Burlington County Institute of Technology

Medford Campus

Westampton Campus

Career and Technical Programs

Career Cluster: *Transportation, Distribution, and Logistics*
Program Name: *Automobile/Automotive Mechanics Technology/Technician*
Program Title: *Automotive Technology*
CIP Code: *470604*

Board Approval Date: August, 2025

Program of Study

- Grade 9
  - Foundations and Safety
  - Introduction to Automotive Technology
- Grade 10
  - Engine Repair
  - Brakes
  - Manual Drive Trains and Axles/Heating Ventilation and air conditioning
- Grade 11
  - Steering and Suspension/Automatic Transmissions/Transaxles
  - Electrical
  - Engine Performance
- Grade 12
  - Advanced Vehicle Electronics
  - Engine Management Systems
  - Light Duty Diesel
  - Hybrid And Electric Vehicle Technology

➔ Program Descriptor

- This program consists of twelve courses of study. The initial courses are General in nature. . They are primarily designed to be basic in nature and familiarize students with safe work practice, tool introduction, and what would be expected in a working environment. There are extensive hands-on and theory situations in each module. It is assumed that after reasonable competency in the above disciplines, the student can move on to Engine, Brakes, Drive Train, Emission Control Repair, Electrical Repair, and Transaxles and Differentials Repair. These are more specialized areas and therefore are more difficult. The proper attitudes towards safety and tool usage should have already been established; therefore the class can proceed to this next level. There are many hands-on activities and considerable theory work in these specialized areas. This program follows the Automotive Service Education Foundation (ASE) certification standards. Upon completion of this program students have the opportunity to become ASE Student certified.

➔ Program Outcome

- The automotive technology program has several articulation agreements with prestigious automotive post secondary programs. The successful graduate can use some of their credits with advanced placement to many of these schools to further their education in this field. A graduate of this program can also elect to enter the job market in various entry positions. Upon successful completion the student will earn their Student ASE certification. They can also earn certificates from Valvoline and other vendors as they complete many online training programs.

➔ Work Based Learning Opportunities

- *School-Based Enterprise:* Students will work on vehicles in the shop. Repairs could include the following, Oil Service, Brake service, tires, batteries, starters, alternator, basic electrical, and fuel supply.
- *Hazardous Career Preparation:* Students will work for a variety of companies, such as Holman, Burlington Chevrolet, and Miller Ford as entry level technicians responsible for all aspects of vehicle repair and maintenance.

➔ Industry Valued Credentials

- ASE: Automotive Service Excellence
  - Automobile Technician
  - Mobile Air Climate Systems Certification (MACS)

- OSHA 10

Course Descriptions

1. Grade 9
    a. *Safety foundation and introductions to automotive technology:* This course is designed for the beginning student and covers the use of special automotive tools, shop manuals, and procedures.

Instruction is given on service of vehicle servicing with compliance of vehicle requirements. Students will learn preventative maintenance techniques, pre-delivery inspection techniques. Precision measurements will be introduced and the math required to perform these tasks. Prepares students to take the MLR ASE

2. Grade 10
    a. *Engine Technology:* This course is designed to provide a learning environment to students interested in general engine repair. The student will have the opportunity to become familiar with automotive terminology and experience hands-on diagnostics and repair procedures in a shop/lab situation. This will include compression, valve train, engine timing and cooling system diagnosis. Safety procedures will be emphasized.Prepares students to take the A1 ASE (Automotive Service Excellence) test.
    b. *Brake System Technology* This class will provide students with a basic knowledge of automotive brake systems. Students will be able to describe the basic operation of the automotive brake system and be able to do drum and disc brake overhauls. They will also be familiar with machine brake drums and rotors, the automotive hydraulic system, power brake system operations, ABS systems and Traction Controls and Stability controls. Prepares students to take the A5 ASE (Automotive Service Excellence) test.
    c. *DriveTrain and Axle Technology Heating Air Conditioning Technology :* This course is designed to provide a learning environment to students interested in transaxle and rear differential repair. This will include manual transmission diagnosis. The student will have the opportunity to become familiar with automotive terminology, trade-related computer software, and experience hands-on diagnostics and repair procedures in a shop/lab situation. Safety procedures will be emphasized. Prepares students to take the A3 ASE (Automotive Service Excellence) test. This course also covers the modern automotive air conditioning systems. The operation, diagnosis and repair of the system will be covered. This will include identification of freons. Recycling, Evacuating and Recharging. The parts and nomenclature will be discussed. Types of refrigerant and their effects on the environment will also be emphasized. Heating system diagnosis and repair will also be covered. Prepares students to take the A7 ASE (Automotive Service Excellence) test.
    d.

3. Grade 11

a. *Automotive Steering and Suspension* This module provides detailed instruction in the function and operation of the tires, wheel bearings, chassis, steering, and suspension systems in rear wheel drive, front wheel drive, two and four wheel drive vehicles, steering systems, suspension systems, rack and pinion systems, and Macpherson struts. Requirements will also include two wheel and four wheel alignments Prepares students to take the A ASE (Automotive Service Excellence) test.
b. *Automotive Automatic Transmissions* This module covers the automatic transmission systems used in the modern automobile and light truck. This module will cover the theory, diagnosis and servicing of domestic and imported automatic. This will include serving the transmission fluids, transmission flushing and filter replacement. Pressure testing will be discussed. Prepares students to take the A2 ASE (Automotive Service Excellence) test.
c. *Electrical* This class covers the electrical system which is a basic system of the automobile. This will cover volts, amps, ohms, DVOM skills. Students will diagnose basic electrical circuits, wiring schematics and testing of circuits and components. Prepares students to take the A6 ASE (Automotive Service Excellence) test.
d. *Engine Performance* This module covers the engine performance systems of the modern automobile, light duty truck and SUV. This module will include basic engine mechanical diagnosis, engine ignition principles and fuel systems. Fuel systems will include testing of fuel pumps and fuel delivery systems. The theory, parts nomenclature and related systems will be discussed. The use of scan tools and other diagnostic equipment will be emphasized. Prepares students to take the A8 ASE (Automotive Service Excellence) test.

