



**2017-2018**

# **Automotive General Service Technician**

**OUTLINE**

## **DESCRIPTION:**

Automotive General Service Technician prepares students for employment where a broad skill set, and general understanding of all automotive systems are required. Students will identify common tools and equipment, know a variety of sources of service information, and perform basic vehicle service and maintenance related to engine performance, transmissions, suspension and steering, brakes, electrical/electronic systems, heating and air conditioning, and customer service procedures. There is an emphasis on safety in the workplace related to use of protective eye wear/clothing, general lab procedures, use of equipment, and ventilation. Successful demonstration of Automotive General Service Technician competencies will assist students with National Automotive Technicians Education Foundation (NATEF) certification. Activities in this course include work-based learning that connects students to industry and the local community. A student must successfully complete at least two years of this program as part of the minimum requirements for articulation.

## **INFORMATION:**

- A. Pre-requisite: None
- B. Length: (Up to) Three years
- C. Sector: Transportation
- D. Pathway: Systems Diagnostic and Service

<b>O*Net SOC Codes</b>	
<b>Code #</b>	<b>Title</b>
49-3023.00	Automotive Service Technicians and Mechanics

<b>Orientation</b>
<ul style="list-style-type: none"><li>A. Introduce the course and facilities.</li><li>B. Discuss the syllabus and major objectives.</li><li>C. Explain applicable classroom management procedures, the ROP Student Rules of Conduct, and any operational guidelines.</li><li>D. Review instructor/student expectations.</li><li>E. Explain enrollment and attendance requirements and procedures.</li><li>F. Review grading and student evaluation procedures.</li><li>G. Discuss the community classroom aspect of the program if applicable.</li><li>H. Discuss the “next steps” related to additional education, training, and employment.</li><li>I. Review classroom safety, emergency and disaster procedures.</li></ul>
<b>1. Communication Skills</b>
<ul style="list-style-type: none"><li>A. Demonstrate positive verbal communication skills using appropriate vocabulary, demeanor, and vocal tone in the classroom and/or worksite.</li><li>B. Read and interpret written information and directions.</li><li>C. Practice various forms of written communication appropriate to the occupation.</li><li>D. Practice positive body language skills.</li><li>E. Practice professional verbal skills for resolving a conflict.</li><li>F. Demonstrate active listening skills including techniques for checking for understanding, and for obtaining clarification of directions.</li></ul>
<b>2. Interpersonal Skills</b>
<ul style="list-style-type: none"><li>A. Demonstrate positive teamwork skills by contributing to a group effort.</li><li>B. Practice the importance of diversity awareness and sensitivity in the workplace.</li><li>C. Define sexual harassment in the workplace and identify the employee’s role and responsibility.</li><li>D. Practice participation skills.</li><li>E. Identify different personality types and strategies for working effectively with each type.</li><li>F. Practice business and social etiquette skills appropriate to the occupation.</li><li>G. Discuss the role of business and personal ethics in the decision-making process.</li><li>H. Evaluate various job-related scenarios and justify decisions based on ethics.</li><li>I. Demonstrate flexibility and adaptability in working with others.</li><li>J. Demonstrate the use of time management skills.</li></ul>
<b>3. Employability Skills</b>

- A. Demonstrate appropriate attendance and punctuality practices for the classroom and worksite if applicable.
- B. Prepare a resume, cover letter, and job application forms.
- C. Demonstrate interviewing techniques using appropriate tone and body language.
- D. Demonstrate appropriate dress and grooming standards in seeking employment and for the workplace.
- E. Identify strategies for employment retention.
- F. Analyze the impact of social networking on employability.
- G. Identify the need for continuing education, professional development, and professional growth in chosen field.
- H. Identify appropriate procedures for leaving a job.
- I. Identify sources of job information, including electronic sources.
- J. Review company policies and current trends in employee compatibility screening, drug screening, and background checks.

#### **4. Leadership**

- A. Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- B. Work with peers to promote divergent and creative perspectives.
- C. Demonstrate how to organize and structure work, individually and in teams, for effective performance and the attainment of goals.
- D. Explain multiple approaches to conflict resolution and their appropriateness for a variety of situations in the workplace.
- E. Employ ethical behaviors and actions that positively influence others.
- F. Use a variety of means to positively impact the direction and actions of a team or organization.
- G. Analyze the short-term and long-term effects a leader's actions and attitudes can have on productivity, morale, and organizational culture.

