Florida Department of Education
Curriculum Framework

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

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

Purpose

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

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

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

Program Structure

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

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

For institutions using this framework, the Automotive Service Excellence Education Foundation (ASEEF) 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 ASE P-1, P-2, or P-3 are ASE tasks. P-4 tasks are additional tasks that may be required by the manufacturer partner. P-4 tasks can be either instructor led or performed by the student as determined by the manufacturer's curriculum.

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

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

The following table illustrates the postsecondary program structure:

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

National Standards

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

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership, and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

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

Florida Department of Education
Student Performance Standards

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

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

Abbreviations:
ASE = Supplemental Tasks

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

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

Course Number: AER0011 **Occupational Completion Point: A** **Automotive Maintenance Technician – 200 Hours**		**Priority Number**
01.0	Proficiently explain and apply required shop and personal safety tasks relating to the automotive industry. The student will be able to:	
01.01	Identify general shop safety rules and procedures.	P-4
01.02	Utilize safe procedures for handling of tools and equipment.	P-4
01.03	Identify and use proper placement of floor jacks and jack stands.	P-4
01.04	Identify and use proper procedures for safe lift operation.	P-4
01.05	Utilize proper ventilation procedures for working within the lab/shop area.	P-4
01.06	Identify marked safety areas.	P-4
01.07	Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.	P-4
01.08	Identify the location and use of eye wash stations.	P-4
01.09	Identify the location of the posted evacuation routes.	P-4
01.10	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.	P-4

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

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

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

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

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

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

Abbreviations:
ER = Engine Repair

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

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

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

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

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

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

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

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

Abbreviations:
AT = Automatic Transmission/Transaxle

For every task in Advanced Automatic Transmission and Transaxle Technician course, the following safety requirement MUST be strictly enforced:

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

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

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

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

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

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

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

Abbreviations:
MD = Manual Drivetrain and Axles

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

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

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

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

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

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

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

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

Abbreviations:
SS = Suspension and Steering

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

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

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

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

06.11	Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.	P-1
06.12	Inspect power steering fluid level and condition.	P-1
06.13	Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.	P-2
06.14	Inspect for power steering fluid leakage; determine needed action.	P-1
06.15	Remove, inspect, replace, and/or adjust power steering pump drive belt.	P-1
06.16	Remove and reinstall power steering pump.	P-2
06.17	Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.	P-2
06.18	Inspect, remove and/or replace power steering hoses and fittings.	P-2
06.19	Inspect, remove and/or replace pitman arm, relay (center-link/intermediate) rod, idler arm, mountings, and steering linkage damper.	P-2
06.20	Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps.	P-1
06.21	Inspect, test and diagnose electrically- assisted power steering systems (including using a scan tool); determine needed action.	P-2
06.22	Identify hybrid vehicle power steering system electrical circuits and safety precautions.	P-2
06.23	Test power steering system pressure; determine needed action.	P-2
Suspension Systems Diagnosis and Repair		
06.24	Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
06.25	Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
06.26	Inspect, remove, and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.	P-3
06.27	Inspect, remove, and/or replace strut rods and bushings.	P-3
06.28	Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators).	P-2
06.29	Inspect, remove, and/or replace steering knuckle assemblies.	P-3
06.30	Inspect, remove and/or replace short and long arm suspension system coil springs and spring insulators.	P-3
06.31	Inspect, remove, and/or replace torsion bars and mounts	P-3
06.32	Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.	P-3
06.33	Inspect, remove, and/or replace strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.	P-3
06.34	Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings.	P-3