4. Grade 12
    a. *Advanced Vehicle Electronics*: This class covers the electrical system which is a basic system of the automobile. This will cover volts, amps, ohms, DVOM skills. Students will diagnose advanced electrical circuits, wiring schematics and testing of circuits and components. Prepares students to take the A6 ASE (Automotive Service Excellence) test.
    b. *Engine Management Systems:* This course covers the engine performance systems of the modern automobile, light duty truck and SUV. This module will include basic engine mechanical diagnosis, engine ignition principles and fuel systems. Fuel systems will include testing of fuel pumps and fuel

delivery systems. The theory, parts nomenclature and related systems will be discussed. The use of scan tools and other diagnostic equipment will be emphasized. Prepares students to take the A8 ASE (Automotive Service Excellence) test.

c. *Light Duty Diesel:*This course is designed to provide a learning environment to students interested in general diesel engine repair. The student will have the opportunity to become familiar with automotive terminology and experience hands-on diagnostics and repair procedures in a shop/lab situation. This will include compression, valve train, engine timing and cooling system diagnosis. Safety procedures will be emphasized.Prepares students to take the A9 ASE (Automotive Service Excellence) test.
d. *Hybrid And Electric Vehicle Technology:* Introduces the theory, operation, diagnosis, service and repair of Hybrid and Electric vehicles. Prepares students to take the L3 ASE (Automotive Service Excellence) test.

Curriculum Maps

Course: CTE	Unit: Career Awareness	Length: Woven Throughout
Standards		

- 9.2.12.CAP.1: Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.

- 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
- 9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
- 9.2.12.CAP.5: Assess and modify a personal plan to support current interests and postsecondary plans. ·
- 9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.
- 9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.
- 9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
- 9.2.12.CAP.9: Locate information on working papers, what is required to obtain them, and who must sign them.
- 9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans)
- 9.2.12.CAP.11: Demonstrate an understanding of Free Application for Federal Student Aid (FAFSA) requirements to apply for postsecondary education
- 9.2.12.CAP.12: Explain how compulsory government programs (e.g., Social Security, Medicare) provide insurance against some loss of income and benefits to eligible recipients.
- 9.2.12.CAP.13: Analyze how the economic, social, and political conditions of a time period can affect the labor market.
- 9.2.12.CAP.14: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income
- 9.2.12.CAP.15: Demonstrate how exemptions, deductions, and deferred income (e.g., retirement or medical) can reduce taxable income.

- 9.2.12.CAP.16: Explain why taxes are withheld from income and the relationship of federal, state, and local taxes (e.g., property, income, excise, and sales) and how the money collected is used by local, county, state, and federal governments. ·
- 9.2.12.CAP.17: Analyze the impact of the collective bargaining process on benefits, income, and fair labor practice. ·
- 9.2.12.CAP.18: Differentiate between taxable and nontaxable income from various forms of employment (e.g., cash business, tips, tax filing and withholding). ·
- 9.2.12.CAP.19: Explain the purpose of payroll deductions and why fees for various benefits (e.g., medical benefits) are taken out of pay, including the cost of employee benefits to employers and self-employment income.
- 9.2.12.CAP.20: Analyze a Federal and State Income Tax Return
- 9.2.12.CAP.21: Explain low-cost and low-risk ways to start a business.
- 9.2.12.CAP.22: Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.
- 9.2.12.CAP.23: Identify different ways to obtain capital for starting a business

Essential Question(s)

- How does one prepare for a career?
- How does one improve marketability?
- Why is career planning important?
- What are the risks in starting a business?

Content

- There are strategies to improve one's professional value and marketability.
- Career planning requires purposeful planning based on research, self-knowledge, and informed choices.
- An individual's income and benefit needs and financial plan can change over time.
- Securing an income involve an understanding of the costs and time in preparing for a career field, interview and negotiation skills, job searches, resume development, prior experience, and vesting and retirement plans

- Understanding income involves an analysis of payroll taxes, deductions and earned benefits.
- There are ways to assess a business's feasibility and risk and to align it with an individual's financial goals

Skills

- Act as a responsible and contributing community member and employee.
- Attend to financial well-being.
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity, increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

Assessments

- Career Research Project
- Resume/Cover Letter

Course: Foundations and Safety Length: 1 Semester

Standards

- 9.3.12.TD-HSE.1 Describe the health,safety and environmental rules and regulations in transportation, distribution and logistics workplaces.

- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.
- • 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8). •
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

Essential Question(s)

- Why is it important to review the SOS before cleaning up a spill?
- What are the benefits of Automotive Service Excellence (ASE) certification for a technician and shop?
- What are the benefits of the unibody design?
- What are some of the health hazards associated with coming into frequent or prolonged contact with used engine oil?
- Why must safety glasses be worn at all times in the shop? For what types of tasks should a full-face
- shield be worn?
- What are the steps you need to take before returning the vehicle to the customer?
- How can the vehicle's date of manufacture be different from the vehicle's model year?
- How are Torx bits different from Allen wrenches?
- How do you check a micrometer for accuracy (zero)?
- What are the precautions when charging batteries and jump-starting vehicles?
- What processes can be tried on bolts that are stuck
- before they are broken off?