#### **5. Personal and Occupational Safety**

- A. Demonstrate procedures to be followed in the case of emergencies.
- B. Discuss ways to report a potential safety hazard to a supervisor.
- C. Identify and discuss cyber ethics, cyber safety, and cyber security.
- D. Apply personal safety practices to and from the job.
- E. Describe the procedure for reporting a work-related hazard or injury.
- F. Recognize the effects of substance abuse in the workplace.
- G. Recognize good housekeeping as a safety issue.
- H. Identify safety hazards commonly found in the workplace environment.
- I. Explain the importance of CAL-OSHA.
- J. Define and discuss ergonomics in relation to the working environment.
- K. Identify the electrical hazards of working with electronic equipment.

#### **6. Shop and Personal Safety**

- A. Locate and demonstrate knowledge of material safety data sheets (MSDS).
- B. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
- C. Identify general shop safety rules and procedures.
- D. Utilize safe procedures for handling of tools and equipment.
- E. (P1) Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- F. Identify and use proper placement of floor jacks and jack stands.
- G. Identify and use proper procedures for safe lift operation.
- H. Identify types of hazardous waste, discuss related safety issues, and demonstrate proper handling and disposal procedures.
- I. Utilize proper ventilation procedures for working within the lab/shop area.
- J. Identify marked safety areas.
- K. 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.
- L. Identify the location and use of eye wash stations.
- M. Identify the location of the posted evacuation routes.
- N. Wear appropriate clothing, accessories and hairstyles for shop/lab activities.
- O. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
- P. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).

## 7. Tools and Equipment

- A. Identify tools and their usage in automotive applications.
- B. Identify standard and metric designation.
- C. Demonstrate safe handling and use of appropriate tools.
- D. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
- E. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

## 8. Preparing Vehicle for Service and Customer

- A. (P1) Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- B. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).
- C. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
- D. Safety check, fill, and replace to proper fluid levels: oil, engine coolant, power steering fluid, brake fluid, windshield washer fluid, differential/transfer case fluid, transmission fluid, etc.
- E. Identify information needed and the service requested on a repair order.

- F. Identify purpose and demonstrate proper use of fender covers, mats.
- G. Demonstrate use of the three C's (concern, cause, and correction).
- H. Review vehicle service history.
- I. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).

## 9. Engine Repair

- A. (P1) Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core; determine necessary action.
- B. Retrieve and record stored OBD I and OBD II diagnostic trouble codes; follow flow chart, diagnose, and clear codes.
- C. Diagnose basic operation and performance of an engine.
- D. Diagnose basic mechanical issues such as, smoke and knocks.
- E. (P1) Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
- F. (P1) Verify operation of the instrument panel engine warning indicators.
- G. (P1) Install engine covers using gaskets, seals, and sealers as required.
- H. (P1) Remove and replace timing belt; verify correct camshaft timing.
- I. (P1) Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.
- J. (P3) Identify hybrid vehicle internal combustion engine service precautions.

### Cylinder Head and Valve Train

- K. (P1) Adjust valves (mechanical or hydraulic lifters).

### Lubrication and Cooling Systems

- L. (P1) Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.
- M. (P1) Perform engine oil and filter change.

## 10. Automatic Transmission and Transaxle

- A. Retrieve and record OBDII diagnostic trouble codes for automatic transmission.
- B. (P1) Check fluid level in a transmission or a transaxle equipped with and without a dip-stick.
- C. Check transmission fluid condition; inspect external seals, gaskets and bushings for leaks.

### In-Vehicle Transmission/Transaxle

- D. (P2) Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.
- E. (P2) Inspect power train mounts.
- F. (P1) Drain and replace fluid and filter(s).

## Off-Vehicle Transmission/Transaxle

- G. (P3) Describe the operational characteristics of a continuously variable transmission (CVT).
- H. (P3) Describe the operational characteristics of a hybrid vehicle drive train.

## **11. Manual Drive Train and Axle**

- A. (P2) Check fluid condition; check for leaks and adjust fluids to proper levels.
- B. Retrieve and record OBDII diagnostic trouble codes for manual transmissions.
- C. (P1) Drain and refill manual transmission/transaxle and final drive unit.

### Clutch

- D. (P1) Check and adjust clutch operation.

### Transmission/Transaxle

- E. (P3) Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.

### Drive Shaft, Half Shafts, Universal and Constant-Velocity (CV) Joints

- F. (P2) Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals.
- G. (P2) Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.