06.35 Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.	P-1
Related Suspension and Steering Service	
06.36 Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.	P-1
06.37 Remove, inspect, service and/or replace front and rear wheel bearings.	P-1
06.38 Describe the function of suspension and steering control systems and components, (i.e., active suspension and stability control).	P-3
Wheel Alignment Diagnosis, Adjustment, and Repair	
06.39 Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action.	P-1
06.40 Perform pre-alignment inspection; measure vehicle ride height; determine needed action.	P-1
06.41 Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber and toe as required; center steering wheel.	P-1
06.42 Check toe-out-on-turns (turning radius); determine needed action.	P-2
06.43 Check steering axis inclination (SAI) and included angle; determine needed action.	P-2
06.44 Check rear wheel thrust angle; determine needed action.	P-1
06.45 Check for front wheel setback; determine needed action.	P-2
06.46 Check front and/or rear cradle (sub-frame) alignment; determine needed action.	P-3
06.47 Reset steering angle sensor.	P-2
Wheels and Tires Diagnosis and Repair	
06.48 Inspect tire condition; identify tire wear patterns; check for correct tire size, application (load and speed ratings), and air pressure as listed on the tire information placard/label.	P-1
06.49 Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.	P-2
06.50 Rotate tires according to manufacturer’s recommendation including vehicles equipped with tire pressure monitoring systems (TPMS)	P-1
06.51 Measure wheel, tire, axle flange, and hub runout; determine needed action.	P-2
06.52 Diagnose tire pull problems; determine needed action.	P-1
06.53 Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.	P-1
06.54 Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-1
06.55 Inspect tire and wheel assembly for air loss; perform needed action.	P-1
06.56 Repair tire following vehicle manufacturer approved procedure.	P-1
06.57 Identify indirect and direct tire pressure monitoring system (TPMS); calibrate system; verify operation of	P-1

	instrument panel lamps.	
06.58	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure	P-1
Manufacturer Specific Steering and Suspension Tasks		
06.59	Service product specific suspension systems.	P-4
06.60	Service product specific ride height control systems.	P-4
06.61	Locate and interpret vehicle major suspension components and identification numbers.	P-4
06.62	Adjust non-rack and pinion worm bearing preload and sector lash.	P-4
06.63	Reinstall wheel; torque lug nuts.	P-4
06.64	Service product specific tire pressure monitoring systems	P-4
06.65	Service product specific electric power steering systems	P-4
06.66	Reset product specific steering wheel sensors	P-4
06.67	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the steering and suspension control systems; determine necessary action.	P-4
06.68	Perform multiplex check to determine that all steering and suspension components are communicating and are performing within specifications.	P-4

Course Description: The Advanced Automotive Brake System Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study drum/disc brakes, hydraulics, power assist units, electronic brakes, traction control, stability control, and miscellaneous diagnostics, service, and repair.

Abbreviations:
BR = Brakes

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

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

BR Task List:	
P-1 =	**42**
P-2 =	**11**
P-3 =	**5**
Total	**56**

Course Number: AER0419 Occupational Completion Point: F Advanced Automotive Brake System Technician – 200 Hours		**Priority Number**
07.0	Explain and apply proficiently the diagnosis, service and repair of drum\disc brake, hydraulics, power assist units, electronic brakes, traction control, stability control systems and miscellaneous (wheel bearings, parking brake,	

electrical, etc.) systems. The student will be able to:	
General: Brake Systems Diagnosis	
07.01 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
07.02 Identify brake system components and configurations.	P-1
07.03 Identify and interpret brake system concerns; determine needed action.	P-1
07.04 Describe procedure for performing a road test to check brake system operation including an anti-lock brake system (ABS).	P-1
07.05 Install wheel and torque lug nuts.	P-1
Hydraulic System Diagnosis and Repair	
07.06 Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).	P-1
07.07 Measure brake pedal height, travel, and free play (as applicable); determine needed action.	P-1
07.08 Check master cylinder for internal/external leaks and proper operation; determine needed action.	P-1
07.09 Remove, bench bleed, and reinstall master cylinder.	P-1
07.10 Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.	P-1
07.11 Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear; and loose fittings/supports; determine needed action.	P-1
07.12 Replace brake lines, hoses, fittings, and supports.	P-2
07.13 Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).	P-2
07.14 Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P-1
07.15 Inspect, test, and/or replace components of brake warning light system.	P-3
07.16 Identify components of hydraulic brake warning light system.	P-2
07.17 Bleed and/or flush brake system.	P-1
07.18 Test brake fluid for contamination.	P-1
Drum Brake Diagnosis and Repair	
07.19 Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.	P-1
07.20 Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P-1
07.21 Refinish brake drum and measure final drum diameter; compare with specification.	P-1

