

Title 7: Education K-12

Part 128: Mississippi Secondary Curriculum Frameworks in Career and Technical Education, Transportation, Distribution, & Logistics, Automotive Service Technician



2022 Automotive Service Technician

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The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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Standards

Standards and alignment crosswalks are referenced in the appendix. Depending on the curriculum, these crosswalks could identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE automotive service technician curriculum is aligned to the following standards:

International Society for Technology in Education Standards (ISTE)

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iste.org

College- and Career-Ready Standards

College- and career-readiness standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn and so teachers and parents know what they need to do to help them.

mdek12.org/oe/college-and-career-readiness-standards

Framework for 21st Century Learning

In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills. *21 Framework Definitions* (2019).

battelleforkids.org/networks/p21/frameworks-resources

Automotive Service Excellence (ASE), Education Foundation Standards

The ASE Education Foundation is a nonprofit organization that evaluates and accredits entry-level automotive technology education programs against standards developed by the automotive service industry. It also develops career-readiness education for students that fuse local partnerships, rigorous standard-based education, workplace experience, and mentorship together.

aseeducationfoundation.org

Preface

Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

Mississippi Teacher Professional Resources

The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning

Program resources can be found at the RCU's website, rcu.msstate.edu.

Learning Management System: An Online Resource

Learning management system information can be found at the RCU's website, under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.

Executive Summary

Pathway Description

The automotive service technician pathway exposes students to hands-on learning experiences and prepares them for the automobile technician industry. Students will master concepts and skills in safety in the workplace, tools and equipment, engine repair, electrical systems, heating and cooling systems, wheel and tire, and more.

College, Career, and Certifications

The automotive service technician pathway is designed as a secondary program for preparation to enter the field of automotive maintenance and light repair. The purpose of the course is to prepare students to continue study in a postsecondary automotive repair program or to begin work as an entry-level automotive technician. The automotive units in this curriculum are written to the National Institute for ASE Maintenance and Light Repair (MLR) credentialing standards in conjunction with the ASE Education Foundation.

Grade Level and Class Size Recommendations

It is recommended that students enter this program as 10th graders. Exceptions to this are a district-level decision based on class size, enrollment numbers, and student maturity. A maximum of 25 students is recommended for classroom-based courses, while a maximum of 15 students is recommended for lab-based courses.

Student Prerequisites

For students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
 2. C or higher in high school-level math (last course taken or the instructor can specify the level of math instruction needed)
 3. Instructor approval and TABE reading score (eighth grade or higher)
- or**
1. TABE reading and math score (eighth grade or higher)
 2. Instructor approval
- or**
1. Instructor approval

Assessment

The latest assessment blueprint for the curriculum can be found at rcu.msstate.edu/curriculum/curriculumdownload.

Teacher Licensure

The latest teacher licensure information can be found at mdek12.org/oel/apply-for-an-educator-license.

Professional Learning

If you have specific questions about the content of any of training sessions provided, please contact the RCU at 662.325.2510.

Course Outlines

Option 1—Four 1-Carnegie Unit Courses

This curriculum consists of four 1-credit courses that should be completed in the following sequence:

1. **Automotive Service Fundamentals I—Course Code: 997002**
2. **Automotive Service Fundamentals II—Course Code: 997003**
3. **Automotive Service Fundamentals III—Course Code: 997004**
4. **Automotive Service Fundamentals IV—Course Code: 997005**

Course Description: Automotive Service Fundamentals I

This course contains an introduction to shop operations, safety, tools and equipment, and preparing the vehicle for both service and the customer. The engine repair unit focuses on the overall internal combustion engine, cylinder and valve train, and lubrication and cooling systems. It also contains an introduction to disc brakes and drum brakes. This is a 1-Carnegie Unit course.

Course Description: Automotive Service Fundamentals II

This course contains an introduction to electrical/electronic information and terminology including electrical/electronic system theory, battery systems, starting systems, and charging systems. The electrical/electronic systems unit contains information on lighting systems, concepts of gauges, warning devices, driver information systems, horn system, wiper/washer system, and accessories system diagnostic repair. This course also includes information for the service and maintenance to the heating, ventilation, and engine cooling system. This 1-Carnegie Unit course should only be taken after students successfully pass Automotive Service Fundamentals I.

Course Description: Automotive Service Fundamentals III

This course contains a review on shop operations, safety, tools and equipment, and preparing the vehicle for both service and the customer. This course contains general suspension/steering theory; steering system inspection, diagnosis, and repair; concepts of front, rear, and miscellaneous systems; and wheel/tire alignment concepts. The engine performance unit contains information on fuel, air induction, and exhaust systems. This 1-Carnegie Unit course should only be taken after students successfully pass Automotive Service Fundamentals II.

Course Description: Automotive Service Fundamentals IV

This course contains an introduction to both automatic and manual drivetrain. This course also covers axles, related brake systems, antilock brakes, and traction control systems. This 1-Carnegie Unit course should only be taken after students successfully pass Automotive Service Fundamentals III.

Automotive Service Fundamentals I—Course Code: 997002

Unit	Unit Title	Hours
1	Orientation	5
2	Workplace Employability Skills	5
3	Automotive Shop and Personal Safety	10
4	Tools and Equipment	10
5	Preparing a Vehicle for Service	5
6	Maintenance	10
7	Wheel and Tire	10
8	Engine Repair	15
9	Engine Cylinder Head and Block	15
10	Cooling System	10
11	General Brakes	10
12	Hydraulic Brake Systems	11
13	Disc Brake Systems	12
14	Drum Brake Systems	12
Total		140

Automotive Service Fundamentals II—Course Code: 997003

Unit	Unit Title	Hours
15	Basic Electrical/Electronic Systems	25
16	Battery System	15
17	Starting System	17
18	Charging System	18
19	Body and Lighting Systems	25
20	Automotive Heating, Ventilation, and Air Conditioning (HVAC)	40
Total		140

Automotive Service Fundamentals III—Course Code: 997004

Unit	Unit Title	Hours
21	Safety and Workplace Employability Skills Review	15
22	Suspension and Steering Systems Operation	13
23	Steering Systems	15
24	Suspension Systems	15
25	Wheel Alignment	13
26	Engine Performance	15
27	Computerized Controls	13
28	Ignition System	13
29	Fuel, Air Induction, and Exhaust Systems	15
30	Emission Control Systems	13
Total		140

Automotive Service Fundamentals IV—Course Code: 997005

Unit	Unit Title	Hours
31	Antilock Brakes and Traction Control	13
32	Power-Assisted Brake Systems	13
33	Related Brake Systems	13
34	Automatic Transmission and Transaxle	15
35	Automatic Transmission and Transaxle Service	15
36	CVT and Hybrid Transmission and Transaxle	13
37	Manual Drivetrain and Axles	15
38	Clutch	13
39	Drive Shaft, Half Shafts, Universal and Constant-Velocity Joints	15
40	Differential and Drive Axles	15
Total		140

Option 2—Two 2-Carnegie-Unit Courses

This curriculum consists of two 2-credit courses, which should be completed in the following sequence:

1. **Automotive Service Technology I—Course Code: 997000**
2. **Automotive Service Technology II— Course Code: 997001**

Course Description: Automotive Service Technology I

This course contains an introduction to shop operations, safety, tools and equipment, and preparing the vehicle for both service and the customer. The engine repair unit focuses on the overall internal combustion engine, cylinder and valve train, lubrication and cooling systems. It also contains an introduction to disc brakes and drum brakes. This course also contains an introduction to electrical/electronic information and terminology including electrical/electronic system theory, battery systems, starting systems, and charging systems. The electrical/electronic systems unit contains information on lighting systems, concepts of gauges, warning devices, driver information systems, horn system, wiper/washer system, and accessories system diagnostic repair. It also includes information for the service and maintenance to the heating, ventilation, and cooling system

Course Description: Automotive Service Technology II

This course contains a review on shop operations, safety, tools and equipment, and preparing the vehicle for both service and the customer. This course contains general suspension/steering theory; steering system inspection, diagnosis, and repair; concepts of front, rear, and miscellaneous systems; and wheel/tire alignment concepts. The engine performance unit contains information on fuel, air induction, and exhaust systems; concepts of emission control system; and concepts of engine service. This course also contains an introduction to both automatic and manual drivetrains and axles. Related brake systems, antilock brakes, and traction control systems are also taught. The course should be taken after the student has successfully passed Automotive Service Technology I.