Content

- Auto shop layout Shop safety
- Types of accidents
- General safety rules
- Right to know laws
- Tool Rules
- Tool Storage
- Wrenches
- Screw Drivers
- Pliers
- Hammers
- Chisels and punches
- Files
- Saws
- Holding tools
- Cleaning tools
- Probe and pick up tools
- Cutting tools
- Prybars Insulated tools
- Compressed Air System
- Air Tools Electric Tools
- Hydraulic Tools
- Shop Equipment
- Fasteners Washers
- Machine screws
- Sheet metal screws
- Non-Threaded Fasteners

- Torquing nuts and bolts
- Lubrication Vehicle Maintenance
- Fluid Service Filter Service
- Chassis Lubrication
- Checking tires Service Intervals
- General Inspection and Problem
- Thread Repairs
- Removing damaged fasteners
- Gaskets and Sealers
- Service Manuals
- Using Service Manuals
- Service Publications
- Technical Assistance Hot lines
- Computer-Based Service
- Data Work Orders

Skills

- Identify general shop safety rules and procedures.
- Utilize safe procedures for handling of tools and equipment.
- Identify and use proper placement of floor jacks and jack stands.
- Identify and use proper procedures for safe lift operation
- Utilize proper ventilation.
- Identify marked safety areas.
- 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.
- Identify the location and use of eye wash stations.
- Identify the location of the posted evacuation routes.
- Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
- Identify and wear appropriate clothing for lab/shop activities.

- Secure hair and jewelry for lab/shop activities.
- Identify vehicle systems which pose a safety hazard during service such as: supplemental restraint systems (SRS), electronic brake control systems, stop/start systems, and remote start systems.
- Identify vehicle systems which pose a safety hazard during service due to high voltage such as: hybrid/electric drivetrain, lighting systems, ignition systems, A/C systems, injection systems, etc.
- Locate and demonstrate knowledge of safety data sheets (SDS).
- Identify tools and their usage in automotive applications.
- Identify standard and metric designation.
- Demonstrate safe handling and use of appropriate tools.
- Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
- Demonstrate proper use of precision measuring tools (e.g., micrometer, dial-indicator, dial-caliper).
- Perform common fastener and thread repair, including removing broken bolts, restoring internal and external threads, and repairing internal threads with a thread insert.
- Identify information needed and the service requested on a repair order.
- Identify purpose and demonstrate proper use of vehicle protection such as: fender covers, mats, seat, and steering wheel covers.
- Perform a vehicle walk-around inspection; identify and document existing vehicle conditions such as body damage, paint damage, windshield damage.
- Perform a vehicle multi-point inspection and complete a vehicle inspection report.
- Demonstrate use of the three C's (concern, cause, and correction).
- Create a plan of action for each specific service or diagnostic situation.
- Review vehicle service history.
- Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
- Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).

Assessments

- Several quizzes weekly written and proficiency
- Written and proficiency Test
- Written and proficiency rubrics
- Observation and verbal quizzes
- Workbook and note taking
- ASE Education Foundation Task Sheets

Course: Introduction to Automotive Technology	Length: 1 Semester

Standards

- 9.3.12.TD-HSE.1 Describe the health,safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.
- • 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8). •

- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.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).
- Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action.
- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.

Essential Question(s)

- How should warning lights react when you start the engine?
- Why should Service manuals be consulted before beginning repairs.
- When repairing an electrical problem, a tech should record the VIN before proceeding.
- What is the reason for writing a proper repair order?
- What does the VIN tell you about the car?
- How would you find the valve lash specifications needed to adjust the valve?
- How often should a lubrication be performed?
- Checking the air in the tires can save fuel mileage?
- Is it proper procedure to discard oil filters immediately after removing them?
- How often should tires be rotated and where would you locate this information?
- Why should front wheel bearings be cleaned, inspected and repacked?
- After a vehicle has been parked for several hours the battery goes dead.What are the types of tests needed?
- Do some Hybrid vehicles operate on high voltage AC current supplied by the battery?

Content

- Lubrication Vehicle Maintenance
- Fluid Service

- Filter Service
- Chassis Lubrication
- Checking tires
- Service Intervals
- General Inspection and Problem

Skills

- Perform in-vehicle inspection.
- Perform fluid inspection.
- Perform belt, hose, and air filter/cabin air filter inspection.
- Perform under-vehicle inspection.
- Perform exterior vehicle inspection.
- Describe heat engines and their operation.
- Explain the physics of engine operation.
- Explain force, work, and power.
- Describe four-stroke engine arrangement, operation, and measurement.
- Describe the purpose and function of spark ignition engine components.
- Explain two-stroke and rotary engine operation.
- Explain the functions of lubricating oil.
- Describe the common types of oil and their additives.
- Identify and describe lubrication system components.
- Identify oil-certifying bodies and their rating standards.
- Describe the operation of oil indicators and warning systems.
- Identify and describe the types of lubrication systems.
- Explain the methods of heat transfer and the principles of engine cooling.
- Describe engine coolant and its required properties.
- Explain how coolant flows in engines.
- Describe the radiator and its associated components.
- Explain the operation of the thermostat and water pump.

- Describe the types and operation of cooling fans.
- Describe the types and function of hoses, belts, and tensioners.
- Describe miscellaneous cooling system components.
- Describe the functions and types of automatic
- transmissions.
- Describe torque converter construction and operation.
- Describe gear train operation.
- Describe methods of holding/driving gears.
- Describe automatic transmission components.

Assessments

- Several quizzes weekly written and proficiency
- Written and proficiency Test
- Written and proficiency rubrics
- Observation and verbal quizzes
- Workbook and note taking
- ASE Education Foundation Task Sheets

Course: Engine Repair	Length: 1 Semester

Standards

- 9.3.12.TD-HSE.1 Describe the health,safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.
- • 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8). •
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
- 9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).

Essential Question(s)

- List the types of engine classifications
- What is the piston location at the beginning of the intake stroke?
- How does the combustion chamber affect the way the fuel and mix together?
- How does an intake manifold change combustion?
- How does an engine use heat energy to produce motion?
- What would be the best way to determine which camshaft is the intake camshaft?