07.22 Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.	P-1
07.23 Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2
07.24 Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	P-1
Disc Brake Diagnosis and Repair	
07.25 Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.	P-1
07.26 Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action.	P-1
07.27 Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action.	P-1
07.28 Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action.	P-1
07.29 Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks.	P-1
07.30 Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.	P-1
07.31 Remove and reinstall/replace rotor.	P-1
07.32 Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P-1
07.33 Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-1
07.34 Retract and re-adjust caliper piston on an integrated parking brake system.	P-2
07.35 Check brake pad wear indicator; determine needed action.	P-1
07.36 Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.	P-1
Power-Assist Units Diagnosis and Repair	
07.37 Check brake pedal travel with and without engine running to verify proper power booster operation.	P-2
07.38 Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum- type power booster.	P-1
07.39 Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine needed action.	P-1
07.40 Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine needed action.	P-3
07.41 Measure and adjust master cylinder pushrod length.	P-3
Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair	
07.42 Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action.	P-1
07.43 Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.	P-2

07.44 Check parking brake system and components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.	P-1
07.45 Check parking brake operation and parking brake indicator light system operation; determine needed action.	P-1
07.46 Check operation of brake stop light system.	P-1
07.47 Replace wheel bearing and race.	P-3
07.48 Remove, reinstall, and/or replace sealed wheel bearing assembly.	P-1
07.49 Inspect and replace wheel studs.	P-1
Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) Systems Diagnosis and Repair	
07.50 Identify and inspect electronic brake control system components (ABS, TCS, and ESC); determine needed action.	P-1
07.51 Describe the operation of a regenerative braking system.	P-3
07.52 Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action.	P-2
07.53 Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action.	P-2
07.54 Depressurize high-pressure components of an electronic brake control system.	P-2
07.55 Bleed the electronic brake control system hydraulic circuits.	P-1
07.56 Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).	P-2
07.57 8. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).	P-1
Manufacturer Specific Brake, Traction Control and Vehicle Stability Control Tasks	
07.58 Service product specific anti-lock brake systems	P-4
07.59 Service product specific traction control systems.	P-4
07.60 Locate and interpret vehicle major brake component and identification numbers (VIN, vehicle certification labels, calibration decals).	P-4
07.61 Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.	P-4
07.62 Install wheel, torque lug nuts, and make final checks and adjustments associated with drum brakes.	P-4
07.63 Install wheel, torque lug nuts, and make final checks and adjustments associated with disc brakes.	P-4
07.64 Remove and install electronic brake control system electrical/electronic and hydraulic components.	P-4

07.65	Service product specific braking systems.	P-4
07.66	Perform product specific brakes relearn procedures	P-4
07.67	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the brake, traction control and vehicle stability control systems; determine necessary action.	P-4
07.68	Perform multiplex check to determine that all brake, traction control and vehicle stability control components are communicating and are performing within specifications.	P-4

Course Description: The Advanced Automotive Electrical/Electronic System Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems diagnostics, service, and repair.

Abbreviations:
EE = Electrical/Electronic Systems

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

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

EE Task List:	
P-1 =	**29**
P-2 =	**16**
P-3 =	**1**
Total	**46**

Course Number: AER0319 Occupational Completion Point: G Advanced Automotive Electrical/Electronic System Technician – 500 Hours		**Priority Number**
08.0	Explain and apply proficiently the diagnosis, service and repair of electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems. The student will be able to:	
General: Electrical System Diagnosis		
08.01	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
08.02	Identify electrical/electronic system components and configurations.	P-1
08.03	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1
08.04	Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.	P-1

