Florida Department of Education
Curriculum Framework

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

Career Certificate Program		
Program Number	l470608	
CIP Number	0647060405	
Grade Level	30, 31	
Program Length	1800 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 10	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Transportation, Distribution and Logistics career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Transportation, Distribution and Logistics career cluster.

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

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

Program Structure

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

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

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

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

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

The following table illustrates the postsecondary program structure:

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

National Standards

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

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

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

Florida Department of Education
Student Performance Standards

Program Title: **Master Automotive Service Technology**
Career Certificate Program Number: **I470608**

Course Description: The Automotive Service Assistor course prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study equipment skills, safety regulations, routine maintenance, and customer service.

Abbreviations:
ASE = Supplemental Tasks

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.

ER Task List	
P-1 =	12
P-2 =	6
P-3 =	0
Total	18

Course Number: AER0014 Occupational Completion Point: A Automotive Services Assistor – 300 Hours	Priority Number
01.0 Proficiently explain and apply required shop and personal safety tasks relating to the automotive industry. The student will be able to:	
01.01 Identify and apply general shop safety rules and procedures, EPA and OSHA standards.	ASE
01.02 Demonstrate knowledge of appropriate automotive industry certifications.	
01.03 Identify and define career opportunities in the automotive service industry.	
01.04 Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).	
01.05 Identify appropriate emergency first aid procedures.	
01.06 Utilize and demonstrate safe procedures for handling of tools and equipment.	ASE
01.07 Identify and use proper placement of floor jacks and jack stands.	ASE
01.08 Identify and use proper procedures for safe lift operation.	ASE
01.09 Utilize proper ventilation procedures for working within the lab/shop area.	ASE

	01.10 Identify proper procedures for safe pit usage.	
	01.11 Identify marked safety areas.	ASE
	01.12 Identify the location and the types of fire extinguishers and other fire safety equipment.	ASE
	01.13 Demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.	ASE
	01.14 Identify the location and use of eye wash stations.	ASE
	01.15 Identify the location of the posted evacuation routes.	ASE
	01.16 Comply with the required use of personal protection equipment (PPE) to include safety glasses, ear protection, gloves, shoes, and other devices as required during lab/shop activities.	ASE
	01.17 Identify and wear appropriate clothing for lab/shop activities.	ASE
	01.18 Secure hair and jewelry for lab/shop activities.	ASE
	01.19 Use proper handling procedures for automotive fluids.	
	01.20 Identify and describe typical automotive lubricants and lubricant properties.	
	01.21 Identify and describe typical automotive seals and gaskets.	
	01.22 Identify the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, battery electric vehicles, and hybrid electric vehicle high voltage circuits.	ASE
	01.23 Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.	
	01.24 Identify the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)	ASE
	01.25 Locate and demonstrate knowledge of Safety Data Sheets (SDS).	ASE
02.0	Explain and apply required tasks associated with the proper use and handling of tools and equipment relating to the automotive industry. The student will be able to:	
	02.01 Identify tools and equipment and their appropriate usage in automotive applications.	ASE
	02.02 Identify and use standard and metric measurement skills and designation.	ASE
	02.03 Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	ASE
	02.04 Demonstrate proper use of precision-measuring tools (i.e., micrometer, digital/dial-indicator, digital/dial caliper) and torque methods.	ASE
03.0	Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services. The student will be able to:	
	03.01 Identify information needed and the service requested on a repair order.	ASE
	03.02 Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.	
	03.03 Identify purpose and demonstrate proper use of fender covers, floor mats and other vehicle protection	ASE

	equipment.	
03.04	Demonstrate use of the three C's (Concern, Cause, and Correction).	ASE
03.05	Review vehicle service history.	ASE
03.06	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	ASE
03.07	Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.	
03.08	Determine the presence of a Tire Pressure Monitoring System (TPMS).	
03.09	Determine the presence of wheel locks.	
03.10	Determine the presence of an air suspension system.	
03.11	Check operation and status of instrument panel warning lights and gauges.	
03.12	Locate and use Vehicle Identification Number (VIN) vehicle information placards, decals, tags, as required.	
03.13	Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.	
03.14	Use proper chemicals for cleaning and lubrication.	P-1
03.15	Reset maintenance indicators; as applicable.	
03.16	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).	ASE
03.17	Inspect under-hood area for leaks, damage, and unusual conditions.	
03.18	Determine fluid type requirements and identify fluid.	P-1
03.19	Check engine oil level and condition; service as required.	
03.20	Check engine coolant level and condition; service as required.	
03.21	Check power steering fluid level and condition; service as required.	P-1
03.22	Check brake fluid level and condition; service as required.	
03.23	Check hydraulic clutch fluid and condition; service as required.	
03.24	Check windshield washer fluid level and condition; service as required.	
03.25	Check automatic transmission fluid level and condition; service as required.	
03.26	Inspect undercar area for leaks, damage, and unusual conditions.	
03.27	Check differential/transfer case fluid level; note unusual conditions; service as required.	P-2
03.28	Check manual transmission fluid level; note unusual conditions; service as required.	P-1