Content

- Engine Bottom End
- Engine Top End
- Engine Front End
- Engine Classification
- Cylinder Arrangement
- Alternative Engines
- Cylinder head
- construction
- Valve Train
- Construction
- Intake Manifold
- Construction
- Exhaust Manifold
- Construction
- Cylinder Block
- Construction
- Piston Construction
- Piston Ring
- Construction
- Piston Pin
- Construction
- Connecting Rod
- Construction
- Crankshaft
- Construction
- Engine Bearing
- Construction

- Rear Main Bearing Oil
- Seal Construction
- Balancer Shafts
- Vibration Damper
- Construction
- Camshaft Drives

Skills

- Identify cylinder head and valve train components and configurations.
- Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure.
- Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.
- Inspect valve actuating mechanisms for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.
- Adjust valves (mechanical or hydraulic lifters).
- Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing.
- Identify engine block assembly components and configurations.
- Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).
- Identify lubrication and cooling system components and configurations.
- Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required.
- Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs; determine needed action.
- Identify causes of engine overheating.
- Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.

- 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.
- Inspect, remove, and replace the water pump.
- Remove, inspect, and replace the thermostat and gasket/seal.
- Remove and replace the radiator.

Assessments

- Several quizzes weekly written and proficiency
- Written and proficiency Test
- Written and proficiency rubrics
- Observation and verbal quizzes
- Workbook and note taking
- ASE Education Foundation Task Sheets

Course: Brakes	Length: 1 Semester

Standards

- 9.3.12.TD-HSE.1 Describe the health,safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.
- • 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8). •
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
- 9.4.5.TL.1: Compare the common uses of at least two different digital tools and identify the advantages and disadvantages of using each.

Essential Question(s)

- Describe the four major parts of a disc brake assembly.
- What are the four functions of a master cylinder?
- Why is a dual master cylinder used?
- What causes a brake caliper piston to retract away from the disc after brake application?
- What is the purpose of a combination valve?
- How does a hydro-boost power brake system operate?
- A spongy brake pedal is normally caused by?

- A wheel cylinder rebuild normally involves?
- How is Pressure bleeding a brake system done by using a pressure bleeder tank?
- When you find the fluid level in the master cylinder is low, you should inspect it ?
- What happens when a tire skids or slides during hard braking?
- After completing repair on a stability control system, what should you do?
- How can a scan tool assist a tech while repairing an ABS System?
-

Content

- Basic Brake System
- Braking Ratio
- Brake Hydraulic
- Components
- Brake System Components
- Parking Brakes
- Brake System
- Problem Diagnosis
- Brake System Inspection
- Vacuum Booster Service
- Hydraulic Booster Service
- Master Cylinder
- Service
- Brake Line and Hoses
- Disc Brake Service
- Drum Brake Service
- Parking Brake Adjustment

- Anti Lock Brake Systems (ABS)
- Traction and Stability
- Control Systems (TSC)
- ABS Service
- TSC Service
- Final System Check

Skills

- 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).
- Identify brake system components and configurations.
- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
- Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).
- Install wheel and torque lug nuts.
- Identify and interpret brake system concerns; determine needed action.
- Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).
- Measure brake pedal height, travel, and free play (as applicable); determine needed action.
- Check the master cylinder for internal/external leaks and proper operation; determine needed action.
- Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports; determine needed action.
- Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.
- Identify components of hydraulic brake warning light systems.
- Bleed and/or replace fluid in the brake system.
- Test brake fluid for contamination.
- Remove, bench bleed, and reinstall the master cylinder.

- Diagnose poor stopping, pulling, or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.
- Replace brake lines, hoses, fittings, and supports.
- Fabricate brake lines using proper material and flaring procedures.
- Inspect, test, and/or replace components of brake warning light system.
- Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.
- Refinish brake drum and measure final drum diameter; compare with specification.
- 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.
- Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.
- Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.
- Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pedal pulsation concerns; determine needed action.
- Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action.
- Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action
- Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action.
- Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads against rotor; inspect for leaks.
- Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.
- Remove and reinstall/replace rotor.
- Refinish rotor on vehicle; measure final rotor thickness and compare with specification.
- Refinish rotor off vehicle; measure final rotor thickness and compare with specification.
- Retract and re-adjust caliper piston on an integrated parking brake system.
- Describe the importance of operating vehicles to burnish/break-in replacement brake pads according to manufacturer’s recommendation.
- Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.

- Check brake pedal travel with and without engine running to verify proper power booster operation.
- Identify components of the brake power assist system (vacuum/ hydraulic/electric).
- Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster; determine needed action.
- Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine needed action.
- Remove, clean, inspect, repack/replace, and install wheel bearings; remove and install bearing races; replace seals; install hub and adjust bearings.
- Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.
- Check parking brake operation (including electric parking brakes); check parking brake indicator light system operation; determine needed action.
- Check operation of brake stop light system.
- Inspect and replace wheel studs.
- Remove, reinstall, and/or replace sealed wheel bearing assembly.
- Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action.
- Identify and inspect electronic brake control system components and describe function (ABS, TCS, ESC); determine needed action.
- Describe the operation of a regenerative braking system.
- Bleed the electronic brake control system hydraulic circuits.

Assessments

- Several quizzes weekly written and proficiency
- Written and proficiency Test
- Written and proficiency rubrics
- Observation and verbal quizzes
- Workbook and note taking
- ASE Education Foundation Task Sheets

Course: Manual Drive Trains and Axles/Heating Ventilation and air conditioning Length: 1 Semester

Standards

- 9.3.12.TD-HSE.1 Describe the health,safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.
- • 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8). •
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
- 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).

Essential Question(s)

- Too much clutch pedal free play can cause the clutch to?
- Can too little clutch pedal free play can cause the clutch to slip?
- A clutch engages close to the floor and will often not disengage. What is the most likely cause?
- Why should a flywheel be resurfaced whenever the clutch friction disc and pressure plate are replaced?
- What could cause a manual transmission to be difficult to shift into all gears but only when the outside temperature is below freezing (32°F or 0°C).
- What is the brass blocking ring used for in the transmission?
- A manual transaxle is noisy in all gears. Which is the most likely cause?
- What is the potential danger of spinning a bearing with compressed air?
- What major problem is a differential designed to prevent?
- What are the differences between a hunting gearset and a non hunting gear set?
- How does the pinion gear transfer power from the ring gear to the axle?
- Describe the basic refrigeration cycle.
- Explain Automatic temperature control systems using temperature sensors and a control module.
- What is the difference between an expansion valve and an orifice tube?
- List and explain the different types of freon used in the automotive industry.
- How does the heating system operate?
- How is the blower motor involved in both the AC system and the heating?
- How does the blower speed vary?
- How is discharging freon into the atmosphere harmful?
- Why should freon being removed from a vehicle be identified before recovery?

