

# Automotive General Service Technician 1

## COURSE OUTLINE

### **DESCRIPTION:**

Automotive General Service Technician 1 is a foundational course that provides students with basic vehicle service skills and a general understanding of automotive system components. Emphasis is placed on proper and safe use of common tools, equipment, personal protective equipment and safety practices in the workplace and general lab. Students will think critically and solve problems related to customer service and vehicle components such as engine repair, transmission, drive train systems, suspension/steering, electrical/electronic systems, and heating/air conditioning systems. Successful completion of this course will provide students a solid foundation in National Automotive Technicians Education Foundation (NATEF) standards while preparing students for industry certifications and entry-level jobs. Activities in this course include work-based learning that connects students to industry and the local community. Students must successfully complete Automotive General Service Technician 1 and Automotive General Service Technician 2 as part of the minimum requirements for articulation.

### **INFORMATION:**

PRE-REQUISITE:	None
LENGTH & LEVEL:	One Year
SECTOR:	Transportation
PATHWAY:	Systems Diagnostic, Service and Repair
ARTICULATED:	Yes (after completion of Auto. Gen. Svc. Tech. 2)
UC A-G APPROVAL:	No

### **O\*NET SOC CODES:**

41-2022.00	Specialists Parts Salesperson
49-3023.00	Automotive Service Technicians and Mechanics
49-3031.00	Bus and Truck Mechanics and Diesel Engine Specialists
53-6031.00	Automotive and Watercraft Service Attendants

<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>

**3. Employability Skills**

- 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 and role of CAL-OSHA and the Environmental Protection Agency (EPA).
- J. Define and discuss ergonomics in relation to the working environment.
- K. Identify the electrical hazards of working with electronic equipment.

<b>6. The Automotive Service Industry</b>
<ul style="list-style-type: none"> <li>A. Describe history of automotive industry.</li> <li>B. Define current automotive industry and future outlook of the automotive industry.</li> <li>C. Identify careers and jobs in automotive service.</li> <li>D. Describe how to obtain a driver's license.</li> <li>E. Introduce the California Driver Education book.</li> <li>F. Emphasize the importance of keeping a clean driving record.</li> </ul>
<b>7. Shop and Personal Safety</b>
<ul style="list-style-type: none"> <li>A. Locate and interpret material safety data sheets (MSDS).</li> <li>B. Comply with the required use of PPEs (safety glasses, ear protection, gloves, shoes, appropriate clothing), accessories and hairstyles for shop/lab activities.</li> <li>C. Explain general shop safety rules and safety procedures.</li> <li>D. Identify types of hazardous waste and describe related safety issues.</li> <li>E. Describe procedures for proper handling, storing, and disposing of hazardous waste, chemicals and flammable materials in accordance with local, state, and federal safety and environmental regulations.</li> <li>F. Follow proper ventilation procedures for working within the lab/shop area.</li> <li>G. Demonstrate proper placement of floor jacks and jack stands.</li> <li>H. Recognize safety color-coding.</li> <li>I. Identify location and types of fire safety equipment; practice fire control and fire safety procedures.</li> <li>J. Identify the location and use of eye wash stations.</li> <li>K. Identify the location of posted evacuation routes.</li> <li>L. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.</li> <li>M. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).</li> <li>N. Pass a safety test.</li> </ul>
<b>8. Automotive Math and Measurement</b>
<ul style="list-style-type: none"> <li>A. Demonstrate knowledge and basic skill in the performance in the use of measurement tools utilized within the automotive industry.</li> <li>B. Measure the length of an object using a ruler with accuracy.</li> <li>C. Measure common automotive parts using precision measuring tools.</li> <li>D. Describe common uses of fasteners.</li> <li>E. Identify standard metric designation of fasteners and identify bolts by grade, diameter, length, and thread pitch.</li> </ul>

- F. State safety rules relating to measurement.
- G. Demonstrate how to use a conversion measurement chart.

## 9. Tools and Equipment

- A. Identify tools and their usage in automotive applications.
- B. Identify safe procedures for handling of tools and equipment.
- C. Demonstrate appropriate use of tools and equipment.
- 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).
- F. Identify and use proper placement of floor jacks and jack stands.
- G. Identify and use proper procedures for safe lift operation.

**In teams, make a video tutorial for assigned tools and present to class. The tutorial should demonstrate proper use, safety precautions, maintenance, and storage practices. Organization and cleanliness of shop areas will be assessed regularly.**

## 10. Preparing Vehicle for Service and Customer

- A. 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. Demonstrate the use of service information, computer resources, reference books, technical service bulletins, and other resources to accurately diagnose and repair automotive systems.
- D. Explain how to properly document maintenance procedures in accordance with applicable laws.
- E. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
- G. 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. in accordance with manufacturer recommendations.
- H. Identify information needed and the service requested on a repair order.
- I. Identify purpose and demonstrate proper use of fender covers, mats.
- J. Demonstrate use of the three C's (concern, cause, and correction).
- K. Review vehicle service history.
- L. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).