### Differential Case Assembly

- H. (P2) Clean and inspect differential housing; check for leaks; inspect housing vent.
- I. (P1) Check and adjust differential housing fluid level.
- J. (P1) Drain and refill differential housing.

### Drive Axles

- K. (P2) Inspect and replace drive axle wheel studs.

### Four-Wheel Drive/All-Wheel Drive

- L. (P3) Inspect front-wheel bearings and locking hubs.
- M. (P2) Check for leaks at drive assembly seals; check vents; check lube level.

## **12. Suspension and Steering Systems**

- A. Inspect and identify various types of steering and suspension system operation and components.
- B. Diagnose and repair various types of steering and suspension system operation and components.
- C. (P1) Disable and enable supplemental restraint system (SRS).

## Related Suspension and Steering Service

- D. (P1) Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
- E. (P2) Flush, fill, and bleed power steering system.
- F. (P1) Remove, inspect, replace, and adjust power steering pump drive belt.
- G. (P2) Inspect and replace power steering hoses and fittings.
- H. (P2) Replace power steering pump filter(s).
- I. (P1) Inspect pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.
- J. (P1) Inspect tie rod ends (sockets), tie rod sleeves, and clamps.
- K. (P1) Inspect upper and lower control arms, bushings, and shafts.
- L. (P1) Inspect and replace rebound and jounce bumpers.
- M. (P1) Inspect track bar, strut rods/radius arms, and related mounts and bushings.
- N. (P1) Inspect upper and lower ball joints (with or without wear indicators).
- O. (P1) Inspect suspension system coil springs and spring insulators (silencers).
- P. (P1) Inspect suspension system torsion bars and mounts.
- Q. (P1) Inspect and replace front stabilizer bar (sway bar) bushings, brackets, and links.
- R. (P1) Inspect strut cartridge or assembly.
- S. (P1) Inspect front strut bearing and mount.
- T. (P1) Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms.
- U. (P1) Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.
- V. (P1) Inspect, remove, and replace shock absorbers; inspect mounts and bushings.
- W. (P3) Inspect electric power-assisted steering.
- X. (P2) Identify hybrid vehicle power steering system electrical circuits and safety precautions.
- Y. (P3) Describe the function of the power steering pressure switch.

## Wheel Alignment

- Z. (P1) Perform pre-alignment inspection and measure vehicle ride height; determine necessary action.

## Wheels and Tires

- AA. (P1) Inspect tire condition; identify tire wear patterns; check for correct size and application (load and speed ratings) and adjust air pressure; determine necessary action.
- BB. (P1) Rotate tires according to manufacturer's recommendations.
- CC. (P1) Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).
- DD. (P2) Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.
- EE. (P1) Inspect tire and wheel assembly for air loss; perform necessary action.
- FF. (P1) Repair tire using internal patch.
- GG. (P2) Identify and test tire pressure monitoring systems (indirect and direct) for operation; verify operation of instrument panel lamps.
- HH. (P2) Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.

## 13. Brakes

- A. (P1) Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, loose fittings and supports; determine necessary action.
- B. (P1) Remove, clean, and inspect linings and brake pads, measure brake drum diameter; determine necessary action.
- C. (P1) Install wheel and torque lug nuts.
- D. (P1) Clean and inspect linings, brake pads, and rotor; measure rotor thickness, thickness variation, and lateral runout, check brake pad wear indicator; determine necessary action.
- E. (P1) Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.
- F. Check parking brake operation and parking brake indicator light system operation; determine necessary action.
- G. (P1) Check operation of brake stop light system.
- H. (P3) Identify traction control/vehicle stability control system components.
- I. Retrieve and record diagnostic trouble codes related to ABS and traction control systems.
- J. (P1) Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).

### Hydraulic System

- K. (P1) Measure brake pedal height, travel, and free play (as applicable); determine necessary action.
- L. (P1) Check master cylinder for external leaks and proper operation.
- M. (P1) Select, handle, store, and fill brake fluids to proper level.
- N. (P3) Identify components of brake warning light system.
- O. (P1) Bleed and/or flush brake system.
- P. (P1) Test brake fluid for contamination.

### Drum Brakes

- Q. (P1) Refinish brake drum and measure final drum diameter; compare with specifications.
- R. (P1) Remove, clean, inspect, and measure brake drum diameter; determine necessary action.
- S. (P1) Refinish brake drum and measure final drum diameter; compare with specifications.
- T. (P1) Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
- U. (P2) Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.
- V. (P2) Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments.