Automotive Service Technology I—Course Code: 997000

Unit	Title	Hours
1	Orientation	5
2	Workplace Employability Skills	5
3	Automotive Shop and Personal Safety	10
4	Tools and Equipment	10
5	Preparing a Vehicle for Service	5
6	Maintenance	10
7	Wheel and Tire	10
8	Engine Repair	15
9	Engine Cylinder Head and Block	15
10	Cooling System	10
11	General Brakes	10
12	Hydraulic Brake Systems	11
13	Disc Brake Systems	12

14	Drum Brake Systems	12
15	Basic Electrical/Electronic Systems	25
16	Battery System	15
17	Starting System	17
18	Charging System	18
19	Body and Lighting Systems	25
20	Automotive Heating, Ventilation, and Air Conditioning (HVAC)	40
Total		280

Automotive Service Technology II—Course Code: 997001

Unit	Title	Hours
21	Safety and Workplace Employability Skills Review	15
22	Suspension and Steering Systems Operation	13
23	Steering Systems	15
24	Suspension Systems	15
25	Wheel Alignment	13
26	Engine Performance	15
27	Computerized Controls	13
28	Ignition System	13
29	Fuel, Air Induction, and Exhaust Systems	15
30	Emission Control Systems	13
31	Antilock Brakes and Traction Control	13
32	Power-Assisted Brake Systems	13
33	Related Brake Systems	13
34	Automatic Transmission and Transaxle	15
35	Automatic Transmission and Transaxle Service	15
36	CVT and Hybrid Transmission and Transaxle	13
37	Manual Drivetrain and Axles	15
38	Clutch	13
39	Drive Shaft, Half Shafts, Universal and Constant-Velocity Joints	15
40	Differential and Drive Axles	15
Total		280

Career Pathway Outlook

Overview

Data used to develop the automotive service technician pathway were collected from a variety of sources including industry surveys and interviews, occupational employment projections, national standards, the MDE, institutions of higher learning, community and junior college requirements, and state and national certification requirements. The pathway is designed to provide an overview of the automotive service area to prepare students for careers in occupations predicted to have a high number of available jobs in the next 10 years. These jobs are in the automotive service sector. Industry input was collected from automotive service businesses in Mississippi to customize the pathway to meet the needs of the state's employers. Employment projections were obtained from the Mississippi Economic Review and Outlook, Mississippi Department of Employment Security, and the *National Occupational Outlook Handbook*.

Students who successfully master the curriculum should have the skills required to acquire ASE certification, which is based on industry-validated performance indicators. Students should also be prepared to enter programs for advanced education in the automotive fields. The pathway will articulate to automotive service programs offered in Mississippi's community and junior colleges.

Needs of the Future Workforce

Automotive service technician and mechanic occupations are projected to have about slightly less-than-average growth over the projection date in Mississippi with a growth rate of 3.9%. With employers struggling to find qualified applicants, jobseekers who have completed postsecondary training programs in automotive technology will have the best job prospects. This field is growing throughout the U.S., which means there will be job opportunities within the state and across the nation.

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Hourly Earnings, 2020
Automotive Service Technician and Mechanics	5,610	5,830	220	3.9	\$18.56

Source: Mississippi Department of Employment Security; mdes.ms.gov (2021).

Perkins V Requirements and Academic Infusion

The automotive service technician curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in the automotive field. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for automotive service careers. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

Transition to Postsecondary Education

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, mccb.edu.

Best Practices

Innovative Instructional Technologies

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The automotive service technician educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

Differentiated Instruction

Students learn in a variety of ways, and numerous factors—students' background, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunity to succeed.

CTE Student Organizations

Teachers should investigate opportunities to sponsor a student organization. There are several here in Mississippi that will foster the types of learning expected from the automotive service technician curriculum. SkillsUSA is an example of a student organization with many outlets for automotive service. Student organizations provide participants and members with growth opportunities and competitive events. They also open the doors to the world of automotive service careers and scholarship opportunities.

Cooperative Learning

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the automotive service technician curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The automotive service technician curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the automotive service technician curriculum that will allow and encourage collaboration with professionals currently in the automotive service technician field.

Work-Based Learning

Work-based learning is an extension of understanding competencies taught in the automotive service technician classroom. This curriculum is designed in a way that necessitates active involvement by the students in the community around them and the global environment. These real-world connections and applications link to all types of students to knowledge, skills, and professional dispositions. Work-based learning should encompass ongoing and increasingly more complex involvement with local companies and industry professionals. Thus, supervised collaboration and immersion into the industry around the students are keys to students' success, knowledge, and skills development.

Professional Organizations

Association for Career and Technical Education (ACTE)
acteonline.org

SkillsUSA
skillsusa.org

Using This Document

Competencies and Suggested Objectives

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

Teacher Resources

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at rcu.msstate.edu/curriculum/curriculumdownload.aspx. All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future, if they are not already. To be added to the guide, [send a Help Desk ticket to the RCU](#) by emailing helpdesk@rcu.msstate.edu.

Perkins V Quality Indicators and Enrichment Material

Some of the units may include an enrichment section at the end. If the automotive service technician program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the automotive service technician program is using a national certification, work-based learning, or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

Unit 1: Orientation

Competencies and Suggested Objectives
1. Describe local program and career and technical center policies and procedures. ^{DOK1} a. Describe local program and career and technical center policies and procedures including dress code, attendance, academic requirements, discipline, and transportation regulations.
2. Describe employment opportunities and responsibilities. ^{DOK1} a. Describe employment opportunities including potential earnings, employee benefits, job availability, and place of employment, working conditions, and educational requirements. b. Describe basic employee responsibilities. c. Explain automotive industry pay scales including flat rate, salary, and hourly. d. Describe ASE certifications related to the automotive industry.
3. Explore leadership skills and personal development opportunities provided by the student organization SkillsUSA. ^{DOK2} a. Demonstrate effective team building and leadership skills. b. Practice appropriate work ethics. c. Explain the purpose, mission, objectives, motto, colors, official dress, and other distinguishing characteristics of SkillsUSA. d. Explain how participation in SkillsUSA can promote lifelong responsibility for community service, professional growth, and development. e. Explore the local, state, and national opportunities available to students through participation in SkillsUSA including, but not limited to, conferences, competitions, community service, philanthropy, and other activities.

Unit 2: Workplace Employability Skills

Competencies and Suggested Objectives

1. Demonstrate the high-quality personal standards expected in the workforce. ^{DOK1}
 - a. Report to work on time daily, ready to take directions and demonstrate motivation to accomplish the task at hand.
 - b. Dress appropriately and use language and manners suitable for the workplace.
 - c. Maintain appropriate personal hygiene.
 - d. Meet and maintain employment eligibility criteria such as drug/alcohol-free status, clean driving record, and so forth.
 - e. Demonstrate honesty, integrity, and reliability.
2. Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations. ^{DOK2}
 - a. Comply with workplace policies/laws.
 - b. Contribute to the success of the team, assist others, and request help when needed.
 - c. Work well with all customers and coworkers.
 - d. Negotiate solutions to interpersonal and workplace conflicts.
 - e. Contribute ideas and demonstrate initiative.
 - f. Follow directions.
 - g. Communicate (written and verbally) effectively with customers and coworkers.
 - h. Read and interpret workplace documents. Write clearly and concisely.
 - i. Analyze and resolve problems that arise in completing assigned tasks.
 - j. Organize and implement a productive plan of work.
 - k. Use scientific, technical, engineering, and mathematics principles and reasoning to accomplish assigned tasks.
 - l. Identify and address the needs of all customers. Provide helpful, courteous, and knowledgeable service and advice as needed.
 - m. Communicate effectively with customers, colleagues, and employers to include conflict resolution.