03.29	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.	
03.30	Lubricate driveline, suspension and steering systems; as applicable.	
03.31	Inspect cooling system pipes and hoses for wear, damage, and proper routing.	
03.32	Change engine oil and filter.	P-1
03.33	Inspect, service, or replace air filters, filter housings, and intake duct work.	P-1
03.34	Inspect and replace fuel filters; as applicable.	P-2
03.35	Inspect and replace air filter.	
03.36	Inspect and replace cabin air filter.	
03.37	Inspect, replace and adjust drive belts; inspect tensioners and pulleys.	P-2
03.38	Document observed damage, unusual conditions, and concerns.	
03.39	Inspect struts, springs, and related components; service as required.	
03.40	Inspect stabilizer bar(s), bushings, brackets, and links; service as required.	
03.41	Inspect springs, torsion bars, and related components; service as required.	
03.42	Inspect shock absorbers and related components.	
03.43	Inspect constant velocity (CV) axle shaft boots; service as required.	
03.44	Identify service considerations when equipped with a Tire Pressure Monitoring System (TPMS).	
03.45	Identify nitrogen-filled tires.	
03.46	Inspect tires, diagnose tire wear patterns, inspect spare and mounting system; check and adjust tire pressure; where applicable.	
03.47	Dismount, inspect, and remount tire on wheel (with/without TPMS); balance wheel and tire assembly.	P-1
03.48	Identify indirect and direct tire pressure monitoring system (TPMS); calibrate system; verify operation of instrument panel lamps.	P-1
03.49	Perform Road Force balance /match mounting.	P-2
03.50	Reinstall wheel; torque wheel fasteners to specification.	
03.51	Check wheel bearings for play and other signs of wear.	
03.52	Perform a visual inspection of a drum brake system.	
03.53	Perform a visual inspection of a disc brake system.	
03.54	Check operation of brake stop light system.	P-1
03.55	Check parking brake operation (manual/electric); check parking brake components for unusual conditions.	

03.56	Check wiper blades, inserts, and arms; replace wiper blades or inserts.	
03.57	Lubricate door latches and hinges.	
03.58	Inspect fuel tank, fuel cap and seal; inspect and replace fuel lines, fittings, and hoses; as applicable.	
03.59	Perform battery state-of-charge test; determine needed action.	P-1
03.60	Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action.	P-1
03.61	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.	
03.62	Perform battery, starting, and charging system tests using appropriate tester.	
03.63	Start a vehicle using jumper cables or a battery auxiliary power supply (jump box).	
03.64	Maintain or restore electronic memory functions if required.	P-2
03.65	Inspect and test fusible links, circuit breakers, and fuses; confirm proper circuit operation; replace as needed.	
03.66	Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.	P-1
03.67	Aim headlights.	P-2

Course Description: The Engine Repair Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of general engine, cylinder heads, valve trains, engine block, lubrication, and cooling systems.

Abbreviations:
ER = Engine Repair

For every task in Engine Repair Technician course, the following safety requirement MUST be strictly enforced:

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

ER Task List:	
	P-1 = 22
	P-2 = 19
	P-3 = 9
Total	**50**

Course Number: AER0110 **Occupational Completion Point: B** **Engine Repair Technician – 150 Hours**		**Priority Number**
04.0	Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, engine block, lubrication and cooling systems. The student will be able to:	
General: Engine Diagnosis; Removal and Reinstallation (R&R)		

04.01	Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advance driver assistance systems (ADAS).	P-1
04.02	Retrieve and record DTCs, OBD monitor status, and freezeframe data; clear codes and date when directed.	
04.03	Verify operation of the instrument panel engine warning indicators.	P-1
04.04	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action.	P-1
04.05	Install engine covers using gaskets, seals, and sealers as required.	P-1
04.06	Verify engine mechanical timing and identify variable timing procedures.	P-1
04.07	Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.	
04.08	Inspect, remove and/or replace engine mounts.	P-2
04.09	Identify service precautions related to service of the internal combustion engine of a hybrid electric vehicle.	P-2
04.10	Remove and reinstall engine on a newer vehicle equipped with OBD; reconnect all attaching components and restore the vehicle to running condition.	P-3
04.11	Identify and interpret engine concern; determine necessary action.	
04.12	Locate and interpret vehicle and major component identification numbers.	
04.13	Diagnose engine noises and vibrations; determine necessary action.	
04.14	Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.	
04.15	Perform engine vacuum tests; determine necessary action.	
04.16	Identify cylinder head and valve train components and configurations.	P-1
04.17	Perform cylinder power balance tests; determine necessary action.	
04.18	Perform cylinder cranking and running compression tests; determine necessary action.	
04.19	Perform cylinder leakage tests; determine necessary action.	
Cylinder Head and Valve Train Diagnosis and Repair		
04.20	Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer’s specification and procedure.	P-1
04.21	Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1
04.22	Inspect valve actuating mechanisms for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-2
04.23	Adjust valves (mechanical or hydraulic lifters).	P-1