08.05	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1
08.06	Demonstrate proper use of a test light on an electrical circuit.	P-1
08.07	Use fused jumper wires to check operation of electrical circuits.	P-1
08.08	Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.	P-1
08.09	Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.	P-1
08.10	Inspect and test fusible links, circuit breakers, and fuses; determine needed action.	P-1
08.11	Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.	P-1
08.12	Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.	P-2
08.13	Repair data bus wiring harness.	P-1
Battery Diagnosis and Service		
08.14	Perform battery state-of-charge test; determine needed action.	P-1
08.15	Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action.	P-1
08.16	Maintain or restore electronic memory functions.	P-1
08.17	Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1
08.18	Perform slow/fast battery charge according to manufacturer’s recommendations.	P-1
08.19	Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1
08.20	Identify safety precautions for high voltage systems on electric, hybrid, hybrid-electric, and diesel vehicles.	P-2
08.21	Identify electrical/electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.	P-1
08.22	Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.	P-2
Starting System Diagnosis and Repair		
08.23	Perform starter current draw tests; determine needed action.	P-1
08.24	Perform starter circuit voltage drop tests; determine needed action.	P-1
08.25	Inspect and test starter relays and solenoids; determine needed action.	P-2
08.26	Remove and install starter in a vehicle.	P-1
08.27	Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.	P-2
08.28	Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank	P-2

condition.	
08.29 Demonstrate knowledge of an automatic idle-stop/start-stop system.	P-2
Charging System Diagnosis and Repair	
08.30 Perform charging system output test; determine needed action.	P-1
08.31 Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.	P-1
08.32 Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P-1
08.33 Remove, inspect, and/or replace generator (alternator).	P-1
08.34 Perform charging circuit voltage drop tests; determine needed action.	P-1
Lighting Systems Diagnosis and Repair	
08.35 Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action.	P-1
08.36 Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.	P-1
08.37 Aim headlights.	P-2
08.38 Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2
Instrument Cluster and Driver Information Systems Diagnosis and Repair	
08.39 Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action.	P-2
08.40 Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine needed action.	P-2
08.41 Reset maintenance indicators as required.	P-2
Body Electrical Systems Diagnosis and Repair	
08.42 Diagnose operation of comfort and convenience accessories and related circuits (such as: power window, power seats, pedal height, power locks, truck locks, remote start, moon roof, sun roof, sun shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, cruise control, and auto dimming headlamps); determine needed repairs.	P-2
08.43 Diagnose operation of security/anti-theft systems and related circuits (such as: theft deterrent, door locks, remote keyless entry, remote start, and starter/fuel disable); determine needed repairs.	P-2
08.44 Diagnose operation of entertainment and related circuits (such as: radio, DVD, remote CD changer, navigation, amplifiers, speakers, antennas, and voice-activated accessories); determine needed repairs.	P-3
08.45 Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back-up camera); determine needed repairs.	P-1

08.46	Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action.	P-2
08.47	Describe the process for software transfer, software updates, or reprogramming of electronic modules.	P-2
Manufacturer Specific Electrical and Electronic Related Tasks		
08.48	Service and repair product specific electrical/electronic systems.	P-4
08.49	Perform product specific diagnostic procedures.	P-4
08.50	Locate and interpret vehicle major electrical/electronic components and identification numbers.	P-4
08.51	Identify location of hybrid vehicle high voltage circuits disconnect (service plug) location and safety procedures.	P-4
08.52	Manufacturer specific battery test; determine necessary action.	P-4
08.53	Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.	P-4
08.54	Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action.	P-4
08.55	Perform product specific electrical/electronic relearning procedures	P-4
08.56	Diagnose operation of entertainment and related circuits (such as: radio, DVD, remote CD changer, navigation, amplifiers, speakers, antennas, and voice activated accessories); determine needed repairs.	P-4
08.57	Diagnose operation of heated and cooled accessories and related circuits (such as: heated/cooled seats, heated steering wheel, heated mirror, heated glass, and heated/cooled cup holders); determine needed repairs.	P-4
08.58	Diagnose operation of safety systems and related circuits (such as: airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back up camera); determine needed repairs.	P-4
08.59	Diagnose operation of comfort and convenience accessories and related circuits (such as: power windows, power seats, pedal height, power locks, truck locks, remote start, moon roof, sun roof, sun shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, and auto dimming headlamps); determine needed repairs.	P-4

Course Description: The Advanced Automotive Heating and Air Conditioning Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, recycling and handling, diagnostics, service, and repair.