Unit 3: Automotive Shop and Personal Safety

Competencies and Suggested Objectives

1. Identify and describe general safety rules. ^{DOK1}
 - a. Identify general shop safety rules and procedures.
 - b. Utilize safe procedures for handling of tools and equipment.
 - c. Identify and use proper placement of floor jacks and jack stands.
 - d. Identify and use proper procedures for safe lift operation.
 - e. Utilize proper ventilation procedures for working within the lab/shop area.
 - f. Identify marked safety areas.
 - g. Identify the location and the types of fire extinguishers and other fire safety equipment.
 - h. Demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.
 - i. Identify the location and use of eyewash stations.
 - j. Identify the location of the posted evacuation routes.
 - k. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
 - l. Identify and wear appropriate clothing for lab/shop activities.
 - m. Secure hair and jewelry for lab/shop activities.
 - n. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high-voltage circuits.
 - o. Demonstrate awareness of the safety aspects of high-voltage circuits (e.g., high-intensity discharge [HID] lamps, ignition systems, injection systems, etc.).
 - p. Locate and demonstrate knowledge of safety data sheets (SDS).
 - q. Identify and explain the procedures for lifting heavy objects.

Note: Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be documented in each student's file.

Unit 4: Tools and Equipment

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Explore tools and equipment used in the automotive service industry. ^{DOK2}<ol style="list-style-type: none">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 (e.g., micrometer, dial indicator, dial caliper).

Unit 5: Preparing a Vehicle for Service

Competencies and Suggested Objectives

1. Explore the procedures for preparing a vehicle for automotive service. ^{DOK2}
 - a. Identify information needed and the service requested on a repair order.
 - b. Identify purpose and demonstrate proper use of fender covers and mats.
 - c. Demonstrate use of the three C's (i.e., concern, cause, and correction).
 - d. Review the vehicle's service history.
 - e. Complete a work order to include customer information, vehicle-identifying information, customer concern, related service history, problem causes, and corrections.
 - f. Ensure the vehicle is prepared to return to customer per school/company policy (i.e., floor mats, steering wheel cover, etc.).

Unit 6: Maintenance

Competencies and Suggested Objectives

1. Inspect and perform general maintenance. ^{DOK2}
 - a. Discuss the importance of regularly scheduled maintenance procedures as outlined in the owner's manual and related to vehicle performance and longevity.
 - b. Complete a work order and maintenance record for a given vehicle.
 - c. Check all under-hood fluid levels (e.g., engine oil, transmission fluid, brake fluid, power steering fluid, and coolant).
 - d. Visually inspect the vehicle for oil and fluid leaks and determine needed repairs.
 - e. Use service information to select proper lubricants, capacities, and filters for lubrication service.
 - f. Identify lubrication system components and configurations.
 - g. Change engine oil and filter accordance to manufacturer's specifications and reset maintenance reminder as required.
 - h. Perform a chassis and body lubrication.
 - i. Inspect and service as needed other filters on the engine including air, fuel, positive crankcase ventilation (PCV) valve crankcase vent filters, and so forth.
 - j. Conduct a general preventive maintenance inspection of hoses, belts, wiper blades, headlights, accessory lights, tires, exhaust, shocks, and so forth. Repair/replace/adjust as needed.
 - k. Clean and service the battery's case, cables, and connections and check its electrolyte level (if applicable). Maintain electronic memory functions while cleaning.

Unit 7: Wheel and Tire

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Perform tire and wheel diagnosis and repair. ^{DOK2}<ol style="list-style-type: none">a. Inspect tire condition/age, identify tire wear patterns, check for correct tire size, application (service class, load, and speed ratings), and air pressure as listed on the tire information placard/label.b. Rotate tires according to the manufacturer's recommendations, including vehicles equipped with tire pressure monitoring systems (TPMS).c. Dismount, inspect, and remount tire on wheel (with/without TPMS), balance wheel and tire assembly.d. Inspect tire and wheel assembly for air loss; determine necessary action.e. Repair tire following tire manufacturer-approved procedure.f. Identify indirect and direct TPMS; calibrate/relearn system; verify operation of instrument panel lamps.g. Demonstrate knowledge of steps required to remove and replace sensors in a TPMS (per OEM/sensor manufacturer).h. Perform road force balance/match mounting.

Unit 8: Engine Repair

Competencies and Suggested Objectives

1. Identify and describe general vehicle information and repairs. ^{DOK2}
 - a. Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls. Include vehicles equipped with advanced driver assistance systems (ADAS).
 - b. Retrieve and record diagnostic trouble codes (DTCs), onboard diagnostics (OBD) monitor status, and freeze frame data. Clear codes and data when directed.
 - c. Verify operation of the instrument panel engine warning indicators.
 - d. Inspect engine assembly for fuel, oil, coolant, and other leaks.
 - e. Install engine covers using gaskets, seals, and sealers as required.
 - f. Demonstrate understanding of the procedure for verifying engine mechanical timing.
 - g. Inspect engine mounts.
 - h. Identify service precautions related to service of the internal combustion engine of a hybrid electric vehicle.

Unit 9: Engine Cylinder Head and Block

Competencies and Suggested Objectives
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| <ol style="list-style-type: none">1. Identify cylinder head, valve train, and engine block components and operation. ^{DOK2}<ol style="list-style-type: none">a. Identify cylinder head and valve train components and configuration.b. Identify engine block assembly components and configurations. |
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Unit 10: Cooling Systems

Competencies and Suggested Objectives
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| <ol style="list-style-type: none">1. Inspect, replace, and adjust accessory drive belt and cooling systems. ^{DOK2}<ol style="list-style-type: none">a. Identify cooling system components and configurations.b. 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.c. Identify causes of engine overheating.d. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.e. Inspect and test coolant; drain and recover coolant; flush and/or refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.f. Identify types of water pumps (e.g., belt driven, chain driven, electrical, etc.)g. Remove, inspect, and replace thermostat and gasket/seal. |
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Unit 11: General Brakes

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Explore general brake systems and theories of operation. ^{DOK2}<ol style="list-style-type: none">a. Research vehicle service information including fluid type, vehicle service history, service precautions, technical service bulletins and recalls. Include vehicles equipped with ADAS.b. Identify brake system components and configuration.c. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.d. Describe the procedure for performing a road test to check brake system operation including an antilock brake system (ABS).e. Install wheel and torque lug nuts.