04.24	Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing.	P-1
04.25	Inspect valve springs for squareness and free height comparison; determine needed action.	P-3
04.26	Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action.	P-3
04.27	Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action.	P-3
04.28	Inspect valves and valve seats; determine needed action.	P-3
04.29	Check valve spring assembled height and valve stem height; determine needed action.	P-3
04.30	Inspect valve lifters and hydraulic lash adjusters; determine needed action.	P-2
04.31	Inspect and/or measure camshaft for runout, journal wear and lobe wear.	P-3
04.32	Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action.	P-3
Engine Block Assembly Diagnosis and Repair		
04.33	Identify engine block assembly components and configurations.	P-1
04.34	Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-1
04.35	Disassemble engine block; clean and prepare components for inspection and reassembly.	P-1
04.36	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.	P-2
04.37	Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.	P-2
04.38	Deglaze and clean cylinder walls.	P-2
04.39	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.	P-2
04.40	Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine needed action.	P-2
04.41	Inspect main and connecting rod bearings for damage and wear; determine needed action.	P-2
04.42	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.	P-3
04.43	Inspect and measure piston skirts and ring lands; determine needed action.	P-2
04.44	Determine piston-to-bore clearance.	P-2
04.45	Inspect, measure, and install piston rings.	P-2
04.46	Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance and/or silencer); inspect shaft(s) and	P-2

	support bearings for damage and wear; determine needed action; reinstall and time.	
04.47	Remove and replace piston pin; where applicable.	
04.48	Assemble engine block.	P-1
Lubrication and Cooling Systems Diagnosis and Repair		
04.49	Identify lubrication and cooling system components and configurations.	
04.50	Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs; determine needed action.	P-1
04.51	Identify causes of engine overheating.	P-1
04.52	Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
04.53	Inspect and/or test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.	P-1
04.54	Inspect, remove, and replace water pump.	P-2
04.55	Remove and replace radiator.	P-2
04.56	Remove, inspect, and replace thermostat and gasket/seal.	P-1
04.57	Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.	P-1
04.58	Perform oil pressure tests; determine needed action.	P-1
04.59	Perform engine oil and filter change; use proper fluid type per manufacturer specification.	P-1
04.60	Inspect auxiliary coolers; determine needed action.	P-2
04.61	Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
04.62	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.	P-2
04.63	Inspect and replace engine cooling and heater system hoses.	

Course Description: The Automatic Transmission and Transaxle Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics, repair, service, and operation of automatic transmission/transaxles.

Abbreviations:
AT = Automatic Transmission/Transaxle

For every task in Automatic Transmission and Transaxle Technician course, the following safety requirement

AT Task List:
P-1 = 13
P-2 = 27
P-3 = 0
Total 40

MUST be strictly enforced:

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

Course Number: AER0257 Occupational Completion Point: C Automatic Transmission and Transaxle Technician – 150 Hours	**Priority Number**
05.0 Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles. The student will be able to:	
General: Transmission and Transaxle Diagnosis	
05.01 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
05.02 Identify automatic transmission and transaxle components and configurations.	P-1
05.03 Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
05.04 Inspect transmission fluid condition; check level; inspect for leaks on transmission or transaxle equipped with a dipstick.	P-1
05.05 Inspect transmission fluid condition; check level; inspect for leaks on transmission or transaxle not equipped with a dipstick.	P-1
05.06 Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine needed action.	P-1
05.07 Diagnose noise and vibration concerns; determine needed action.	P-2
05.08 Perform stall test; determine needed action.	P-2
05.09 Perform lock-up converter system tests; determine needed action.	P-2
05.10 Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.	P-1
05.11 Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.	P-1
05.12 Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).	P-1
In-Vehicle Transmission/Transaxle Maintenance and Repair	
05.13 Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.	P-1
05.14 Inspect for leakage; replace external seals, gaskets, and bushings.	P-2

05.15 Perform relearn procedures.	P-2
05.16 Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits.	P-1
05.17 Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.	P-1
05.18 Inspect, replace and align powertrain mounts.	P-2
05.19 Diagnose electronic transmission control systems using a scan tool; determine necessary action.	
Off-Vehicle Transmission and Transaxle Repair	
05.20 Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mounting surfaces.	P-2
05.21 Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings.	P-1
05.22 Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.	P-2
05.23 Describe the operational characteristics of a continuously variable transmission (CVT).	P-2
05.24 Describe the operational characteristics of a hybrid electric vehicle drive train.	P-2
05.25 Disassemble, clean, and inspect transmission/transaxle.	P-2
05.26 Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, switches, solenoids, sleeves, retainers, brackets, check valves/balls, screens, spacers, and gaskets).	P-2
05.27 Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine needed action.	P-2
05.28 Assemble transmission/transaxle.	P-2
05.29 Inspect, measure, and reseal oil pump assembly and components.	P-2
05.30 Measure transmission/transaxle end play and/or preload; determine needed action.	P-2
05.31 Inspect, measure, and/or replace thrust washers and bearings.	P-2
05.32 Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.	P-2
05.33 Inspect bushings; determine needed action.	P-2
05.34 Inspect and measure planetary gear assembly components; determine needed action.	P-2
05.35 Inspect case bores, passages, bushings, vents, and mating surfaces; determine needed action.	P-2
05.36 Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform needed action.	P-2
05.37 Inspect measure, repair, adjust or replace transaxle final drive components.	P-2
05.38 Inspect clutch drum, piston, check-balls, springs, retainers, seals, friction plates, pressure plates, and bands; determine needed action.	P-2

05.39 Measure clutch pack clearance; determine needed action.	P-2
05.40 Air test operation of clutch and servo assemblies.	P-2
05.41 Inspect one-way clutches, races, rollers, sprags, springs, cages, retainers; determine needed action.	P-2
05.42 Install and seat torque converter to engage drive/splines.	
05.43 Inspect bands and drums; determine necessary action.	

Course Description: The Manual Drivetrain and Axle Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of drive train, clutch, transmission, transaxle, half shaft universal, constant-velocity joint, rear axle, ring and pinion gears, differential case assemble, limited slip differential, drive shaft, and four wheel drive/all-wheel drive.