Content

- Clutch Principles
- Clutch Construction
- Diagnosis Clutch Problems

- Automatic Manual Clutch
- Hybrid Vehicle Clutch
- Servicing Clutch
- Automated Manual
- Clutch Service
- Basis Transmission
- Parts
- Purpose of the
- Manual Transmission
- Gear Fundamentals
- Manual Transmission Construction
- Manual Transmission Types
- Manual Transmission Power Flow
- Speedometer Drive
- Manual Transmission Actuators
- Manual Transmission Sensors and Switches
- Manual Transmission Problem Diagnosis
- Manual Transmission Problems
- Transmission Identification
- Manual Transmission Service
- Adjusting Transmission Linkage
- Basic Rear Drive Axle Assembly
- Differential Construction
- Differential Action
- Limited Slip
- Differentials

- Rear Drive Axles
- Rear Axle Problem Diagnosis
- Differential Maintenance
- Rear Axle Service
- Differential Service
- Principles of Refrigeration
- Basic Refrigeration Cycle
- Automotive Air Conditioning System
- Air Conditioning System Controls
- Service Valves
- Heating Systems
- Heating and Air Conditioning Controls
- Ducts and Vents
- Passenger Compartment Filters
- Solar Ventilation
- Inspecting an Air Conditioning System
- Refrigerant Safety Precautions
- R-134A Service DIfferences
- R1234Y Differences
- Testing an Air Conditioning System
- Recovering Refrigerant
- Common A/C Component Problems
- Evacuating an Air Conditioning System
- Charging and Air Conditioning System
- Heater Service
- Electronic Climate Control Service

Skills

- 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).
- Identify manual drivetrain and axles components and configurations.
- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
- Check fluid condition; check for leaks; determine needed action.
- Drain and refill manual transmission/transaxle; use proper fluid type per manufacturer specification.
- Diagnose drivetrain concerns; determine needed action.
- Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.
- Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action.
- Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; determine needed action.
- Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable).
- Bleed clutch hydraulic system.
- Inspect flywheel and ring gear for wear and cracks, and discoloration; determine needed action.
- Measure flywheel runout and crankshaft end play; determine needed action.
- Describe the operation and service of a system that uses a dual mass flywheel.
- Describe the operational characteristics of an electronically controlled manual transmission/transaxle.
- Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers.
- Inspect and/or remove/replace bearings, hubs, and seals.
- Inspect and/or service/replace shafts, yokes, boots, and universal/CV joints.
- Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.
- Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action.
- Diagnose universal joint noise and vibration concerns; determine needed action.

- Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles; determine needed action.
- Inspect differential housing; check for leaks; inspect housing vent.
- Check and adjust differential housing fluid level; use proper fluid type per manufacturer specification.
- Drain and refill differential housing; using proper fluid type per manufacturer specification.
- Inspect and replace companion flange and/or pinion seal; measure companion flange runout.
- Demonstrate knowledge of drive pinion and ring gear service and set up including depth, preload, backlash and gear tooth contact.
- Inspect and replace drive axle wheel studs.
- Remove and replace drive axle shafts.
- Inspect and replace drive axle shaft seals, bearings, and retainers.
- Measure drive axle flange runout and shaft end play; determine needed action.
- Identify concerns related to variations in tire circumference and/or final drive ratios.
- Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.
- Inspect axle locking mechanisms; determine needed action(s).
- Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.
- 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).
- Identify heating, ventilation, and air conditioning (HVAC) components and configurations.
- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed
- Perform A/C system performance test; interpret results; determine needed action
- Identify abnormal operating noises in the A/C system; determine needed action.
- Leak test A/C system; determine needed action.
- Identify and interpret heating and air conditioning problems; determine needed action.
- Identify refrigerant type; test for sealant; select and connect proper gauge set/test equipment; record temperature and pressure readings.

- Inspect condition/quantity of refrigerant oil removed from A/C system; determine needed action.
- Determine recommended oil and oil capacity for system application and component(s) replacement.
- Inspect, remove, and/or replace A/C compressor drive belts, pulleys, and tensioners; determine needed action.
- Inspect for proper A/C condenser airflow; determine needed action.
- Inspect evaporator housing condensation drain; determine needed action.
- Inspect, test, and/or service A/C compressor clutch components and/or assembly; determine needed action.
- Remove, inspect, and reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity.
- Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; determine needed action.
- Remove, inspect, and reinstall replace receiver/drier or accumulator/drier; determine recommended oil type and quantity.
- Remove, inspect, and install expansion valve or orifice (expansion) tube.
- Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action.
- Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.
- Remove, inspect, reinstall, and/or replace condenser; determine required oil type and quantity.
- Inspect engine cooling and heater systems hoses and pipes; determine needed action.
- Inspect and test heater control valve(s); determine needed action.
- Diagnose temperature control problems in the HVAC system related to the engine cooling system, including electric heating; determine needed action.
- Determine procedure to remove, inspect, reinstall, and/or replace heater core; properly refill system
- Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; determine needed action.
- Identify the source of HVAC system odors.
- Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.
- Diagnose A/C compressor control systems; determine needed action.

- Diagnose malfunctions in the vacuum, mechanical, and/or electrical components and controls of the HVAC system; determine needed action.
- Inspect, test, remove and/or replace HVAC system control panel; determine needed action
- Check operation of automatic HVAC control systems; determine needed action.
- Demonstrate awareness of the need to recover, recycle, and handle refrigerants using proper equipment and procedures.
- Use and maintain refrigerant handling equipment according to equipment manufacturer's standards.
- Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.
- Recycle, label, and store refrigerant.