Key assignment: Students will identify service information, parts, specifications and prepare a variety of vehicles for service according to industry standards using computerized resources, manuals, technical bulletins, and reference documents. Students will then create a poster that lists stages of the vehicle service preparation including documentation and return to customer.

## 11. Engine Performance and Service

- A. Demonstrate basic knowledge and skill of engine performance, diagnosis and service.
- B. Locate the components of an engine and describe their function.
- C. Visually check engine to determine engine condition.
- D. Verify engine operating temperature.
- E. Remove and replace spark plugs.
- F. 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.
- G. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
- H. Verify operation of the instrument panel engine warning indicators.
- I. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.
- J. Perform engine oil and filter change.

Key assignment: Students will diagnose engine operation and performance.

## 12. Automatic Transmission and Transaxle

- A. Describe OBD I and OBD II diagnostic trouble codes for automatic transmission.
- B. 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.
- D. Inspect external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.
- E. Inspect power train mounts.
- F. Drain and replace fluid and filter(s).

Key assignment: Students will diagnose transmission operation and performance.

## 13. Manual Drive Train and Axle

- A. Demonstrate skills to correctly perform a basic automatic transmission service.
- B. Compare the operation of a conventional transmission to the operation of an electronic
- C. transmission, including precautions to be followed in the routine service of an electronic
- D. transmission.
- E. Check fluid condition; check for leaks and adjust fluids to proper levels.
- F. Drain and refill manual transmission/transaxle and final drive unit.
- G. Inspect clutch operation.
- H. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.
- I. Clean and inspect differential housing; check for leaks; inspect housing vent.
- J. Check and adjust differential housing fluid level.
- K. Drain and refill differential housing.
- L. Inspect drive axle.

Key assignment: Students will diagnose transmission operation and performance.

#### 14. Suspension and Steering Systems

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

Key assignment: Students will test and diagnose steering and suspension components.

#### 15. Wheels and Tires

- A. Inspect for tire condition and wheel problems; determine necessary action.
- B. Compare and contrast different types of tires and tire ratings.
- C. Identify tire wear patterns and determine necessary action.
- D. Check for correct tire size and application (load and speed ratings) and correct as necessary.
- E. Rotate tires according to manufacturer's recommendations.
- F. Dismount, inspect, and remount tire on wheel.
- G. Inspect tire on wheel equipped with tire pressure monitoring system sensor.

- H. Inspect tire and wheel assembly for air loss.
- I. Identify tire pressure monitoring systems (indirect and direct) for operation.
- J. Inspect and identify sensors in a tire pressure monitoring system.
- K. Practice the use of torque wrench.
- L. Inspect tire condition, adjust air pressure and/or determine necessary action.
- M. Balance wheel and tire assembly (static and dynamic).
- N. Dismount and remount tire on wheel equipped with tire pressure monitoring system sensor.
- O. Inspect tire and wheel assembly for air loss; perform necessary action.
- P. Repair tire using internal patch.
- Q. Identify and test tire pressure monitoring systems (indirect and direct) for operation; verify operation of instrument panel lamps.
- R. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.

**Successfully perform maintenance and repair of tires and wheels.**

**16. Brakes**

- A. Describe brake system components.
- B. Install wheel and torque lug nuts and practice the use of torque wrench.
- C. Check master cylinder for external leaks and proper operation.
- D. Select, handle, store, and fill brake fluids to proper level.
- E. Inspect and describe the function for caliper, pads and rotors.
- F. Inspect and describe the purpose for wheel bearings, seals and hub.
- G. Identify function of caliper pistons on an integral parking system.
- H. Inspect and demonstrate knowledge on function of wheel bearings, seals, and bearings.
- I. Properly remove and clean wheel bearings.

Pass a braking system test identifying and describing components, functionality and maintenance.

**17. Electrical/Electronic Systems**

- A. Demonstrate knowledge and basic skill of automotive electrical system components, including diagnostic and repair.
- B. Describe the safety practices that should be followed when working with electrical systems.
- C. Measure and describe the flow of electricity in a simple circuit including voltage, amperage, and resistance.
- D. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
- E. Perform battery state-of-charge test; determine necessary action.
- F. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
- G. Measure key-off battery drain (parasitic draw).
- H. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.

**Battery Service**



- I. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action.
- J. Maintain or restore electronic memory functions.
- K. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.
- L. Perform slow/fast battery charge according to manufacturer's recommendations.