Abbreviations:
MD = Manual Drivetrain and Axles

For every task in Manual Drivetrain and Axle Technician course, the following safety requirement MUST be strictly enforced:

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

MD Task List:
P-1 = 16
P-2 = 30
P-3 = 6
Total 52

Course Number: AER0274 Occupational Completion Point: D Manual Drivetrain and Axle Technician – 150 Hours	**Priority Number**
06.0 Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive. The student will be able to:	
General: Drive Train Diagnosis	
06.01 Identify and interpret drive train concerns; determine needed action.	P-1
06.02 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
06.03 Check fluid condition; check for leaks; determine needed action.	P-1
06.04 Identify manual drive train and axle components and configurations.	P-1

06.05	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
06.06	Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification.	P-1
06.07	Diagnose fluid loss, level, and condition concerns; determine necessary action.	
Clutch Diagnosis and Repair		
06.08	Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action.	P-2
06.09	Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform needed action.	P-2
06.10	Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable).	P-2
06.11	Bleed clutch hydraulic system.	P-2
06.12	Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.	P-2
06.13	Inspect flywheel and ring gear for wear, cracks, and discoloration; determine needed action.	P-2
06.14	Measure flywheel runout and crankshaft end play; determine needed action.	P-2
06.15	Describe the operation and service of a system that uses a dual mass flywheel.	P-3
06.16	Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.	
06.17	Describe the operation and service of an electronically controlled dual clutch system.	
06.18	Inspect engine block, core plugs, rear main engine oil seal, clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action.	
Transmission/Transaxle Diagnosis and Repair		
06.19	Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers.	P-2
06.20	Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.	P-2
06.21	Diagnose noise concerns through the application of transmission/transaxle powerflow principles.	P-2
06.22	Diagnose hard shifting and jumping out of gear concerns; determine needed action.	P-2
06.23	Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action.	P-2
06.24	Disassemble, inspect clean, and reassemble internal transmission/transaxle components.	P-3
06.25	Remove and reinstall manual transmission/transaxle.	
06.26	Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action.	
06.27	Inspect, replace, and align powertrain mounts.	

06.28	Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.	
06.29	Remove and replace transaxle final drive.	
06.30	Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.	
06.31	Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action.	
06.32	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.	
06.33	Inspect lubrication devices (oil pump or slingers); perform necessary action.	
06.34	Inspect, test, and replace transmission/transaxle sensors and switches.	
Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair (Front, Rear, All-Wheel, and Four-Wheel drive)		
06.35	Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action.	P-1
06.36	Diagnose universal joint noise and vibration concerns; perform needed action.	P-1
06.37	Inspect, remove, and/or replace bearings, hubs, and seals.	P-1
06.38	Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.	P-1
06.39	Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles; determine needed action.	P-2
06.40	Inspect, service, and replace shaft center support bearings.	
Drive Axle Diagnosis and Repair – Ring and Pinion Gears and Differential Case Assembly		
06.41	Clean and inspect differential housing; check for leaks; inspect housing vent.	P-1
06.42	Check and adjust differential housing fluid level; use proper fluid type per manufacturer specification.	P-1
06.43	Drain and refill differential housing; use proper fluid type per manufacturer specifications.	P-1
06.44	Diagnose noise and vibration concerns; determine needed action.	P-2
06.45	Inspect and replace companion flange and/or pinion seal; measure companion flange runout.	P-2
06.46	Inspect ring gear and measure runout; determine needed action.	P-2
06.47	Remove, inspect, reinstall and/or drive pinion and ring gear, spacers, sleeves, and bearings.	P-2
06.48	Measure and adjust drive pinion depth.	P-2
06.49	Measure and adjust drive pinion bearing preload.	P-2
06.50	Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types).	P-2

06.51 Check ring and pinion tooth contact patterns; perform needed action.	P-2
06.52 Disassemble, inspect, measure, adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.	P-2
06.53 Reassemble and reinstall differential case assembly; measure runout; determine needed action.	P-2
06.54 Diagnose noise and vibration concerns; determine necessary action.	
Drive Axle Diagnosis and Repair – Limited Slip Differential	
06.55 Diagnose noise, slippage, and chatter concerns; determine needed action.	P-3
06.56 Measure rotating torque; determine needed action.	P-3
06.57 Inspect and reinstall limited slip differential components.	
06.58 Identify operational characteristics of electronic control differentials.	
Drive Axle Diagnosis and Repair – Drive Axles	
06.59 Inspect and replace drive axle wheel studs.	P-1
06.60 Remove and replace drive axle shafts.	P-1
06.61 Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2
06.62 Measure drive axle flange runout and shaft end play; determine needed action.	P-2
06.63 Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine needed action.	P-2
Four-Wheel Drive/All-Wheel Drive Component Diagnosis and Repair	
06.64 Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-2
06.65 Inspect locking mechanisms; determine needed action.	P-3
06.66 Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P-2
06.67 Identify concerns related to variations in tire circumference and/or final drive ratios.	P-1
06.68 Diagnose noise, vibration, and unusual steering concerns; determine needed action.	P-2
06.69 Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive/all-wheel drive systems.	P-2
06.70 Disassemble, service, and reassemble transfer case and components.	P-3
06.71 Remove and reinstall transfer case.	

Course Description: The Automotive Suspension and Steering Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of general suspension, steering systems, front suspensions, rear suspensions, wheel alignment, and tires.