Assessments

- Several quizzes weekly written and proficiency
- Written and proficiency Test
- Written and proficiency rubrics
- Observation and verbal quizzes
- Workbook and note taking
- ASE Education Foundation Task Sheets

Course: Steering and Suspension/Automatic Transmissions/Transaxles

Length: 1 Semester

Standards

- 9.3.12.TD-HSE.1 Describe the health,safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.
- • 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8). •
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).

Essential Question(s)

- What is the main purpose of a suspension?
- Explain oversteer.
- Explain understeer.

- How does a SLA suspension function?
- Can a vehicle height be adjusted on a torsion bar suspension?
- What is the location of the spring on a MacPherson Suspension?
- What is a suspension leveling system and how does it work?
- What is the purpose of a shock absorber and how does it operate?
- Explain how by inspecting the vehicle, a tech can see if there are signs of needing an alignment?
- Explain the operating principles of steering systems.
- What are the differences between a linkage steering and a rack-and-pinion steering system?
- Identify the major parts of a steering system.
- List and explain the six major parts of a linkage-type steering system.?
- List and explain the four major parts of a manual rack-and-pinion steering system.
- Define the term "gearbox ratio."
- Define the term "tracking."
- What is caster and how does it affect the vehicle?
- What is camber and how does it affect the vehicle?
- What is toe and how does it affect the vehicle?
- What should be checked on a pre alignment check?
- Does curb weight affect the specifications and why or why not?
- Why should every alignment begin with a road test?
- List the eight major parts of an automatic transmission. Explain the function of each.
- What are the four main components of automatic transmission construction?
- What is the stator support?
- Describe the movement of a planetary gearset.
- What is the purpose of using a compound planetary gearset?
- Explain how Solenoids and servos are friction devices that drive or lock planetary gearset members?
- Where do automatic transmission fluid leaks commonly occur?

- What is the procedure for band adjustment?

Content

- Functions of the Suspension System
- Basic Suspension Systems
- Types of Suspension Systems
- Understeer and Oversteer
- Suspension System Springs
- Suspension System Construction
- Long-Short Arm Suspension
- Torsion Bar Suspension
- MacPherson Strut Suspension
- Pickup Truck Suspension Systems
- Rear Suspension Systems
- Suspension Leveling Systems
- Electronic Suspension System
- Active Suspension System
- Suspension System Diagnosis
- Shock Absorber Service
- Suspension Spring Service
- Ball Joint Service Suspension
- Bushing Service
- MacPherson Strut Service
- Wheel Alignment is needed
- Computerized Suspension Diagnosis
- Functions of a Steering System
- Basic Steering Systems
- Steering Column Assembly

- Steering Gear Principles
- Steering Linkage (Worm-Type Gear Box)
- Manual Rack-and-Pinion
- Steering
- Linkage Type Power Steering System
- Power Rack-and-pinion Steering
- Electronic Steering Assist
- Four-Wheel Steering Systems
- Steering System Problem Diagnosis
- Steering System Maintenance
- Steering Column Service
- Manual Steering Gear Box Service
- Steering Linkage Service
- Manual Rack-and-pinion Service
- Power Steering System Service
- Wheel Alignment Principles
- Caster
- Camber
- Toe
- Steering Axis Inclination
- Setback
- Toe-out-on-turns
- Pre-Alignment Inspection
- Adjusting Wheel Alignment
- Wheel Alignment Tools and Equipment
- Alignment Machines
- Road Test after Alignment
- Basic Automatic Transmission
- Hydraulic System

- Parking Pawl
- Automatic Transmission Power Flow
- Electronic Transmission Control
- Automatic Transmission Designs
- Automatic Transmission Diagnosis
- Automatic Transmission Maintenance
- Major Transmission Service
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Skills

- 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).
- Identify suspension and steering system components and configurations.
- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
- Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.
- Identify and interpret suspension and steering system concerns; determine needed action.
- Inspect rack and pinion steering gear tie rod ends (sockets) and bellows boots; repair or replace as needed.
- Inspect power steering fluid level and condition.
- Drain and replace power steering system fluid; use proper fluid type per manufacturer specification.
- Inspect for power steering fluid leakage; determine needed action.
- Remove, inspect, replace, and/or adjust power steering pump drive belt.
- Inspect, remove, and/or replace power steering hoses and fittings.
- Inspect, remove, and/or replace pitman arm, relay (centerlink/intermediate) rod, idler arm, mountings, and steering linkage damper.
- Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps (non-rack and pinion). Inspect and test electric power steering system; determine needed action.
- Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).
- Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action.

- Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.
- Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.
- Inspect steering shaft universal joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.
- Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.
- Remove and reinstall power steering pump.
- Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.
- Inspect, remove, and/or replace upper and/or lower control arms, bushings, and shafts.
- Inspect and replace rebound/jounce bumpers.
- Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings.
- Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators).
- Inspect, remove, and/or replace suspension system coil springs and spring insulators.
- Inspect, remove, and/or replace torsion bars and mounts.
- Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.
- Inspect, remove, and/or replace strut assembly, strut coil spring, insulators, and upper strut bearing mount.
- Inspect, remove, and/or replace components of suspension systems (Coil, Leaf, and Torsion).
- Inspect, remove, and/or replace components of electronically controlled suspension systems.
- Inspect, remove, and/or replace steering knuckle assemblies.
- Diagnose suspension system noises, body sway, and uneven ride height concerns; determine needed action
- Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.
- Inspect, service, and/or replace front and rear wheel bearings.
- Describe the function of electronically controlled suspension and steering systems and components, (i.e., active suspension and stability control).
- Perform pre-alignment inspection; measure vehicle ride height; determine needed action.
- Describe four-wheel alignment angles (camber, caster, and toe) and effects on vehicle handling\tire wear.
- Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front caster, front and rear camber, and toe as required; center steering wheel.