Unit 12: Hydraulic Brake Systems

Competencies and Suggested Objectives
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| <ol style="list-style-type: none">1. Apply concepts of hydraulic brake systems by performing inspection, diagnosis, and repair. ^{DOK2}<ol style="list-style-type: none">a. Demonstrate understanding of hydraulic principles (Pascal's law).b. Describe proper brake pedal height, travel, and feel.c. Check master cylinder proper operation.d. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports.e. Select, handle, store, and fill brake fluids to the proper level; use the proper fluid type per manufacturer specification.f. Identify components of hydraulic brake warning light systems.g. Bleed and/or replace fluid in the brake system.h. Test brake fluid for contamination. |
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Unit 13: Disc Brake Systems

Competencies and Suggested Objectives

1. Apply concepts of disc brake systems by performing inspection, diagnosis, and repair. ^{DOK2}
 - a. Remove and clean caliper assembly; inspect for leaks, damage, and wear.
 - b. Inspect caliper mounting and slides/pins for proper operation, wear, and damage.
 - c. Remove, inspect, and/or replace brake pads and retaining hardware.
 - d. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads against rotor and inspect for leaks.
 - e. Clean and inspect rotor and mounting surface, and measure rotor thickness, thickness variation, and lateral runout.
 - f. Remove and reinstall/replace rotor.
 - g. Refinish rotor on vehicle; measure final rotor thickness and compare with specification.
 - h. Refinish rotor off vehicle; measure final rotor thickness and compare with specification.
 - i. Retract and readjust the caliper piston on an integral parking brake system.
 - j. Describe the importance of operating the vehicle to burnish/break-in replacement brake pads according to manufacturers' recommendations.

Unit 14: Drum Brake Systems

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Apply concepts of drum brake systems by performing inspection, diagnosis, and repair.^{DOK2}<ol style="list-style-type: none">a. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.b. Refinish brake drum and measure final drum diameter; compare with specification.c. 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.d. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.e. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.

Unit 15: Basic Electrical/Electronic Systems

Competencies and Suggested Objectives

1. Explore general electrical/electronic systems and theories of operation. ^{DOK2}
 - a. Research vehicle service information including vehicle service history, service precautions, and technical service bulletins and recalls. Include vehicles equipped with ADAS.
 - b. Identify electrical/electronic system components and configurations.
 - c. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.
 - d. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
 - e. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.
 - f. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
 - g. Describe types of test lights; use appropriate test light to check operation of electrical circuits per service information.
 - h. Use fused jumper wires to check operation of electrical circuits per service information.
 - i. Use wiring diagrams to trace electrical/electronic circuits.
 - j. Measure key-off battery drain (i.e., parasitic draw).
 - k. Inspect and test fusible links, circuit breakers, and fuses.
 - l. Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair).

Unit 16: Battery System

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Apply concepts of battery systems by performing inspection, diagnosis, and repair. ^{DOK2}<ol style="list-style-type: none">a. Perform battery state-of-charge test; determine necessary action.b. Confirm proper battery capacity, size, type, and application for vehicle; perform battery capacity and load test.c. Maintain or restore electronic memory functions as recommended by the manufacturer.d. Inspect and clean battery; fill battery cells (if applicable); check battery cables, connectors, clamps, and hold-downs.e. Charge battery according to manufacturers' recommendations.f. Jumpstart vehicle using jumper cables and a booster battery or an auxiliary power supply.g. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting the vehicle battery.

Unit 17: Starting System

Competencies and Suggested Objectives
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| <ol style="list-style-type: none">1. Apply concepts of starting systems by performing inspection, diagnosis, and repair. ^{DOK2}<ol style="list-style-type: none">a. Perform starter current draw test.b. Perform starter circuit voltage drop tests.c. Inspect and test starter relays and solenoids.d. Remove and install starter in a vehicle.e. Inspect and test switches, connectors, and wires of starter control circuits.f. Demonstrate knowledge of an automatic idle-stop/start-stop system. |
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Unit 18: Charging System

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Apply concepts of charging systems by performing inspection, diagnosis, and repair. ^{DOK2}<ol style="list-style-type: none">a. Perform charging system output test.b. Inspect, adjust, and/or replace generator (i.e., alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.c. Remove, inspect, and/or replace generator (i.e., alternator).d. Perform charging circuit voltage drop tests.

Unit 19: Body and Lighting Systems

Competencies and Suggested Objectives

1. Explore the operation of and perform diagnosis, service and repair on the lighting, instrument cluster, and body electrical systems. ^{DOK2}
 - a. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (e.g., fog lights, driving lights, etc.); replace as needed.
 - b. Aim headlights.
 - c. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators as required.
 - d. Demonstrate understanding of vehicle comfort, convenience, access, safety, and operation of related systems.
 - e. Remove and reinstall the door panel.
 - f. Describe the operation of keyless entry and/or remote start systems.
 - g. Describe disabling and enabling procedures for SRS; verify indicator lamp operation.
 - h. Verify windshield wiper and washer operation; replace wiper blades.

Unit 20: Automotive Heating, Ventilation, and Air Conditioning (HVAC)

Competencies and Suggested Objectives

1. Discuss theory and operation of the air-conditioning and heating system. ^{DOK2}
 - a. Research vehicle service information including refrigerant/oil/fluid type, vehicle service history, service precautions, and technical service bulletins and recalls. Include vehicles equipped with ADAS.
 - b. Identify HVAC components and configurations.
 - c. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.
 - d. Identify steps of an air conditioner performance test.
 - e. Identify abnormal operating noises in the air-conditioning system.
 - f. Visually inspect the air-conditioning system for signs of leaks.
 - g. Identify and interpret heating and air-conditioning problems.
2. Identify, inspect, and perform general maintenance and repair on the air-conditioning system and related components. ^{DOK2}
 - a. Inspect and/or replace air conditioner compressor drive belts, pulleys, and tensioners.
 - b. Inspect air-conditioning condenser for proper airflow.
 - c. Inspect evaporator housing condensation drain.
3. Diagnose, service and repair the heating, ventilation, and engine cooling systems. ^{DOK2}
 - a. Inspect engine cooling and heater systems hoses and pipes.
4. Identify, inspect, and diagnose HVAC controls, relays, and resistors, actuators, cables, and condensate drains; determine necessary action for general maintenance and repair. ^{DOK 2}
 - a. Inspect HVAC ducts, doors, hoses, cabin filters, and outlets.
 - b. Identify the source of HVAC system odors.
 - c. Identify and inspect blower motor assembly for proper air flow and remove any debris.

Note: For every task in Automotive HVAC, 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.

Unit 21: Safety and Workplace Employability Skills Review

Competencies and Suggested Objectives	
1. Identify and describe general safety rules. ^{DOK1}	<ul style="list-style-type: none">a. Identify general shop safety rules and procedures.b. Utilize safe procedures for handling of tools and equipment.c. Identify and use proper placement of floor jacks and jack stands.d. Identify and use proper procedures for safe lift operation.e. Utilize proper ventilation procedures for working within the lab/shop area.f. Identify marked safety areas.g. 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.h. Identify the location and use of eye-washing stations.i. Identify the location of the posted evacuation routes.j. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.k. Identify and wear appropriate clothing for lab/shop activities.l. Secure hair and jewelry for lab/shop activities.m. Demonstrate awareness of the safety aspects of SRS, electronic brake control systems, and hybrid vehicle high-voltage circuits.n. Demonstrate awareness of the safety aspects of high voltage circuits (e.g., high-intensity discharge [HID] lamps, ignition systems, injection systems, etc.).o. Locate and demonstrate knowledge of SDS.p. Identify and explain the procedures for lifting heavy objects.
2. Demonstrate the high-quality personal standards expected in the workforce. ^{DOK1}	<ul style="list-style-type: none">a. Report to work daily on time, ready to take directions, and demonstrate motivation to accomplish the task at hand.b. Dress appropriately and use language and manners suitable for the workplace.c. Maintain appropriate personal hygiene.d. Meet and maintain employment eligibility criteria (e.g., drug/alcohol-free status, clean driving record, etc.).e. Demonstrate honesty, integrity, and reliability.
3. Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations. ^{DOK2}	<ul style="list-style-type: none">a. Comply with workplace policies/laws.b. Contribute to the success of the team, assist others, and request help when needed.c. Work well with all customers and coworkers.d. Negotiate solutions to interpersonal and workplace conflicts.e. Contribute ideas and demonstrate initiative.f. Follow directions.