Abbreviations:
SS = Suspension and Steering

For every task in Automotive Suspension and Steering Technician course, the following safety requirement MUST be strictly enforced:

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

SS Task List:	
P-1	**27**
P-2	**22**
P-3	**6**
Total	**55**

Course Number: AER0453 **Occupational Completion Point: E** **Automotive Suspension and Steering Technician – 150 Hours**	**Priority Number**
07.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions systems, wheel alignment, and wheels and tires. The student will be able to:	
General: Suspension and Steering Systems	
07.01 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
07.02 Identify suspension and steering system components and configurations.	
07.03 Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
07.04 Identify and interpret suspension and steering system concerns; determine needed action.	P-1
Steering Systems Diagnosis and Repair	
07.05 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1
07.06 Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).	P-1
07.07 Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action.	P-2
07.08 Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-3
07.09 Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-1
07.10 Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.	P-2

07.11 Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.	P-2
07.12 Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.	P-1
07.13 Drain and replace power steering system fluid; use proper fluid type per manufacturer specification.	P-2
07.14 Inspect for power steering fluid leakage; determine needed action.	P-1
07.15 Remove and reinstall power steering pump.	P-2
07.16 Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.	P-2
07.17 Inspect, remove and/or replace power steering hoses and fittings.	P-2
07.18 Inspect, remove and/or replace pitman arm, relay (center-link/intermediate) rod, idler arm, mountings, and steering linkage damper.	P-2
07.19 Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps.	P-1
07.20 Inspect and test electric power steering system; determine needed action.	P-1
07.21 Identify hybrid electric vehicle power steering system electrical circuits and safety precautions.	P-2
07.22 Test power steering system pressure; determine needed action.	P-3
Suspension Systems Diagnosis and Repair	
07.23 Diagnose suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
07.24 Inspect, remove, and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.	P-2
07.25 Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators).	P-2
07.26 Inspect, remove, and/or replace steering knuckle assemblies.	P-2
07.27 Inspect, remove and/or replace suspension system coil springs and spring insulators.	P-2
07.28 Inspect, remove, and/or replace torsion bars and mounts	P-2
07.29 Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.	P-3
07.30 Inspect, remove, and/or replace strut assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.	P-3
07.31 Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings.	P-3
07.32 Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.	P-1
07.33 Inspect, remove, and /or replace components of suspension systems (coil, leaf, and torsion).	P-1
07.34 Inspect, remove, and /or replace components of electronically controlled suspension systems.	P-1
Related Suspension and Steering Service	

07.35	Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.	P-2
07.36	Remove, inspect, service and/or replace front and rear wheel bearings.	P-1
07.37	Describe the function of suspension and steering control systems and components, (i.e., active suspension and stability control).	P-2
Wheel Alignment Diagnosis, Adjustment, and Repair		
07.38	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action.	P-1
07.39	Perform pre-alignment inspection; measure vehicle ride height; determine needed action.	P-1
07.40	Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber and toe as required; center steering wheel.	P-1
07.41	Check toe-out-on-turns (turning radius); determine needed action.	P-2
07.42	Check steering axis inclination (SAI) and included angle; determine needed action.	P-2
07.43	Check rear wheel thrust angle; determine needed action.	P-1
07.44	Check for front wheel setback; determine needed action.	P-2
07.45	Check front and/or rear cradle (sub-frame) alignment; determine needed action.	P-3
07.46	Reset steering angle sensor and related equipment.	P-2
07.47	Identify operational characteristics of an ADAS system (brakes, lane departure, etc.).	
Wheels and Tires Diagnosis and Repair		
07.48	Inspect tire condition; identify tire wear patterns; check for correct tire size, application (load and speed ratings), and air pressure as listed on the tire information placard/label.	P-1
07.49	Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.	P-2
07.50	Rotate tires according to manufacturer’s recommendation including vehicles equipped with tire pressure monitoring systems (TPMS)	P-1
07.51	Measure wheel, tire, axle flange, and hub runout; determine needed action.	P-2
07.52	Diagnose tire pull problems; determine needed action.	P-1
07.53	Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.	P-1
07.54	Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-1
07.55	Inspect tire and wheel assembly for air loss; perform needed action.	P-1
07.56	Repair tire following vehicle manufacturer approved procedure.	P-1
07.57	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure	P-1
07.58	Reinstall wheel; torque lug nuts.	

Course Description: The Automotive Brake System Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of brake systems, drum brakes, disc brakes, power assist units, electronic brakes, traction, and stability control.

Abbreviations:
BR = Brakes

BR Task List:	
	P-1 = 30
	P-2 = 23
	P-3 = 3
Total	**56**

For every task in Automotive Brake System Technician course, the following safety requirement MUST be strictly enforced:

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

Course Number: AER0418 **Occupational Completion Point: F** **Automotive Brake System Technician – 150 Hours**		**Priority Number**
08.0	Explain and apply proficiently the diagnosis, service and repair of drum\disc brake, hydraulics, power assist units, electronic brakes, traction control, stability control systems and miscellaneous (wheel bearings, parking brake, electrical, etc.) systems.--The student will be able to:	
General: Brake Systems Diagnosis		
08.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
08.02	Identify and interpret brake system concerns; determine needed action.	P-1
08.03	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
08.04	Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).	P-1
08.05	Install wheel and torque lug nuts.	P-1
08.06	Identify and interpret brake system concerns; determine needed action.	P-1
Hydraulic System Diagnosis and Repair		
08.07	Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).	P-1
08.08	Measure brake pedal height, travel, and free play (as applicable); determine needed action.	P-1
08.09	Check master cylinder for internal/external leaks and proper operation; determine needed action.	P-1