- Check toe-out-on-turns (turning radius); determine needed action.
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- Check steering axis inclination (SAI) and included angle; determine needed action.
- Check rear wheel thrust angle; determine needed action.
- Check for front wheel setback; determine needed action.
- Identify front and/or rear cradle (subframe) misalignment; determine needed action.
- Reset steering angle sensor.
- Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action.
- 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.
- Rotate tires according to manufacturer's recommendations including vehicles equipped with tire pressure monitoring system (TPMS).
- Dismount, inspect, and remount tire on wheel (with/without TPMS); balance wheel and tire assembly.
- Inspect tire and wheel assembly for air loss; determine needed action.
- Repair tire following tire manufacturer approved procedure.
- Identify indirect and direct tire pressure monitoring systems (TPMS); calibrate/relearn system; verify operation of instrument panel lamps.
- Demonstrate knowledge of steps required to remove and replace sensors (per OEM/sensor manufacturer) in a tire pressure monitoring system (TPMS).
- Perform Road Force balance/match mounting.
- Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.
- Measure wheel, tire, axle flange, and hub runout; determine needed action.
- Diagnose tire pull problems; determine needed action.
- 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).
- Identify automatic transmission and transaxle components and configurations.
- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.

- Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle equipped with a dipstick.
- Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle not equipped with a dipstick.
- Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.
- Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).
- Identify and interpret transmission/transaxle concerns, differentiate between engine performance and transmission/transaxle concerns; determine needed action.
- Diagnose fluid loss and condition concerns; determine needed action.
- Perform stall test; determine needed action.
- Perform lock-up converter system tests; determine needed action.
- Perform pressure tests on transmissions/transaxles equipped with electronic pressure control; determine needed action.
- Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.
- Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.
- Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.
- Perform relearn procedures.
- Inspect, replace and/or align powertrain mounts.
- Inspect for leakage; replace external seals, gaskets, and bushings.
- Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits.
- Describe the operational characteristics of a continuously variable transmission (CVT).
- Describe the operational characteristics of a hybrid vehicle drive train.
- Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces.
- Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings.

- Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.

Assessments

- Several quizzes weekly written and proficiency
- Written and proficiency Test
- Written and proficiency rubrics
- Observation and verbal quizzes
- Workbook and note taking
- ASE Education Foundation Task Sheets

Course: Electrical	Length: 1 Semester

Standards

- 9.3.12.TD-HSE.1 Describe the health,safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.
- • 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8). •
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
- • 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

Essential Question(s)

- What is a free electron?

- What causes an electron to jump from atom to atom, in relation to electricity?
- What happens if you place two like charges near each other?
- Explain Ohm's Law.
- What is the function of resistance in an electric circuit?
- What happens to current if voltage increases and resistance remains constant?
- What happens to the voltage if current increases and the resistance remains constant?
- In what way is a parallel circuit different from a series circuit?
- What is a series-parallel circuit?
- Describe how to find the equivalent resistance in a series-parallel circuit.
- If you know the total current and resistance in a circuit, how can you find electric power in watts?
- Explain the operation and application of a mercury switch.
- A capacitor is a storage device for electricity.Why is it necessary?
- What is the purpose of a Zener diode?
- What type of solder should be used when repairing wire connections, and why?
- How is a ground side voltage drop test performed?
- Explain how a diode can convert AC to DC current?
- Explain input sensors.
- How does a BUS circuit relay information to and from the PCM?
- How is magnetism used in a starter motor?
- Validate the reason remote starters can not be installed on a manual transmission vehicle.
- Describe how a movable pole shoe starting motor operates.
- Why should the battery be disconnected before removing the starter?
- Describe the function of a starter relay.
- Why are neutral safety switches installed on manual and automatic transmissions?
- If a belt slipping will a load is being sent to the alternator, what should the tech do?
- Explain what could result from switching the polarity

- Where can information be located about wiring and diagnosing accessories?

Content

- Atomic Structure
- Electricity
- Magnetism
- Electric Circuits
- Conventional and Electron Theory
- Direct and Alternating Current
- Circuit Types
- Ohm's Law
- Circuit Calculations
- Prefixes of Electrical Units
- Electric Components
- Electrical Repair Tools
- Electrical Test Equipment
- Automotive Wiring
- Cutting Stripping Wire
- Soldering
- Connectors
- Wiring Repairs
- Wiring Diagrams
- Basic Circuit Problems
- Electrical Diagnosis and Repair
- Types of Circuit Problems
- Using Test Devices

- Using a Multimeter
- Basic Component Tests
- Cybernetics
- Computer Circuit
- Advantages
- Digital Electronics
- Integrated Circuits
- Computer Signals
- Computer System
- Operation
- Sensors
- Computers
- Actuators
- On-Board Diagnosis
- Systems
- Scanning Computer
- Preliminary Visual
- Inspection
- Computer System
- Circuit Problems
- Sensor and Actuator Problems
- Sensor Service
- Actuator Service
- Computer Service
- 12 Volt Starting System Principles
- Starting Motor Fundamentals

- 12 Volt Starting Motor Construction
- 12 Volt Starting Motor Types
- 12 Volt Neutral Safety Switch
- 12 Volt Starter Relay
- ECM Controlled 12 Volt Starting Circuit
- Starting Systemb Diagnosis
- 12 Volt Cable Service
- Starter Solenoid Service
- Ignition Switch Service
- 12 Volt Starter Relay Service
- Neutral Safety Switch Service
- 12 Volt Starter Service
- 12 Volt Charging System Functions
- 12 Volt Charging Systems Precautions
- 12 Volt Charging System Tests
- Alternator Service
- Voltage Regulator Service
- Light
- Light Bulbs
- Lighting Systems
- Light System Service
- Dash Instrumentation
- Windshield Wipers
- Horns
- Radio
- Power Seats

- Power Windows
- Power Door Locks
- Power Trunk Release
- Heated Windshield
- Reminder System
- Cruise Control System
- Power Mirrors
- Driver Information Center