- g. Communicate — both written and verbally — effectively with customers and coworkers.
- h. Read and interpret workplace documents; write clearly and concisely.
- i. Analyze and resolve problems that arise in completing assigned tasks.
- j. Organize and implement a productive plan of work.
- k. Use scientific, technical, engineering and mathematics principles and reasoning to accomplish assigned tasks.
- l. Identify and address the needs of all customers, providing helpful, courteous, and knowledgeable service and advice as needed.
- m. Communicate effectively with customers, colleagues, and employers to include conflict resolution.

Note: Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be documented in each student's file.

Unit 22: Suspension and Steering Systems Operation

Competencies and Suggested Objectives

1. Explore general suspension and steering systems and theories of operation. ^{DOK2}
 - a. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins and recalls. Include vehicles equipped with ADAS.
 - b. Identify suspension and steering system components and configurations.
 - c. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.
 - d. Disable and enable SRS; verify indicator lamp operation.

Unit 23: Steering Systems

Competencies and Suggested Objectives

1. Apply concepts of steering systems by performing inspection, diagnosis, and repair. ^{DOK2}
 - a. Inspect inner tie rod ends/sockets of a rack and pinion steering gear; inspect the bellows/dust boots.
 - b. Inspect power steering fluid level and condition.
 - c. Drain and replace power steering system fluid; use proper fluid type per manufacturer specification.
 - d. Inspect for power steering fluid leakage.
 - e. Remove, inspect, replace, and/or adjust power steering pump drive belt.
 - f. Inspect, remove and/or replace power steering hoses and fittings.
 - g. Inspect pitman arm, relay (center link/intermediate) rod, idler arm, mountings, and steering linkage damper.
 - h. Inspect tie rod ends/sockets, tie rod sleeves, and clamps (non-rack and pinion).
 - i. Inspect electric power steering system.
 - j. Inspect upper and lower control arms, bushings, and shafts.
 - k. Inspect track bar, strut rods/radius arms, and related mounts and bushings.
 - l. Inspect upper and lower ball joints (with or without wear indicators).
 - m. Inspect suspension system coil springs and spring insulators (silencers).
 - n. Inspect suspension system torsion bars and mounts.
 - o. Inspect and/or replace front stabilizer bar (sway bar) bushings, brackets, and links.
 - p. Inspect, remove and/or replace strut cartridge or assembly; inspect mounts and bushings.
 - q. Inspect front strut bearing and mount.
 - r. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms.
 - s. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.
 - t. Inspect, remove, and replace shock absorbers; inspect mounts and bushings.
 - u. Identify hybrid vehicle power steering system electrical circuits and safety precautions.
 - v. Describe the function of steering and suspension control systems and components (i.e., active suspension, and stability control).

Unit 24: Suspension Systems

Competencies and Suggested Objectives

1. Apply concepts of suspension systems by performing inspection, diagnosis, and repair.^{DOK2}
 - a. Inspect upper and/or lower control arms, bushings, and shafts.
 - b. Inspect and replace rebound/jounce bumpers.
 - c. Inspect track bar, strut rods/radius arms, and related mounts and bushings.
 - d. Inspect upper and/or lower ball joints (with or without wear indicators).
 - e. Inspect suspension system coil springs and spring insulators.
 - f. Inspect torsion bars and mounts.
 - g. Inspect and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.
 - h. Inspect, remove and/or replace strut assembly, strut coil spring, insulators, and upper strut bearing mount.
 - i. Inspect components of suspension systems (i.e., coil, leaf, and torsion).
 - j. Inspect components of electronically controlled suspension systems.
 - k. Inspect, remove, and replace shock absorbers; inspect mounts and bushings.
 - l. Inspect front and rear wheel bearings.
 - m. Describe the function of electronically controlled suspension and steering systems and components (i.e., active suspension and stability control).

Unit 25: Wheel Alignment

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Apply concepts of wheel alignment. ^{DOK2}<ol style="list-style-type: none">a. Perform prealignment inspection and measure vehicle ride height.b. Describe four-wheel alignment angles (e.g., camber, caster, toe, etc.) and the effects on tire wear and handling the vehicle.

Unit 26: Engine Performance

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Explore general engine components and testing of proper operation. ^{DOK2}<ol style="list-style-type: none">a. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins and recalls. Include vehicles equipped with ADAS.b. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.c. Demonstrate understanding of proper engine cooling system operation.d. Demonstrate understanding of camshaft timing including engines equipped with variable valve timing (VVT) systems.

Unit 27: Computerized Controls

Competencies and Suggested Objectives
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| <ol style="list-style-type: none">1. Apply concepts of computerized engine controls by performing inspection, diagnosis. ^{DOK2}<ol style="list-style-type: none">a. Identify computerized control system components and configurations. |
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Unit 28: Ignition System

Competencies and Suggested Objectives
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| <ol style="list-style-type: none">1. Apply concepts of ignition systems by performing inspection, diagnosis, and repair. ^{DOK2}<ol style="list-style-type: none">a. Identify ignition system components and configuration.b. Remove, inspect, and replace spark plugs, and inspect secondary ignition components for wear and damage. |
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Unit 29: Fuel, Air Induction, and Exhaust Systems

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Apply concepts of fuel, air induction, and exhaust systems by performing inspection, diagnosis, and repair as needed. ^{DOK2}<ol style="list-style-type: none">a. Identify fuel, air induction, and exhaust system components and configurations.b. Replace fuel filter(s) where applicable.c. Inspect, service, or replace air filters, filter housings, and intake ductwork.d. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields.e. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields.f. Check and refill diesel exhaust fluid (DEF).

Unit 30: Emission Control Systems

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Apply concepts of emissions control systems by performing inspection, diagnosis, and repair. ^{DOK2}<ol style="list-style-type: none">a. Identify emission control system components and configuration.b. Inspect, test, service, and/or replace PCV filter/breather, valve, tubes, orifices, and hoses.

Unit 31: Antilock Brakes and Traction Control

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Explore antilock brake systems (ABS), traction control systems (TCS), and vehicle stability control systems. ^{DOK2}<ol style="list-style-type: none">a. Identify electronic brake control system components and describe their respective functions (e.g., ABS, TCS, electronic stability control [ESC] systems, etc.).b. Describe the operation of a regenerative braking system.

Unit 32: Power-Assisted Brake Systems

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Apply concepts of power-assisted unit systems by performing inspection, diagnosis, and repair.^{DOK2}<ol style="list-style-type: none">a. Check brake pedal travel with and without the engine running to verify proper power booster operation.b. Identify components of the power-assisted brake system (i.e., vacuum, hydraulic, and electric)

Unit 33: Related Brake Systems

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Apply concepts of related systems (i.e., wheel bearings, parking brakes, and electrical) by performing inspection, diagnosis, and repair. ^{DOK2}<ol style="list-style-type: none">a. Remove, clean, inspect, repack/replace, and install wheel bearings; remove and install bearing races, replace seals; install hub; adjust bearings.b. Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.c. Check parking brake operation (including electric parking brakes) and parking brake indicator light system operation.d. Check operation of brake stop light system.e. Inspect and replace wheel studs.

Unit 34: Automatic Transmission and Transaxle

Competencies and Suggested Objectives

1. Explore general automatic transmissions and transaxles. ^{DOK2}
 - a. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins and recalls. Include vehicles equipped with ADAS.
 - b. Identify automatic transmission and transaxle components and configurations.
 - c. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.
 - d. Inspect transmission or transaxle (including those equipped and not equipped with a dipstick) for transmission fluid condition, fluid level, and leaks.
 - e. Demonstrate knowledge of transmission and transaxle gear reduction and multiplication operation using driving, driven, and held member (i.e., power flow) principles.