08.10	Remove, bench bleed, and reinstall master cylinder.	P-1
08.11	Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.	P-1
08.12	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear; and loose fittings/supports; determine needed action.	P-1
08.13	Replace brake lines, hoses, fittings, and supports.	P-2
08.14	Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).	P-2
08.15	Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P-1
08.16	Inspect, test, and/or replace components of brake warning light system.	P-3
08.17	Identify components of hydraulic brake warning light system.	P-2
08.18	Bleed and/or replace brake fluid.	P-1
08.19	Test brake fluid for contamination.	P-1
08.20	Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.	
Drum Brake Diagnosis and Repair		
08.21	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.	P-2
08.22	Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P-2
08.23	Refinish brake drum and measure final drum diameter; compare with specification.	P-2
08.24	Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.	P-2
08.25	Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2
08.26	Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	P-2
Disc Brake Diagnosis and Repair		
08.27	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.	P-1
08.28	Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action.	P-1
08.29	Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action.	P-1
08.30	Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action.	P-1
08.31	Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks.	P-1
08.32	Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.	P-1

08.33 Remove and reinstall/replace rotor.	P-1
08.34 Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P-1
08.35 Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-2
08.36 Retract and re-adjust caliper piston on an integrated parking brake system.	P-1
08.37 Check brake pad wear indicator; determine needed action.	
08.38 Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.	P-1
08.39 Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts.	
Power-Assist Units Diagnosis and Repair	
08.40 Check brake pedal travel with and without engine running to verify proper power booster operation.	P-2
08.41 Identify components of the brake power assist system (vacuum, hydraulic, and electric).	P-2
08.42 Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster; determine needed action.	P-2
08.43 Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine needed action.	P-2
08.44 Inspect electric power booster unit; determine needed action.	P-3
Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair	
08.45 Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action.	P-1
08.46 Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.	P-2
08.47 Check parking brake operation (including electric parking brakes); check parking brake indicator light system operation; determine needed action.	P-2
08.48 Check parking brake operation and parking brake indicator light system operation; determine needed action.	P-1
08.49 Replace wheel bearing and race.	P-3
08.50 Remove, reinstall, and/or replace sealed wheel bearing assembly.	P-1
08.51 Inspect and replace wheel studs.	P-2
Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) Systems Diagnosis and Repair	
08.52 Identify and inspect electronic brake control system components (ABS, TCS, & ESC); determine needed action.	P-1
08.53 Describe the operation of a regenerative braking system.	P-2
08.54 Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action.	P-2

08.55	Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action.	P-2
08.56	Depressurize high-pressure components of an electronic brake control system.	P-2
08.57	Bleed the electronic brake control system hydraulic circuits.	P-1
08.58	Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).	P-2
08.59	Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).	P-2
08.60	Remove and install electronic brake control system electrical/electronic and hydraulic components.	

Course Description: The Automotive Electrical/Electronic System Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of electrical/electronics, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems.

Abbreviations:
EE = Electrical/Electronic Systems

For every task in Automotive Electrical/Electronic System Technician course, the following safety requirement MUST be strictly enforced:

EE Task List:
P-1 = 40
P-2 = 6
P-3 = 0
Total 46

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

Course Number: AER0360 Occupational Completion Point: G Automotive Electrical/Electronic System Technician – 300 Hours		**Priority Number**
09.0	Explain and apply proficiently the diagnosis, service and repair of electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems. The student will be able to:	
General: Electrical System Diagnosis		
09.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
09.02	Identify electrical/electronic system components and configurations.	P-1
09.03	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1

09.04	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1
09.05	Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.	P-1
09.06	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1
09.07	Describe types of test lights; use appropriate test light to check operation of electrical circuits per service information.	P-1
09.08	Use fused jumper wires to check operation of electrical circuits.	P-1
09.09	Use wiring diagrams during the diagnosis of electrical/electronic circuit problems (e.g., symbols).	P-1
09.10	Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.	P-1
09.11	Inspect and test fusible links, circuit breakers, and fuses; determine needed action.	P-1
09.12	Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.	P-1
09.13	Test and measure circuit using an oscilloscope and/or graphing multimeter (GMM); interpret results; determine needed action.	P-1
09.14	Identify repair procedures for network connected systems.	P-1
09.15	Identify and interpret electrical/electronic system concern; determine necessary action.	
Battery Diagnosis and Service		
09.16	Maintain or restore electronic memory functions.	P-1
09.17	Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1
09.18	Perform slow/fast battery charge according to manufacturer's recommendations.	P-1
09.19	Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1
09.20	Identify safety precautions for high voltage systems on electric, hybrid, hybrid-electric, and diesel vehicles.	
09.21	Identify electrical/electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.	P-2
09.22	Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.	
09.23	Perform battery conductance test; determine necessary action.	
Starting System Diagnosis and Repair		
09.24	Perform starter current draw tests; determine needed action.	P-1
09.25	Perform starter circuit voltage drop tests; determine needed action.	P-1
09.26	Inspect and test starter relays and solenoids; determine needed action.	P-2