Abbreviations:
HA = Heating and Air Conditioning

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

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

HA Task List:	
P-1 =	17
P-2 =	16
P-3 =	4
Total	36

Course Number: AER0173 Occupational Completion Point: H Advanced Automotive Heating and Air Conditioning Technician – 200 Hours	**Priority Number**
09.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling. The student will be able to:	
General: A/C System Diagnosis and Repair	
09.01 Research vehicle service information, including refrigerant/oil/fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
09.02 Identify heating, ventilation, and air conditioning (HVAC) components and configurations.	P-1
09.03 Identify and interpret heating and air conditioning problems; determine needed action.	P-1
09.04 Performance test A/C system; identify problems.	P-1
09.05 Identify abnormal operating noises in the A/C system; determine needed action.	P-2
09.06 Identify refrigerant type; select and connect proper gauge set/test equipment; record temperature and pressure readings.	P-1
09.07 Leak test A/C system; determine needed action.	P-1
09.08 Inspect condition of refrigerant oil removed from A/C system; determine needed action.	P-2
09.09 Determine recommended oil and oil capacity for system application.	P-1
09.10 Using a scan tool, observe and record related HVAC data and trouble codes.	P-3
Refrigeration System Component Diagnosis and Repair	
09.11 Inspect, remove, and/or replace A/C compressor drive belts, pulleys, tensioners and visually inspect A/C components for signs of leaks; determine needed action.	P-1
09.12 Inspect, test, service and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.	P-2
09.13 Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity.	P-2
09.14 Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	P-2

09.15 Determine need for an additional A/C system filter; perform needed action.	P-3
09.16 Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform needed action.	P-2
09.17 Inspect for proper A/C condenser airflow; determine needed action.	P-1
09.18 Remove, inspect, and replace receiver/drier or accumulator/drier; determine recommended oil type and quantity.	P-2
09.19 Remove, inspect, and install expansion valve or orifice (expansion) tube.	P-1
09.20 Inspect evaporator housing water drain; perform needed action.	P-1
09.21 Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action.	P-2
09.22 Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.	P-2
Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair	
09.23 Inspect engine cooling and heater systems hoses and pipes; perform needed action.	P-1
09.24 Inspect and test heater control valve(s); perform needed action.	P-2
09.25 Diagnose temperature control problems in the HVAC system; determine needed action.	P-2
09.26 Determine procedure to remove, inspect, reinstall, and/or replace heater core.	P-2
Operating Systems and Related Controls Diagnosis and Repair	
09.27 Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.	P-1
09.28 Diagnose A/C compressor clutch control systems; determine needed action.	P-2
09.29 Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine needed action.	P-2
09.30 Inspect and test HVAC system control panel assembly; determine needed action.	P-3
09.31 Inspect and test HVAC system control cables, motors, and linkages; perform needed action.	P-3
09.32 Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; perform needed action.	P-1
09.33 Identify the source of HVAC system odors.	P-2
09.34 Check operation of automatic or semi-automatic HVAC control systems; determine needed action.	P-2
Refrigerant Recovery, Recycling, and Handling	
09.35 Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer’s standards.	P-1
09.36 Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.	P-1

09.37	Recycle, label, and store refrigerant.	P-1
Manufacturer Specific Heating and Air Conditioning Related Tasks		
09.38	Service product specific climate control systems.	P-4
09.39	Locate and interpret vehicle heating and air conditioning major components and identification numbers.	P-4
09.40	Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action.	P-4
09.41	Inspect, test, and replace thermostat and gasket/seal.	P-4
09.42	Determine coolant condition and coolant type for vehicle application; drain and recover coolant.	P-4
09.43	Flush system; refill system with recommended coolant; bleed system.	P-4
09.44	Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.	P-4
09.45	Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.	P-4
09.46	Service product specific hybrid heating and A/C systems.	P-4
09.47	Perform product specific heating and A/C relearn procedure	P-4
09.48	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the Heating and Air Conditioning systems; determine necessary action.	P-4
09.49	Perform multiplex check to determine that Heating and Air Conditioning components are communicating and are performing within specifications.	P-4
09.50	Identify proper service precautions and procedures for R1234yf systems.	P-4