Unit 35: Automatic Transmission and Transaxle Service

Competencies and Suggested Objectives
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| <ol style="list-style-type: none">1. Explain, diagnose, service, and repair automatic, in-vehicle transmissions and transaxles.^{DOK2}<ol style="list-style-type: none">a. Inspect external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.b. Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.c. Demonstrate understanding of relearn principles.d. Inspect, replace and/or align powertrain mounts. |
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Unit 36: CVT and Hybrid Transmission and Transaxle

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Explore continuously variable transmissions (CVTs) and hybrid transmission and/or transaxle operation. ^{DOK2}<ol style="list-style-type: none">a. Describe the operational characteristics of a CVT.b. Describe the operational characteristics of a hybrid vehicle drivetrain.

Unit 37: Manual Drivetrain and Axles

Competencies and Suggested Objectives

1. Explain, diagnose, service, and repair manual, in-vehicle transmission and transaxles. ^{DOK2}
 - a. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins and recalls. Include vehicles equipped with ADAS.
 - b. Identify manual drivetrain and axle components and configuration.
 - c. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.
 - d. Check fluid condition and for leaks.
 - e. Drain and refill manual transmission/transaxle; use proper fluid type per manufacturer specification.
 - f. Describe the operational characteristics of an electronically controlled manual transmission/transaxle.

Unit 38: Clutch

Competencies and Suggested Objectives
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| <ol style="list-style-type: none">1. Explain, diagnose, service, and repair clutch hydraulic system. ^{DOK2}<ol style="list-style-type: none">a. Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.b. Check for hydraulic system leaks.c. Identify components of the clutch system. |
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Unit 39: Drive Shaft, Half Shafts, Universal and Constant-Velocity (CV) Joints

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Inspect and perform general maintenance on driveshafts, half shafts, universal joints, and constant-velocity (CV) joints for front-, rear-, all-, and four-wheel drive vehicles. ^{DOK2}<ol style="list-style-type: none">a. Inspect, remove, and/or replace bearings, hubs, and seals.b. Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.c. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.

Unit 40: Differential and Drive Axles

Competencies and Suggested Objectives
<ol style="list-style-type: none">1. Inspect and perform general maintenance on differentials. ^{DOK2}<ol style="list-style-type: none">a. Inspect differential housing; check for leaks, inspect housing vent.b. Check and adjust differential housing fluid level; use proper fluid type per manufacturer specification.c. Drain and refill differential housing using proper fluid type per manufacturer specification.d. Inspect and replace drive axle wheel studs.e. Identify concerns related to variations in tire circumference and/or final drive ratios.

Student Competency Profile

Student's Name: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit, which are the tasks that are necessary to be mastered to pass the national certification. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

Student's degree of competency will be noted using the following scale:

- 5** Mastered competencies. Able to perform all elements of the task successfully and independently without supervision.
- 4** Satisfactory performance of task. Acceptable performance of all elements of task with mastery of some elements.
- 3** Capable of performing task adequately, but some elements need improvement.
- 2** Satisfactory performance of some elements of task and unsatisfactory performance of some elements of task.
- 1** Unsatisfactory performance of task.
- 0** **Student missed task**

Required Supplemental Tasks			
Shop and Personal Safety			
	1.	Identify general shop safety rules and procedures.	
	2.	Utilize safe procedures for handling of tools and equipment.	
	3.	Identify and use proper placement of floor jacks and jack stands.	
	4.	Identify and use proper procedures for safe lift operation.	
	5.	Utilize proper ventilation procedures for working within the lab/shop area.	
	6.	Identify marked safety areas.	
	7.	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.	
	8.	Identify the location and use of eyewash stations.	
	9.	Identify the location of the posted evacuation routes.	
	10.	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.	
	11.	Identify and wear appropriate clothing for lab/shop activities.	

	12.	Secure hair and jewelry for lab/shop activities.	
	13.	Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high-voltage circuits.	
	14.	Demonstrate awareness of the safety aspects of high-voltage circuits (e.g., high-intensity discharge [HID] lamps, ignition systems, injection systems, etc.).	
	15.	Locate and demonstrate knowledge of safety data sheets (SDS).	
Work Habits / Ethic			
	1.	Complies with workplace policies/laws.	
	2.	Contributes to the success of the team, assists others, and requests help when needed.	
	3.	Works well with all customers and coworkers.	
	4.	Negotiates solutions to interpersonal and workplace conflicts.	
	5.	Contributes ideas and initiative.	
	6.	Follows directions.	
	7.	Communicates (written and verbal) effectively with customers and coworkers.	
	8.	Reads and interprets workplace documents; writes clearly and concisely.	
	9.	Analyzes and resolves problems that arise in completing assigned tasks.	
	10.	Organizes and implements a productive plan of work.	
	11.	Uses scientific, technical, engineering and mathematics principles and reasoning to accomplish assigned tasks.	
	12.	Identifies and addresses the needs of all customers; provides helpful, courteous, and knowledgeable service and advice as needed.	
	13.	Respectful of tools and property used in school and the workplace environment.	
Preparing Vehicle for Customer			
	1.	Ensure vehicle is prepared to return to customer per school/company policy (i.e., floor mats, steering wheel cover, etc.).	
Workplace Employability Skills Personal Standards			
	1.	Reports to work daily on time; able to take directions and motivated to accomplish the task at hand.	

	2.	Dresses appropriately and uses language and manners suitable for the workplace.	
	3.	Maintains appropriate personal hygiene.	
	4.	Meets and maintains employment eligibility criteria (e.g., drug/alcohol-free status, clean driving record, etc.).	
	5.	Demonstrates honesty, integrity, and reliability.	
Tools and Equipment			
	1.	Identify tools and their usage in automotive applications.	
	2.	Identify standard and metric designation.	
	3.	Demonstrate safe handling and use of appropriate tools.	
	4.	Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	
	5.	Demonstrate proper use of precision measuring tools (e.g., micrometer, dial-indicator, dial-caliper).	
Preparing Vehicle for Service			
	1.	Identify information needed and the service requested on a repair order.	
	2.	Identify purpose and demonstrate proper use of fender covers, mats.	
	3.	Demonstrate use of the three Cs (concern, cause, and correction).	
	4.	Review vehicle service history.	
	5.	Complete work order to include customer information, vehicle-identifying information, customer concern, related service history, cause, and correction.	

Engine Repair			
A. General			
	1.	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).	P1
	2.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	3.	Verify operation of the instrument panel engine warning indicators.	P1
	4.	Inspect engine assembly for fuel, oil, coolant, and other leaks.	P1

	5.	Install engine covers using gaskets, seals, and sealers as required.	P2
	6.	Demonstrate understanding of the procedure for verifying engine mechanical timing.	P1
	7.	Inspect engine mounts.	P2
	8.	Identify service precautions related to service of the internal combustion engine of a hybrid electric vehicle.	P2
B. Cylinder Head and Valvetrain			
	1.	Identify cylinder head and valve train components and configurations.	P1
C. Engine Block Assembly			
	1.	Identify engine block assembly components and configurations.	P1
D. Lubrication and Cooling			
	1.	Identify lubrication and cooling system components and configurations	P1
	2.	Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required.	P1
	3.	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.	P1
	4.	Identify causes of engine overheating	P2
	5.	Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P1
	6.	Inspect and test coolant; drain and recover coolant; flush and/or refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.	P1
	7.	Identify type of water pumps (belt driven, chain driven, and electric).	P3
	8.	Remove, inspect, and replace thermostat and gasket/seal.	P1

Automatic Transmission and Transaxle			
A. General			
	1.	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).	P1
	2.	Identify automatic transmission and transaxle components and configurations.	P1