09.27	Remove and install starter in a vehicle.	P-1
09.28	Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.	P-1
09.29	Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.	P-1
09.30	Demonstrate knowledge of an automatic idle-stop/start-stop system.	P-1
09.31	Diagnose a no-crank condition using a wiring diagram and test equipment; determine needed action.	P-1
Charging System Diagnosis and Repair		
09.32	Perform charging system output test; determine needed action.	P-1
09.33	Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.	P-1
09.34	Inspect, adjust, and/or replace alternator (generator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P-1
09.35	Remove, inspect, and/or replace alternator (generator); determine needed action.	P-1
09.36	Perform charging circuit voltage drop tests; determine needed action.	P-1
Lighting Systems Diagnosis and Repair		
09.37	Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action.	P-1
09.38	Describe operation and diagnosis of an adaptive headlight system.	
09.39	Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2
09.40	Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.	
Instrument Cluster and Driver Information Systems Diagnosis and Repair		
09.41	Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action.	P-1
09.42	Diagnose the causes of incorrect operation of warning devices and other driver information systems; determine needed action.	P-1
09.43	Verify operation of instrument panel gauge sending units for causes of abnormal readings; determine needed action.	P-1
09.44	Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.	
Body Electrical Systems Diagnosis and Repair		
09.45	Diagnose vehicle comfort, convenience, access, safety, and related system operation; determine needed action.	P-2
09.46	Remove and reinstall door panel.	P-1
09.47	Diagnose operation of security/anti-theft systems and related circuits (such as: theft deterrent, door locks, remote keyless entry, remote start, and starter/fuel disable); determine needed repairs.	P-2

09.48	Diagnose operation of entertainment and related circuits (such as: radio, DVD, remote CD changer, navigation, amplifiers, speakers, antennas, and voice-activated accessories); determine needed repairs.	P-2
09.49	Describe disabling and enabling procedures for supplemental restraint system (SRS); verify indicator lamp operation.	P-1
09.50	Verify windshield wiper and washer operation; replace wiper blades.	P-1
09.51	Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back-up camera); determine needed repairs.	P-1
09.52	Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action.	P-1
09.53	Describe the process for software transfer, software updates, or reprogramming of electronic modules.	P-1
09.54	Diagnose heated glass, mirror, or seat operation; determine necessary action.	

Course Description: The Automotive Heating and Air Conditioning Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling.

Abbreviations:
HA = Heating and Air Conditioning

For every task in Automotive Heating and Air Conditioning Technician course, the following safety requirement MUST be strictly enforced:

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

HA Task List:
P-1 = 20
P-2 = 14
P-3 = 2
Total 36

Course Number: AER0172 **Occupational Completion Point: H** **Automotive Heating and Air Conditioning Technician – 150 Hours**		**Priority Number**
10.0	Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling. The student will be able to:	
General: A/C System Diagnosis and Repair		
10.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1

10.02	Identify heating, ventilation, and air conditioning (HVAC) components and configurations.	P-1
10.03	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
10.04	Identify and interpret heating and air conditioning problems; determine needed action.	P-1
10.05	Performance test A/C system; identify problems.	
10.06	Identify abnormal operating noises in the A/C system; determine needed action.	P-2
10.07	Identify refrigerant type; test for sealant; select and connect proper gauge set/test equipment; record temperature and pressure readings.	P-1
10.08	Leak test A/C system; determine needed action.	P-1
10.09	Inspect condition/quantity of refrigerant oil removed from A/C system; determine needed action.	P-2
10.10	Determine recommended oil and oil capacity for system application and component(s) replacement.	P-1
Refrigeration System Component Diagnosis and Repair		
10.11	Inspect, remove, and/or replace A/C compressor drive belts, pulleys, tensioners and visually inspect A/C components for signs of leaks; determine needed action.	P-1
10.12	Inspect, test, and/or service A/C compressor clutch components and mountings; determine needed action.	P-2
10.13	Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity.	P-2
10.14	Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	
10.15	Determine need for an additional A/C system filter; perform needed action.	P-3
10.16	Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform needed action.	P-2
10.17	Inspect for proper A/C condenser airflow; determine needed action.	P-1
10.18	Remove, inspect, and replace receiver/drier or accumulator/drier; determine recommended oil type and quantity.	P-2
10.19	Remove, inspect, and install expansion valve or orifice (expansion) tube.	P-1
10.20	Inspect evaporator housing water drain; perform needed action.	P-1
10.21	Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action.	P-1
10.22	Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.	P-2
10.23	Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action.	
Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair		
10.24	Inspect engine cooling and heater systems hoses and pipes; perform needed action.	P-1

10.25 Inspect and test heater control valve(s); perform needed action.	P-2
10.26 Diagnose temperature control problems in the HVAC system; determine needed action.	P-2
10.27 Determine procedure to remove, inspect, reinstall, and/or replace heater core.	P-2
10.28 Inspect, test, and replace thermostat and gasket/seal.	
10.29 Determine coolant condition and coolant type for vehicle application; drain and recover coolant.	
10.30 Flush system; refill system with recommended coolant; bleed system.	
10.31 Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.	
10.32 Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.	
Operating Systems and Related Controls Diagnosis and Repair	
10.33 Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.	P-1
10.34 Diagnose A/C compressor clutch control systems; determine needed action.	P-1
10.35 Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine needed action.	P-2
10.36 Inspect., test remove and/or replace HVAC system control panel; determine needed action.	P-2
10.37 Inspect and test HVAC system control cables, motors, and linkages; perform needed action.	P-3
10.38 Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; perform needed action.	P-1
10.39 Identify the source of HVAC system odors.	P-2
10.40 Check operation of automatic HVAC control systems; determine needed action.	P-2
Refrigerant Recovery, Recycling, and Handling	
10.41 Demonstrate awareness of the need to recover, recycle, and handle refrigerant using roper equipment and procedures.	P-1
10.42 Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.	P-1
10.43 Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.	P-1
10.44 Recycle, label, and store refrigerant.	P-1

Course Description: The Automotive Engine Performance Technician course prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer, engine and emission control systems.