Course Description: The Advanced Automotive Engine Performance Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engines, ignition, fuel, air induction, exhaust, computer, engine and emission control systems diagnostics, service, and repair.

Abbreviations:
EP = Engine Performance

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

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

EP Task List:	
P-1 =	**22**
P-2 =	**20**
P-3 =	**2**
Total	**43**

Course Number: AER0506	**Priority Number**

Occupational Completion Point: I Advanced Automotive Engine Performance Technician – 500 Hours	
10.0 Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems. The student will be able to:	
General: Engine Diagnosis	
10.01 Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P-1
10.02 Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
10.03 Identify and interpret engine performance concerns; determine needed action.	P-1
10.04 Diagnose abnormal engine noises or vibration concerns; determine needed action.	P-3
10.05 Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.	P-2
10.06 Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action.	P-1
10.07 Perform cylinder power balance test; determine needed action.	P-2
10.08 Perform cylinder cranking and running compression tests; determine needed action.	P-1
10.09 Perform cylinder leakage test; determine needed action.	P-1
10.10 Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.	P-2
10.11 Verify engine operating temperature; determine needed action.	P-1
10.12 Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT).	P-1
Computerized Controls Diagnosis and Repair	
10.13 Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable.	P-1
10.14 Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1
10.15 Perform active tests of actuators using a scan tool; determine needed action.	P-1
10.16 Describe the use of OBD monitors for repair verification.	P-1
10.17 Diagnose the causes of emissions or drive-ability concerns with stored or active diagnostic trouble codes (DTC); obtain, graph, and interpret scan tool data.	P-1
10.18 Diagnose emissions or drive-ability concerns without stored or active diagnostic trouble codes; determine needed action.	P-1
10.19 Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO); perform needed action.	P-2

10.20 Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, HVAC, automatic transmissions, non-OEM installed accessories, or similar systems); determine needed action.	P-2
Ignition System Diagnosis and Repair	
10.21 Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns; determine needed action.	P-2
10.22 Inspect and test crankshaft and camshaft position sensor(s); determine needed action.	P-1
10.23 Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as needed.	P-3
10.24 Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair	
10.25 Diagnose (troubleshoot) hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine needed action.	P-2
10.26 Check fuel for contaminants; determine needed action.	P-2
10.27 Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; perform needed action.	P-1
10.28 Replace fuel filter(s) where applicable.	P-2
10.29 Inspect, service, or replace air filters, filter housings, and intake duct work.	P-1
10.30 Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2
10.31 Inspect, test, and/or replace fuel injectors.	P-2
10.32 Verify idle control operation.	P-1
10.33 Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform needed action.	P-1
10.34 Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.	P-1
10.35 Perform exhaust system back-pressure test; determine needed action.	P-2
10.36 Check and refill diesel exhaust fluid (DEF).	P-2
10.37 Test the operation of turbocharger/supercharger systems; determine needed action.	P-2
Emissions Control Systems Diagnosis and Repair	
10.38 Diagnose oil leaks, emissions, and drive-ability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.	P-3
10.39 Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes,	P-2