### Disc Brakes

- W. (P1) Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action.
- X. (P1) Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.
- Y. (P1) Remove, inspect, and replace pads and retaining hardware; determine necessary action.
- Z. (P1) Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.
- AA. (P1) Remove and reinstall rotor.

- BB. (P1) Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.
- CC. (P1) Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.
- DD. (P3) Retract and re-adjust caliper piston on an integral parking brake system.
- EE. (P1) Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.

#### Power-Assist Units

- FF. (P2) Check brake pedal travel with, and without, engine running to verify proper power booster operation.

#### Miscellaneous (Wheel Bearings, Parking Breaks, Electrical, Etc.)

- GG. (P1) Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.
- HH. (P2) Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed.
- II. (P2) Replace wheel bearing and race.

#### Electronic Brakes and Traction and Stability Control Systems

- JJ. (P3) Describe the operation of a regenerative braking system.

### **14. Electrical/Electronic Systems**

- A. (P1) Use wiring diagrams to trace electrical/electronic circuits.
- B. (P1) Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.
- C. (P1) Perform solder repair of electrical wiring.
- D. (P1) Perform battery state-of-charge test; determine necessary action.
- E. (P1) Perform starter circuit voltage drop tests; determine necessary action.
- F. Identify location of hybrid vehicle high voltage circuit disconnects (service plug) location and safety procedures.
- G. Disarm and enable the SRS for vehicle service.
- H. (P1) Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
- I. (P1) Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
- J. (P2) Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
- K. (P2) Check operation of electrical circuits with a test light.
- L. (P2) Check operation of electrical circuits with fused jumper wires.
- M. (P1) Measure key-off battery drain (parasitic draw).
- N. (P1) Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
- O. (P1) Replace electrical connectors and terminal ends.

#### Battery Service

- P. (P1) Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action.

- Q. (P1) Maintain or restore electronic memory functions.
- R. (P1) Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.
- S. (P1) Perform slow/fast battery charge according to manufacturer's recommendations.
- T. (P3) Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.
- U. (P1) Identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.
- V. (P3) Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.

## Starting System

- W. (P1) Perform starter current draw test; determine necessary action.
- X. (P2) Inspect and test starter relays and solenoids; determine necessary action.
- Y. (P1) Remove and install starter in a vehicle.
- Z. (P2) Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.

## Charging System

- AA. (P1) Perform charging system output test; determine necessary action.
- BB. (P1) Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.
- CC. (P2) Remove, inspect, and re-install generator (alternator).
- DD. (P1) Perform charging circuit voltage drop tests; determine necessary action.

## Lighting Systems

- EE. (P1) Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
- FF. (P2) Aim headlights.
- GG. (P2) Identify system voltage and safety precautions associated with high-intensity discharge headlights.

## Accessories

- HH. (P1) Disable and enable airbag system for vehicle service; verify indicator lamp operation.
- II. (P1) Remove and reinstall door panel.
- JJ. (P3) Describe the operation of keyless entry/remote-start systems.
- KK. (P1) Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.
- LL. (P1) Verify windshield wiper and washer operation; replace wiper blades.

## **15. Heating and Air Conditioning**

- A. Identify basic components and operation of HVAC systems.
- B. (P1) Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action.
- C. (P2) Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions.
- D. (P1) Inspect A/C condenser for airflow restrictions; determine necessary action.
- E. (P1) Inspect engine cooling and heater systems hoses; perform necessary action.

- F. (P1) Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action.
- G. (P2) Identify the source of A/C system odors.

## 16. Engine Performance

- A. (P1) Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.
- B. (P2) Perform cylinder power balance test; determine necessary action.
- C. (P1) Perform cylinder cranking and running compression tests; determine necessary action.
- D. (P1) Perform cylinder leakage test; determine necessary action.
- E. (P1) Verify engine operating temperature.
- F. (P1) Remove and replace spark plugs; inspect secondary ignition components for wear and damage.

### Computerized Engine Controls

- G. (P1) Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.
- H. (P1) Describe the importance of operating all OBDII monitors for repair verification.

### Fuel, Air Induction, and Exhaust Systems

- I. (P1) Replace fuel filter(s).
- J. (P1) Inspect, service, or replace air filters, filter housings, and intake duct work.
- K. (P1) Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action.
- L. (P1) Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed.
- M. (P3) Check and refill diesel exhaust fluid (DEF).

