; (determine PCM) to interpret system operation; determine necessary action.	P-2
04.26	Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action.	
04.27	Inspect engine cooling and heater system hoses; perform necessary action.	P-1
04.28	Determine procedure to remove, inspect, and reinstall heater core.	P-2
04.29	Inspect, test, and replace thermostat and gasket/seal.	
04.30	Determine coolant condition and coolant type for vehicle application; drain and recover coolant.	
04.31	Flush system; refill system with recommended coolant; bleed system.	
04.32	Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.	
04.33	Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.	

CTE Standards and Benchmarks		Priority Number
04.34	Inspect and test heater control valve(s); perform necessary action.	P-2
04.35	Inspect and test A/C-heater blower, motors, resistors, switches, relays, wiring, and protection devices; perform necessary action.	P-1
04.36	Diagnose A/C compressor clutch control systems; determine necessary action.	P-2
04.37	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
04.38	Inspect and test A/C-heater control panel assembly; determine necessary action.	P-3
04.39	Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action.	P-3
04.40	Inspect A/C-heater ducts, doors, hoses, cabin filters and outlets; perform necessary action.	P-1
04.41	Identify the source of A/C system odors.	P-2
04.42	Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action.	P-2
04.43	Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.	P-1
04.44	Identify and recover A/C system refrigerant.	P-1
04.45	Recycle, label, and store refrigerant.	P-1
04.46	Evacuate and charge A/C system; add refrigerant oil as required.	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 NATEF tasks. NATEF requires that a minimum of 95% of P-1 tasks, 80% of P-2 tasks, and 50% of P-3 tasks are to be accomplished.

The standard length of this program is 1800 hours. **Automotive Service Technology 1** is a core program. 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.**

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 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