	orifices, and hoses; perform needed action.	
10.40	Diagnose emissions and drive-ability concerns caused by the exhaust gas recirculation (EGR) system; inspect, test, service and/or replace electrical/electronic sensors, controls, wiring, tubing, exhaust passages, vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) systems; determine needed action.	P-2
10.41	Diagnose emissions and drive-ability concerns caused by the secondary air injection system; inspect, test, repair, and/or replace electrical/electronically operated components and circuits of secondary air injection systems; determine needed action.	P-2
10.42	Diagnose emissions and drive-ability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.	P-1
10.43	Diagnose emission and drive-ability concerns caused by catalytic converter system; determine needed action.	P-2
10.44	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.	P-2
Manufacturer Specific Engine Performance Related Tasks		
10.45	Adjust valves on engines with mechanical or hydraulic lifters.	P-4
10.46	Remove and replace timing belt; verify correct camshaft timing.	P-4
10.47	Remove and replace thermostat and gasket/seal.	P-4
10.48	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	P-4
10.49	Perform common fastener and thread repairs, to include: remove broken bolt, restore internal and external threads, and repair internal threads with a threaded insert.	P-4
10.50	Inspect engine oil and/or filter for condition and determine necessary action.	P-4
10.51	Identify hybrid vehicle internal combustion engine service precautions.	P-4
10.52	Demonstrate proficiency in use of computer-based information systems.	P-4
10.53	Perform product specific OBD II drive cycle diagnostic tests.	P-4
10.54	Service product specific ignition systems.	P-4
10.55	Inspect and test distributor; service as needed.	P-4
10.56	Perform exhaust system back-pressure test; determine needed action.	P-4
10.57	Service product specific fuel injection systems.	P-4
10.58	Locate and interpret vehicle engine performance major components and identification numbers.	P-4
10.59	Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.	P-4

10.60 Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.	P-4
10.61 Check for module communication (including CAN/BUS systems) errors using a scan tool.	P-4
10.62 Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.	P-4
10.63 Inspect and test mechanical components of secondary air injection systems; perform necessary action.	P-4
10.64 Demonstrate knowledge of direct injection systems.	P-4
10.65 Interpret diagnostic trouble codes (DTCs) and scan tool data related to the engine control systems; determine necessary action.	P-4
10.66 Perform multiplex check to determine that engine control components are communicating and are performing within specifications.	P-4
10.67 Perform universal drive cycle to run monitors and erase permanent DTCs.	P-4
Electrification Tasks are optional and can be instructor demonstrated and/or performed by the student. The manufacturer sponsor of the program will determine the integration plan for electrification based on the roll out of vehicles in their product lines. Electrification tasks can be spread throughout the program and other courses in a manner that best fits the manufacturer's curriculum.	
10.68 Perform high voltage disconnect procedure; reconnect/enable high voltage system.	
10.69 Select, test and use proper safety gloves.	
10.70 Select, qualify, and use proper electrical testing equipment and leads.	
10.71 Diagnose problems caused by damaged or failed harnesses, connectors, terminals and fuses.	
10.72 Diagnose high voltage (HV) battery pack malfunctions.	
10.73 Remove and install high voltage battery pack.	
10.74 Test, diagnose and repair high voltage leaks/loss of isolation.	
10.75 Test, diagnose and repair high voltage battery pack heating and cooling systems.	
10.76 Test, diagnose, repair or replace high voltage battery pack internal components.	
10.77 Test and diagnose charging problems when using electric vehicle supply equipment (EVSE).	
Internal Combustion Engine (ICE)	
10.78 Retrieve and diagnose DTCs; determine needed repairs	
10.79 Determine if the internal combustion engine (ICE) is in CRANK mode or RUN mode.	
10.80 Differentiate between driveability problems caused by the internal combustion engine and/or hybrid drive system.	
10.81 Perform internal combustion engine cranking compression test.	