### Emissions Control Systems

- N. (P2) Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.

## Key Assignments

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
1. Students will participate in mock interviews that represent current industry practices (e.g., skills demonstrations, resumes, applications, portfolios, personal websites, etc.).	1A, B, D 3B, C, D, I, J	2 3 10	2 3		LS 11-12.6 SLS 11-12.2
1. Students will prepare a variety of vehicles for service according to industry standards.	1A - F 2A, D, I, J 3A, D 5B, G 6A, B, D, E, N 7C, D 8A - I 9E, M 10B, C, F 11A, D, H-J, M 12G 13A, M, O, U 14Q 15E 16J	1 2 11 12	4 5 6 10	C1.0 C2.0 C4.0 C5.0	WS 11-12.6 WS 11-12.7 RSTS 11-12.4 RLST 11-12.3 RLST 11-12.10 SEP 4, 8 CC 2 LS 2.D PS 4.C WS 11-12.4
2. <b>Beginner:</b> Students will diagnose engine operation and performance.	1A - F 2A, D, I, J 3A, D 5B, G 6B, D, E, G, H, I, N, P 7A-E 8A-C, E-H 9A, B, D-F, K-M 16F, J-L, N	1 4 5 11 12	2 4 5 6 10	C2.0 C3.0 C4.0 C6.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4 RLST 11-12.3 RLST 11-12.10 SEP 4, 8 CC 2 ETS 1.B
3. <b>Advanced:</b> Students will use diagnostic information to affect engine repair.	1A - F 2A, D, I, J 3A, D 5B, G 6B, D, E, G, H,	1 4 5 11 12	2 4 5 6 10	C2.0 C3.0 C4.0 C6.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4 RLST 11-12.3

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
	I, N, P 7A-E 8A-C, E-H 9A-H, J-M 16A-L, N				RLST 11-12.10 SEP 4, 8 CC 2 ETS 1.B
4. <b>Beginner:</b> Students will diagnose transmission operation and performance.	1A - F 2A, D, I, J 3A, D 5B, G 6B, D, E, G, H, I, N, P 7A-E 8A-C, E-H 10B-F 11A, C-M	1 4 5 11 12	2 4 5 6 10	C2.0 C3.0 C4.0 C8.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4 RLST 11-12.3 RLST 11-12.10 SEP 4, 8 CC 2 ETS 1.B
5. <b>Advanced:</b> Students will use diagnostic information to affect transmission repair.	1A - F 2A, D, I, J 3A, D 5B, G 6B, D, E, G, H, I, N, P 7A-E 8A-C, E-H 10A-F 11A-M	1 4 5 11 12	2 4 5 6 10	C2.0 C3.0 C4.0 C8.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4
6. <b>Beginner:</b> Students will test and diagnose steering and suspension components.	1A - F 2A, D, I, J 3A, D 5B, G 6B, D, E, G, H, I, N, P 7A-E 8I 12C-V, Y, AA- FF	1 4 5 11 12	2 4 5 6 10	C2.0 C3.0 C4.0 C8.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
7. <b>Advanced:</b> Students will use diagnostic information to repair and align steering and suspension components.	1A - F 2A, D, I, J 3A, D 5B, G 6B, D, E, G, H, I, N, P 7A-E 12C-V, Y, Z, AA-HH	1 4 5 11 12	2 4 5 6 10	C2.0 C3.0 C4.0 C8.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4
8. <b>Beginner:</b> Students will diagnose and repair mechanical and hydraulic brake systems.	1A - F 2A, D, I, J 3A, D 5B, G 6B, D, E, G, H, I, N, P 7A-E 8A-C, E-H 13A-G, K-GG, II-JJ	1 4 5 11 12	2 4 5 6 10	C2.0 C3.0 C4.0 C8.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4
9. <b>Advanced:</b> Students will diagnose and repair traction control and anti-lock brake systems.	1A - F 2A, D, I, J 3A, D 5B, G 6B, D, E, G, H, I, N, P 7A-E 8A-C, E-I 13A-JJ	1 4 5 11 12	2 4 5 6 10	C2.0 C3.0 C4.0 C8.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4
10. Students will diagnose and repair basic automotive electrical systems.	1A - F 2A, D, I, J 3A, D 5B, G 6B, D, E, G, H, I, N, P 7A-E 8A-C, E-H	1 4 5 11 12	2 4 5 6 10	C2.0 C3.0 C4.0 C7.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4 A-CED 4 PS 3.A