	3.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	4.	Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle equipped with a dipstick.	P1
	5.	Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle not equipped with a dipstick.	P3
	6.	Demonstrate knowledge of transmission/transaxle gear reduction/multiplication operation using driving, driven, and held member (power flow) principles.	P3
	7.	Demonstrate knowledge of hydraulic principles (Pascal's Law) in a transmission/transaxle.	P3
B. In-Vehicle			
	1.	Inspect external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.	P2
	2.	Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.	P1
	3.	Demonstrate understanding of relearn procedures.	P2
	4.	Inspect, replace and/or align power train mounts.	P3
C. Off-Vehicle			
	1.	Describe the operational characteristics of a continuously variable transmission (CVT).	P3
	2.	Describe the operational characteristics of a hybrid vehicle drivetrain.	P2

Manual Drivetrains and Axles			
A. General			
	1.	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).	P1
	2.	Identify manual drivetrain and axle components and configurations.	P1
	3.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	4.	Check fluid condition; check for leaks.	P2
	5.	Drain and refill manual transmission/transaxle; use proper fluid type per manufacturer specification.	P1

B. Clutch			
	1.	Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.	P3
C. Transmission/Transaxle			
	1.	Describe the operational characteristics of an electronically controlled manual transmission/transaxle.	P2
D. Driveshaft, Half Shaft, Universal Joints, and Constant-Velocity (CV) Joints (Front, Rear, All, and Four-Wheel Drive)			
	1.	Inspect and/or remove/replace bearings, hubs, and seals.	P2
	2.	Inspect and/or service/replace shafts, yokes, boots, and universal/CV joints.	P2
	3.	Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P3
E. Differential and Drive Axles			
	E. 1	Ring and Pinion Gears and Differential Housing Assembly	
	1.	Inspect differential housing; check for leaks; inspect housing vent.	P1
	2.	Check and adjust differential housing fluid level; use proper fluid type per manufacturer specification.	P1
	3.	Drain and refill differential housing; using proper fluid type per manufacturer specification.	P1
	E. 2	Drive Axles	
	1.	Inspect and replace drive axle wheel studs.	P2
F. Four-wheel Drive/All-wheel Drive			
	1.	Identify concerns related to variations in tire circumference and/or final drive ratios.	P3

Suspension/Steering Systems			
A. General			
	1.	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).	P1
	2.	Identify suspension and steering system components and configurations.	P1

	3.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	4.	Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P2
B. Steering Systems			
	1.	Inspect rack and pinion steering gear tie rod ends (sockets) and bellows boots.	P1
	2.	Inspect power steering fluid level and condition.	P2
	3.	Drain and replace power steering system fluid; use proper fluid type per manufacturer specification.	P2
	4.	Inspect for power steering fluid leakage.	P2
	5.	Remove, inspect, replace, and/or adjust power steering pump drive belt.	P2
	6.	Inspect, remove, and/or replace power steering hoses and fittings.	P2
	7.	Inspect pitman arm, relay (center link/intermediate) rod, idler arm, mountings, and steering linkage damper.	P2
	8.	Inspect tie rod ends (sockets), tie rod sleeves, and clamps (non-rack and pinion).	P2
	9.	Inspect electric power steering system.	P2
C. Suspension Systems			
	1.	Inspect upper and/or lower control arms, bushings, and shafts.	P2
	2.	Inspect and replace rebound/jounce bumpers.	P3
	3.	Inspect track bar, strut rods/radius arms, and related mounts and bushings.	P2
	4.	Inspect upper and/or lower ball joints (with or without wear indicators).	P2
	5.	Inspect suspension system coil springs and spring insulators.	P2
	6.	Inspect torsion bars and mounts.	P3
	7.	Inspect and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.	P2
	8.	Inspect, remove, and/or replace strut assembly, strut coil spring, insulators, and upper strut bearing mount.	P2
	9.	Inspect components of suspension systems (Coil, Leaf, and Torsion).	P1
	10	Inspect components of electronically controlled suspension systems.	P2

D. Related Suspension and Steering Service			
	1.	Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.	P2
	2.	Inspect front and rear wheel bearings.	P1
	3.	Describe the function of electronically controlled suspension and steering systems and components, (i.e., active suspension and stability control).	P2
E. Wheel Alignment			
	1.	Perform pre-alignment inspection; measure vehicle ride height.	P2
	2.	Describe four-wheel alignment angles (camber, caster, and toe) and effects on vehicle handling\tire wear.	P1
F. Wheels and Tires			
	1.	Inspect tire condition/age; identify tire wear patterns; check for correct tire size, application (service-class, load, and speed ratings), and air pressure as listed on the tire information placard/label.	P1
	2.	Rotate tires according to manufacturer's recommendations including vehicles equipped with tire pressure monitoring systems (TPMS).	P1
	3.	Dismount, inspect, and remount tire on wheel (with/without TPMS); balance wheel and tire assembly.	P1
	4.	Inspect tire and wheel assembly for air loss; determine needed action.	P1
	5.	Repair tire following tire manufacturer approved procedure.	P1
	6.	Identify indirect and TPMS; calibrate/relearn system; verify operation of instrument panel lamps.	P1
	7.	Demonstrate knowledge of steps required to remove and replace sensors (per OEM/sensor manufacturer) in a TPMS.	P1
	8.	Perform Road Force balance/match mounting.	P3

Brakes			
A. General			
	1.	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).	P1
	2.	Identify brake system components and configurations.	P1

	3.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	4.	Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system.	P1
	5.	Install wheel and torque lug nuts.	P1
B. Hydraulic System			
	1.	Demonstrate understanding of hydraulic principles (Pascal's law).	P1
	2.	Describe proper brake pedal height, travel, and feel.	P1
	3.	Check the master cylinder for proper operation.	P1
	4.	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports.	P1
	5.	Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P1
	6.	Identify components of hydraulic brake warning light system.	P3
	7.	Bleed and/or replace fluid in the brake system.	P1
	8.	Test brake fluid for contamination.	P2
C. Drum Brakes			
	1.	Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P2
	2.	Refinish brake drum and measure final drum diameter; compare with specification.	P3
	3.	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.	P3
	4.	Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P3
	5.	Preadjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	P3
D. Disc Brakes			
	1.	Remove and clean caliper assembly; inspect for leaks and damage, and wear.	P1
	2.	Inspect caliper mounting and slides/pins for proper operation, wear, and damage.	P1

	3.	Remove, inspect, and/or replace brake pads and retaining hardware.	P1
	4.	Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads against rotor; inspect for leaks.	P1
	5.	Clean and inspect rotor and mounting surface, measure rotor thickness, thickness variation, and lateral runout.	P1
	6.	Remove and reinstall/replace rotor.	P1
	7.	Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P3
	8.	Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P3
	9.	Retract and re-adjust caliper piston on an integrated parking brake system.	P2
	10	Describe the importance of operating vehicles to burnish/break-in replacement brake pads according to manufacturer's recommendation.	P2
E. Power-Assist Units			
	1.	Check brake pedal travel with and without engine running to verify proper power booster operation.	P2
	2.	Identify components of the brake power assist system (vacuum/hydraulic/electric).	P2
F. Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)			
	1.	Remove, clean, inspect, repack/replace, and install wheel bearings; remove and install bearing races; replace seals; install hub and adjust bearings.	P3
	2.	Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.	P2
	3.	Check parking brake operation (including electric parking brakes); check parking brake indicator light system operation.	P2
	4.	Check operation of brake stop light system.	P1
	5.	Inspect and replace wheel studs.	P2
G. Electronic Brake, Traction Control, and Stability Control Systems			
	1.	Identify electronic brake control system components and describe function (ABS, TCS, ESC).	P2
	2.	Describe the operation of a regenerative braking system.	P3