### Starting and Charging System

- M. Inspect switches, connectors, and wires of starter control circuits; determine necessary action.
- N. Perform charging system output test; determine necessary action.
- O. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.

### Lighting Systems and Accessories

- P. Inspect interior and exterior lamps; replace as needed.
- Q. Identify system voltage.
- R. Inspect interior sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
- S. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.
- T. Verify windshield wiper and washer operation; replace wiper blades.

**Demonstrate safety practices to be followed inspecting and diagnosing electric systems. Accurately use electrical test instruments to measure voltage, amperage, and resistance.**

## **18. Heating and Air Conditioning**

- A. Demonstrate knowledge of function, diagnosis and maintenance of heating and cooling systems.
- B. Describe safety precautions to be observed when working on heating and air conditioning systems.
- C. Explain the function and operation of HVAC systems.
- D. Identify basic components and operation of HVAC systems.
- E. Inspect A/C compressor drive belts, pulleys, and tensioners; determine necessary action.
- F. Inspect engine cooling and heater systems hoses; perform necessary action.
- G. Inspect cabin filters; perform necessary action.
- H. Identify the source of A/C system odors.
- I. Keep checking and replacing air cabin filters.

**Inspect hoses, A/C compressor drive belts, pulleys, and tensioners; determine and perform necessary action.**

## **19. Certifications**

- A. Demonstrate knowledge of safety certification requirements in SP2 Safety and Environmental Training.
- B. Complete certification requirements for *Valvoline* Motor Oil 101, *Valvoline* Auto Fluids 101 and *Valvoline* Auto Chemicals 101.

## 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
2. Students will research the automotive industry for an assigned decade and create a presentation on makes and models of cars including the newest technologies and innovations (e.g., drive train system, brake, steering and suspension systems, electrical systems, computer systems, cooling and lubrication systems, exhaust systems, body/frame construction and safety systems) and the impact of transportation on the economy, society (such as driver's license requirements), and American culture.	6A-F	1 4 5	2 4 5	C1.0 C2.0	WS 11-12.6 WS 11-12.7
3. Students will make a video tutorial for assigned tools and present to class. The tutorial should demonstrate proper use, safety precautions, maintenance, and storage practices. Organization and cleanliness of shop areas will be assessed regularly.	7A-N 9A-G 17A-T	1 4 5	2 4 5	C2.0	WS 11-12.6 WS 11-12.7
4. Accurately use a ruler and a precision measuring device. Select the proper types of bolts, nuts, and washers for a given task.	8A-G	1 5	5 10	C2.0	A-CED 4 RLST 11-12.3 RLST 11-12.4
5. Students will identify service information, parts, specifications and prepare a variety of vehicles for service according to industry standards using computerized resources, manuals, technical bulletins, and reference documents. Students will then create a poster that lists stages of the vehicle service preparation including documentation and return to customer.	1A - F 2A, D, I, J 3A, D 5B, G 7, 8, 9 10 A-L	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

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
6. Students will diagnose engine operation and performance.	1A - F 2A, D, I, J 3A, D 5B, G 7, 8, 9 11 A-J	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
7. Students will diagnose transmission operation and performance.	1A - F 2A, D, I, J 3A, D 5B, G 7, 8, 9 12 A-F 13 A-L	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
8. Students will test and diagnose steering and suspension components.	1A - F 2A, D, I, J 3A, D 5B, G 7,8,9 14 A-T	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. Students will successfully perform maintenance and repair of tires and wheels.	15 A-T	1 4 5	2 4 5	C2.0 C3.0	LS 11-12.6 WS 11-12.6
10. Pass a braking system test identifying and describing components, functionality and maintenance.	16 A-I	1 4 5 11 12	2 4 5 6 10	C2.0 C3.0 C4.0	LS 11-12.6 WS 11-12.6
11. Students will demonstrate safety practices to be followed inspecting and diagnosing electric systems. Accurately use electrical test instruments to measure voltage, amperage, and	1A - F 2A, D, I, J 3A, D 5B, G	1 4 5 11	2 4 5 6	C2.0 C3.0 C4.0 C6.0	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
resistance.	7,8,9 17 A-T	12	10		RLST 11-12.3 RLST 11-12.10 SEP 4, 8 CC 2 ETS 1.B
12. Inspect hoses, A/C compressor drive belts, pulleys, and tensioners; determine and perform necessary action.	1A - F 2A, D, I, J 3A, D 5B, G 7, 8, 9 18 A-I	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
13. Students will pass performance and written tests for certifications.	7-14, 16 19 A-B	1, 4,5	<b>4,5,10</b>	<b>C1</b>	LS 11-12.6 WS 11-12.6,7 RLST 11-12.3,4 SEP 4, 8

## 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