Abbreviations:
EP = Engine Performance

For every task in Automotive Engine Performance Technician course, the following safety requirement MUST be strictly enforced:

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

EP Task List:	
P-1 =	34
P-2 =	13
P-3 =	2
Total	49

Course Number: AER0503 Occupational Completion Point: I Automotive Engine Performance Technician – 300 Hours		Priority Number
11.0	Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems. The student will be able to:	
General: Engine Diagnosis		
11.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
11.02	Identify and interpret engine performance concerns; determine needed action.	P-1
11.03	Diagnose abnormal engine noises or vibration concerns; determine needed action.	P-2
11.04	Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.	P-2
11.05	Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action.	P-1
11.06	Perform cylinder power balance test; determine needed action.	P-1
11.07	Perform cylinder cranking and running compression tests; determine needed action.	P-1
11.08	Perform cylinder leakage test; determine needed action.	P-1
11.09	Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.	P-1
11.10	Verify proper engine cooling system operation; determine needed action.	P-1
11.11	Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT).	P-1
11.12	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	
11.13	Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.	
11.14	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.	

Computerized Controls Diagnosis and Repair		
11.15	Identify computerized control system components and configurations.	P-1
11.16	Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable.	P-1
11.17	Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1
11.18	Perform active tests of actuators using a scan tool; determine needed action.	P-1
11.19	Describe the use of OBD monitors for repair verification.	P-1
11.20	Diagnose the causes of emissions or drive-ability concerns with stored or active diagnostic trouble codes (DTC); obtain, graph, and interpret scan tool data.	P-1
11.21	Diagnose emissions or drive-ability concerns without stored or active diagnostic trouble codes; determine needed action.	P-1
11.22	Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO); perform needed action.	P-1
11.23	Diagnose drive-ability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, HVAC, automatic transmissions, non-OEM installed accessories, or similar systems); determine needed action.	P-2
11.24	Check for module communication (including CAN/BUS systems) errors using a scan tool.	
11.25	Describe the process for reprogramming or recalibrating the powertrain/engine control module (PCM/ECM).	P-1
Ignition System Diagnosis and Repair		
11.26	Identify ignition system components and configurations.	P-1
11.27	Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns; determine needed action.	P-1
11.28	Inspect and test crankshaft and camshaft position sensor(s); determine needed action.	P-1
11.29	Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as needed.	P-2
11.30	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1
11.31	Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.	
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair		
11.32	Identify fuel, air induction, and exhaust system components and configurations.	P-1
11.33	Diagnose (troubleshoot) hot or cold no-starting, hard starting, poor drive-ability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine needed action.	P-2

11.34	Check fuel for contaminants; determine needed action.	P-2
11.35	Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; perform needed action.	P-1
11.36	Replace fuel filter(s) where applicable.	P-2
11.37	Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2
11.38	Inspect, test, and/or replace fuel injectors on low- and high-pressure systems.	P-1
11.39	Verify idle control operation.	P-1
11.40	Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform needed action.	P-1
11.41	Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.	P-1
11.42	Perform exhaust system back-pressure test; determine needed action.	P-2
11.43	Check and refill diesel exhaust fluid (DEF).	P-3
11.44	Test the operation of turbocharger/supercharger systems; determine needed action.	P-2
Emissions Control Systems Diagnosis and Repair		
11.45	Identify emission control system components and configurations.	P-1
11.46	Diagnose oil leaks, emissions, and drive-ability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.	P-2
11.47	Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform needed action.	P-2
11.48	Diagnose emissions and drive-ability concerns caused by the exhaust gas recirculation (EGR) system; inspect, test, service and/or replace electrical/electronic sensors, controls, wiring, tubing, exhaust passages, vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) systems; determine needed action.	P-1
11.49	Diagnose emissions and drive-ability concerns caused by the secondary air injection system; inspect, test, repair, and/or replace electrical/electronically-operated components and circuits of secondary air injection systems; determine needed action.	P-2
11.50	Diagnose emissions and drive-ability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.	P-1
11.51	Diagnose emission and drive-ability concerns caused by catalytic converter system; determine needed action.	P-1
11.52	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.	P-1
11.53	Inspect and test electrical/electronically operated components and circuits of secondary air injection systems; determine needed action.	P-3
11.54	Adjust valves on engines with mechanical or hydraulic lifters; as applicable.	

11.55	Remove and replace timing belt; verify correct camshaft timing.	
11.56	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	
11.57	Inspect engine oil and/or filter for condition and determine necessary action.	
11.58	Identify hybrid electric vehicle internal combustion engine service precautions.	

Additional Information

Laboratory Activities

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

Special Notes

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

It is recommended that the program be Automotive Service Excellence (ASE) Education Foundation Master Certified (MAST) and the instructors be A1-A8 ASE Master and Advanced Engine Performance (L1) ASE Certified.

Career and Technical Student Organization (CTSO)

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

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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