Basic Electrical/Electronic Systems	
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A. General			
	1.	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).	P1
	2.	Identify electrical/electronic system components and configurations.	P1
	3.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	4.	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P1
	5.	Demonstrate proper use of a digital multimeter when measuring source voltage, voltage drop (including grounds), current flow, and resistance.	P1
	6.	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P1
	7.	Describe types of test lights; use appropriate test light to check operation of electrical circuits per service information.	P2
	8.	Use fused jumper wires to check operation of electrical circuits per service information.	P2
	9.	Use wiring diagrams to trace electrical/electronic circuits.	P1
	10	Measure key-off battery drain (parasitic draw).	P2
	11	Inspect and test fusible links, circuit breakers, and fuses.	P1
	12	Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair).	P2
B. Batteries (Conventional 12-volt)			
	1.	Perform battery state-of-charge test; determine needed action.	P1
	2.	Confirm proper battery capacity, size, type, and application for vehicle; perform battery capacity and load test.	P1
	3.	Maintain or restore electronic memory functions as recommended by the manufacturer.	P2
	4.	Inspect and clean battery; fill battery cells (if applicable); check battery cables, connectors, clamps, and hold-downs.	P1
	5.	Perform battery charging according to manufacturer's recommendations.	P1

	6.	Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P1
	7.	Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery.	P2
C. Starting System			
	1.	Perform starter current draw test.	P1
	2.	Perform starter circuit voltage drop tests.	P1
	3.	Inspect and test starter relays and solenoids.	P2
	4.	Remove and install starter in a vehicle.	P3
	5.	Inspect and test switches, connectors, and wires of starter control circuits.	P2
	6.	Demonstrate knowledge of an automatic idle-stop/start-stop system.	P2
D. Charging System			
	1.	Perform charging system output test.	P1
	2.	Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P1
	3.	Remove, inspect, and/or replace generator (alternator).	P3
	4.	Perform charging circuit voltage drop tests.	P2
E. Lighting Systems			
	1.	Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (e.g., fog lights, driving lights). Replace as needed.	P1
	2.	Aim headlights.	P2
F. Instrument Cluster and Driver Information Systems			
	1.	Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators as required.	P1
G. Body Electrical Systems			
	1.	Demonstrate understanding of vehicle comfort, convenience, access, safety, and related systems operation.	P3
	2.	Remove and reinstall the door panel.	P2
	3.	Describe the operation of keyless entry/remote-start systems.	P3
	4.	Describe disabling and enabling procedures for SRS. Verify indicator lamp operation.	P2

	5.	Verify windshield wiper and washer operation; replace wiper blades.	P1
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HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)			
A. General			
	1.	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).	P1
	2.	Identify HVAC components and configuration.	P1
	3.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	4.	Identify steps of an A/C performance test.	P2
	5.	Identify abnormal operating noises in the A/C system.	P3
	6.	Visually inspect the A/C system for signs of leaks.	P1
	7.	Identify and interpret heating and air conditioning problems.	P1
B. Refrigeration System Components			
	1.	Inspect and/or replace A/C compressor drive belts, pulleys, and tensioners.	P1
	2.	Inspect for proper A/C condenser airflow.	P2
	3.	Inspect evaporator housing condensation drain.	P1
C. Heating, Ventilation, and Engine Cooling Systems			
	1.	Inspect engine cooling and heater systems hoses and pipes.	P1
D. Operating Systems and Related Controls			
	1.	Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets.	P1
	2.	Identify the source of HVAC system odors.	P2
E. Refrigerant Recovery, Recycling, and Handling			
	1.	Demonstrate awareness of the need to recover, recycle, and handle refrigerants using proper equipment and procedures.	P1

ENGINE PERFORMANCE			
A. General			
	1.	Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. 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).	P1
	2.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	3.	Perform cylinder power balance test; document results.	P1
	4.	Perform cylinder cranking and running compression test; document results.	P1
B. Computerized Controls			
	1.	Identify computerized control system components and configurations.	P1
C. Ignition System			
	1.	Identify ignition system components and configurations.	P1
	2.	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P2
D. Fuel, Air Induction, and Exhaust Systems			
	1.	Identify fuel, air induction, and exhaust system components and configurations.	P1
	2.	Replace fuel filter(s) where applicable.	P2
	3.	Inspect, service, or replace air filters, filter housings, and intake duct work.	P1
	4.	Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields.	P1
	5.	Inspect condition of exhaust system hangers, brackets, clamps, and heat shields.	P1
	6.	Check and refill diesel exhaust fluid.	P3
E. Emissions Control Systems			
	1.	Identify emission control system components and configurations.	P1
	2.	Inspect, test, and service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses.	P2

Appendix A: Industry Standards

AUTOMOTIVE SERVICE TECHNICIAN PATHWAY CONTENT STANDARDS AND PERFORMANCE ELEMENTS

	Standard	A0 Shop Operations	A1 Engine Repair	A2 Automatic Transmission Transaxle	A3 Manual Drive Train & Axles	A4 Suspension and Steering	A5 Service Brakes	A6 Electrical/ Electronics	A7 Heating and Cooling	A8 Engine Performance
Unit										
1		X								
2		X								
3		X								
4		X								
5		X								
6			X							
7						X				
8			X							
9			X							
10			X							
11			X							
12							X			
13							X			
14							X			
15							X			
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19								X		
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33							X			
34				X						
35				X						
36				X						
37					X					
38					X					
39					X					
40					X					

A0 - Automotive Shop Operations

- Shop and Personal Safety
- Tools and Equipment
- Preparing Vehicle for Service
- Preparing Vehicle for Customer

A1 - Automotive Engine Repair

- 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.
- General
- Cylinder Head and Valve Train
- Lubrication and Cooling Systems

A2 - Automatic Transmission/Transaxle

- 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.
- General
- Automatic Transmission/Transaxle
 - General
 - In-Vehicle Transmission/Transaxle
 - Off-Vehicle Transmission and Transaxle

A3 - Manual Drivetrain and Axles

- General
- Clutch
- Transmission/Transaxle
- Driveshaft, Half Shafts, Universal and Constant-Velocity (CV) Joints
- Differential Case Assembly
- Drive Axles
- Four-wheel Drive/All-wheel Drive

A4 - Automotive Suspension/Steering

- 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. General Suspension and Steering Systems Diagnosis
- General
- Steering Systems Diagnosis and Repair
- Suspension Systems Diagnosis and Repair
- Related Suspension and Steering Service
- Wheel Alignment Diagnosis, Adjustment, and Repair
- Wheels and Tires Diagnosis and Repair

A5 - Automotive Service Brakes

- 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.

- General Brake Systems Diagnosis
- Hydraulic System Diagnosis and Repair
- Drum Brake Diagnosis and Repair
- Disc Brake Diagnosis and Repair
- Power-Assist Units Diagnosis and Repair
- Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.)
- Electronic Brakes, and Traction and Stability Control Systems Diagnosis and Repair

A6 - Automotive Service Electrical/Electronics

- 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.
- General: Electric System Diagnosis
- Battery Diagnosis and Service
- Starting System Diagnosis and Repair
- Charging System Diagnosis and Repair
- Lighting Systems Diagnosis and Repair
- Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair
- Horn and Wiper/Washer Diagnosis and Repair
- Accessories Diagnosis and Repair

A7 - Automotive Heating and Air Conditioning

- 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.
- General: A/C System Diagnosis and Repair
- Refrigeration System Component Diagnosis and Repair
- Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair
- Operating Systems and Related Controls Diagnosis and Repair
- Refrigerant Recovery, Recycling, and Handling

A8 - Automotive Engine Performance

- 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.
- General: Engine Diagnosis
- Computerized Engine Controls Diagnosis and Repair
- Ignition System Diagnosis and Repair
- Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair
- Emissions Control Systems Diagnosis and Repair