10.82 Keep the internal combustion engine running during service.	
10.83 Diagnose internal combustion engine no-crank condition.	
10.84 Diagnose internal combustion engine cranks/no-start condition.	
10.85 Interpret vacuum and compression readings on Atkinson cycle engines.	
10.86 Identify engine start/stop strategy; diagnose malfunctions.	
10.87 Service engine cooling system.	
Drive Systems	
10.88 Perform high voltage disconnect procedure; reconnect/enable high voltage system.	
10.89 Select, test, and use proper safety gloves.	
10.90 Select, qualify, and use proper electrical testing equipment and leads.	
10.91 Retrieve and diagnose driveline DTCs; determine needed repairs.	
10.92 Diagnose problems caused by damaged or failed harnesses, connectors, and terminals.	
10.93 Test, diagnose and repair high voltage leaks/loss of isolation.	
10.94 Remove and install rotor from stator.	
10.95 Diagnose motor-rotor position sensor (Resolver or Encoder type).	
10.96 Diagnose drive/traction motor-generator assembly for proper operation (such as an inoperative condition, noise, shudder, overheating, etc.).	
10.97 Diagnose improper electrically actuated parking pawl operation; determine needed repair.	
10.98 Identify transmission fluid and coolant fluid requirements; verify fluid levels.	
Power Electronics	
10.99 Perform high voltage disconnect procedure; reconnect/enable high voltage system.	
10.100 Select, test, and use proper safety gloves.	
10.101 Select, qualify, and use proper electrical testing equipment and leads.	
10.102 Retrieve and diagnose DTCs; determine needed repairs.	
10.103 Diagnose problems caused by damaged or failed harnesses, connectors, and terminals.	
10.104 Identify procedures necessary to establish the proper vehicle operational power mode during service (OFF, ACCESSORY, POWER ON, READY TO DRIVE).	
10.105 Diagnose the cause of a hybrid system warning displayed on the instrument panel and/or driveability complaint.	

10.106 Diagnose impact sensor problems; determine needed repair.	
10.107 Diagnose AC/DC inverter overheating; determine needed repair.	
10.108 Diagnose AC/DC inverter failure; determine needed repair.	
10.109 Replace AC/DC inverter cooling pump.	
10.110 Remove and install AC/DC inverter.	
10.111 Diagnose failures in the data communications bus network; determine needed repair.	
10.112 Locate and test the voltage level of capacitors.	
10.113 Diagnose, locate and safely disable/enable safety interlocks.	
10.114 Diagnose failed DC/DC converter; determine needed repair.	
10.115 Remove and install DC/DC converter.	
10.116 Test high voltage cable integrity and loss of isolation.	
10.117 Perform 12-volt battery testing.	
10.118 Diagnose system main relay (SMR)/contactor malfunctions; determine needed repairs.	
Hybrid Supporting Systems	
10.119 Perform high voltage disconnect procedure; reconnect/enable high voltage system.	
10.120 Select, test, and use proper safety gloves.	
10.121 Select, qualify, and use proper electrical testing equipment and leads.	
10.122 Diagnose problems caused by damaged or failed harnesses, connectors, and terminals.	
10.123 Retrieve and diagnose DTCs; determine needed repairs.	
10.124 Inspect, test, and diagnose EVAP emission system components; determine needed repairs.	
10.125 Observe and interpret driver indicators, power flow display and energy monitor; determine necessary action.	
10.126 Test and diagnose high voltage air compressor malfunctions; determine necessary action.	
10.127 Remove and install high voltage air conditioning compressor; identify and select proper system oil.	
10.128 Diagnose cabin heating system performance problems; determine needed repairs.	
10.129 Diagnose and repair electric/electronic steering systems.	
10.130 Diagnose brake system performance problems; differentiate between braking problems caused by the hydraulic system and the regenerative system; determine needed repairs.	
10.131 Deactivate brake system self-test prior to service.	

10.132 Service liquid cooling system(s).	

Additional Information

Laboratory Activities

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

Special Notes

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

It is highly recommended that the program be Automotive Service Excellence Education Foundation (ASE) Master Certified and be approved by the appropriate industry manufacturer to provide manufacturer certification. Instructors must meet the specific manufacturer certification and be A1-A8 ASE Master certified, Advanced Engine Performance (L1) ASE Certification is also recommended. Program must meet the equipment and specialty tool requirement as specified by the manufacturer sponsor. The program must offer EPA section 609 recognized refrigerant-recycling certification training.

Career and Technical Student Organization (CTSO)

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

Cooperative Training – OJT

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

Basic Skills

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

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

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

Accommodations

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

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