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
	14A-E, H-S, U, W-Z, AA-GG, II-LL				
11. Students will diagnose and repair basic automotive HVAC systems.	1A - F 2A, D, I, J 3A, D 5B, G 6B, D, E, G, H, I, N, P 7A-E 8A-C, E-H 9A 14A-C, E, K-O 15B, D-G	1 4 5 11 12	2 4 5 6 10	C2.0 C3.0 C4.0 C7.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4 PS 3.B

## Standards Assessed in this Program

### Career Ready Practices

1. Apply appropriate technical skills and academic knowledge.
2. Communicate clearly, effectively, and with reason.
3. Develop an education and career plan aligned to personal goals.
4. Apply technology to enhance productivity.
5. Utilize critical thinking to make sense of problems and persevere in solving them.
7. Act as a responsible citizen in the workplace and the community.
8. Model integrity, ethical leadership, and effective management.
9. Work productively in teams while integrating cultural/global competence.
10. Demonstrate creativity and innovation.
11. Employ valid and reliable research strategies.
12. Understand the environmental, social, and economic impacts of decisions.

### Anchor Standards

#### 2.0 Communications

- Acquire and use accurately sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

#### 3.0 Career Planning and Management

- Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.

#### 4.0 Technology

- Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the sector workplace environment.

#### 5.0 Problem Solving and Critical Thinking

- Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.

#### 6.0 Health and Safety

- Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the sector workplace environment.

#### 7.0 Responsibility and Flexibility

- Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the sector workplace environment and community settings.

#### 8.0 Ethics and Legal Responsibilities

- Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.

## **9.0 Leadership and Teamwork**

- Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution.

## **10.0 Technical Knowledge and Skills**

- Apply essential technical knowledge and skills common to all pathways in the sector following procedures when carrying out experiments or performing technical tasks.

## Pathway Standards

### **Transportation - Systems Diagnostics and Service Pathway**

**C1.0** Demonstrate the practice of personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards.

**C2.0** Practice the safe and appropriate use of tools, equipment, and work processes.

**C3.0** Use scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems.

**C4.0** Perform and document maintenance procedures in accordance with the recommendations of the manufacturer.

**C5.0** Apply and understand appropriate business practices.

**C6.0** Demonstrate the application, operation, maintenance, and diagnosis of engines, including, but not limited to, two- and four-stroke and supporting subsystems.

**C7.0** Demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards.

**C8.0** Demonstrate the function and principles of automotive drivetrain, steering and suspension, brake, and tire and wheel components and systems in accordance with national industry standards.

## Common Core State Standards

### **ENGLISH LANGUAGE ARTS**

#### **Language Standards**

**LS 11-12.6:** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the (career and college) readiness level, demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

**LS 2.D**

#### **Reading Standards for Literacy in Science and Technical Subjects**

**RLST 11-12.3:** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

**RLST 11-12.4:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context.

**RLST 11-12.10:** By the end of grade 12 read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.

## Speaking and Listening Standards

**SLS 11-12.2:** Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions, and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

**SLS 11-12.1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners, building on others ideas and expressing their own clearly and persuasively.

**SLS 11-12.1d:** Respond thoughtfully to diverse perspectives, synthesize comments, claims and evidence made on all sides of an issue, resolve contradictions when possible, and determine what additional information or research is required to deepen the investigation or complete the work.

## Writing Standards

**WS 11-12.4:** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

**WS 11-12.6:** Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback including new arguments and information.

**WS 11-12.7:** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem, narrow or broaden the inquiry when appropriate, synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

## MATHEMATICS

### Algebra- Creating Equations

**A-CED 4:** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law  $V = IR$  to highlight resistance  $R$ .

## SCIENCE

### Crosscutting Concept

**CC 2:** Cause and effect: Mechanism and explanation

### Engineering, Technology, and the Applications of Science

**ETS 1.B:** Developing Possible Solutions

### Physical Sciences

**PS 3.A:** Definitions of Energy

**PS 3.B:** Conservation of Energy and Energy Transfer

**PS 4.C:** Information Technologies and Instrumentation

**Scientific and Engineering Practices**

**SEP 4:** Analyzing and interpreting data

**SEP 8:** Obtaining, evaluating, and communicating information