Skills

- 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).
- Identify electrical/electronic system components and configurations.
- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
- Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
- Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.
- Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
- Describe types of test lights; use appropriate test lights to check operation of electrical circuits as directed per service information.
- Use fused jumper wires to check operation of electrical circuits per service information.
- Use wiring diagrams during the diagnosis of electrical/electronic circuit problems.
- Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.
- Inspect and test fusible links, circuit breakers, and fuses; determine needed action

- Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.
- Test and measure circuit using an oscilloscope and/or graphing multimeter (GMM); interpret results; determine needed action.
  Perform battery state-of-charge test; determine needed action.
- Confirm proper battery capacity, size, type, and application for vehicle; perform battery capacity and load test; determine needed action.
- Maintain or restore electronic memory functions as recommended by the manufacturer.
- Inspect and clean battery; fill battery cells (if applicable); check battery cables, connectors, clamps, and hold-downs.
- Perform battery charging according to manufacturer's recommendations.
- Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
- Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting the vehicle battery.
- Perform starter current draw test; determine needed action.
- Perform starter circuit voltage drop tests; determine needed action.
- Inspect and test starter relays and solenoids; determine needed action.
- Remove and install starters in a vehicle.
- Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.
- Demonstrate knowledge of automatic idle-stop/start-stop system.
- Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.
- Perform charging system output test; determine needed action.
- Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment; determine needed action.
- Remove, inspect, and/or replace generator (alternator); determine needed action.
- Perform charging circuit voltage drop tests; determine needed action.
- Diagnose charging system for causes of undercharge, no-charge, or overcharge conditions; determine needed action.

- Diagnose a no-crank condition using a wiring diagram and test equipment; determine needed action.
- Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); determine needed action.
- Describe the process for software transfer, software updates, or reprogramming of electronic modules.

Assessments

- Several quizzes weekly written and proficiency
- Written and proficiency Test
- Written and proficiency rubrics
- Observation and verbal quizzes
- Workbook and note taking
- ASE Education Foundation Task Sheets

Course: Engine Performance — Length: 1 Semester

Standards

- 9.3.12.TD-HSE.1 Describe the health,safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.
- • 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8). •
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
- 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).

Essential Question(s)

- Explain the difference between a hot and cold spark plug.
- What is direct ignition?
- Describe how to test an ignition coil.
- How is the octane rating of gasoline a measurement of the fuel's ability to resist knocking or pinging?
- Explain the proper procedure for testing fuel pressure.
- What type of light should be used while working on a fuel system and why?
- Do all vehicles use a fuel filter?
- Describe fuel pressure testing of a fuel pressure regulator.
- What should be the first operation while diagnosing an engine performance problem?
- Why should basic engine mechanical equipment always be checked before repairing performance problems?
- Which test procedure would give better detailed data steam and why? Global OBD II or Vehicle specific?

Content

- Ignition System Diagnosis

- Spark Plug Service
- Secondary Wire Service
- Distributor Service
- Electronic Ignition Service
- Contact Point Distributor Service
- Ignition Timing Service
- Fuel System Technology
- Fuel Supply System
- Fuel Supply System
- Petroleum
- Gasoline
- Diesel Fuel
- Alternative Fuels
- Gasoline Injection Problem Diagnosis
- Fuel System Tests
- Fuel Injector Problems
- Replacing Multiport Fuel Injectors
- Replacing Direct Fuel Injectors
- Locating Engine Performance Problems
- Typical Performance Problems
- Vacuum and Pressure Gauge Tests

Skills

- 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).
- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
- Verify proper engine cooling system operation; determine needed action.

- Verify correct camshaft timing including engines equipped with variable valve timing (VVT) systems; determine needed action.
- Identify and interpret engine performance concerns; determine needed action.
- Diagnose abnormal engine noises or vibration concerns; determine needed action.
- Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.
- Perform engine manifold pressure tests (vacuum/boost); determine needed action.
- Perform cylinder power balance test; determine needed action.
- Perform cylinder cranking and running compression tests; determine needed action.
- Perform cylinder leakage test; determine needed action.
- Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.
- Identify computerized control system components and configurations.
- Access and use service information to perform step-by-step (troubleshooting) diagnosis.
- Perform active tests of actuators using a scan tool; determine needed action.
- Describe the use of OBD monitors for repair verification.
- Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM), digital storage oscilloscope (DSO), and/or scan tool; determine needed action.
- Describe the process for reprogramming or recalibrating the powertrain/engine control module (PCM/ECM).
- Identify ignition system components and configurations.
- Remove and replace spark plugs; inspect secondary ignition components for wear and damage; determine needed action.
- Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns; determine needed action.
- Inspect and test crankshaft and camshaft position sensor(s); determine needed action.
- Inspect, test, and/or replace ignition control module and/or powertrain/engine control module; reprogram/initialize as needed.

- Identify fuel, air induction, and exhaust system components and configurations.
- Replace fuel filter(s) where applicable.
- Inspect, service, or replace air filters, filter housings, and intake duct work.
- Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine needed action.
- Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.
- Check fuel for quality, composition, and contamination; determine needed action.
- Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; determine needed action.
- Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air
- Inspect, test, and/or replace fuel injectors on low- and high-pressure systems.
- Verify proper idle speed; determine needed action.
- Perform exhaust system back-pressure test; determine needed action.
- Identify emission control system components and configurations.
- Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; determine needed action.
- Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.
- Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; inspect, test, service and/or replace electrical/electronic sensors, controls, wiring, tubing, exhaust passages, vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) system; determine needed action.
- Inspect and test electrical/electronically operated components and circuits of secondary air injection systems; determine needed action.
- Diagnose emissions and driveability concerns caused by catalytic converter system; determine needed action.

- Diagnose emissions and driveability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.
- Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.

Assessments

- Several quizzes weekly written and proficiency
- Written and proficiency Test
- Written and proficiency rubrics
- Observation and verbal quizzes
- Workbook and note taking
- ASE Education Foundation Task Sheets

Course: Advanced Vehicle Electronics Length: 1 Semester

Standards

- 9.3.12.TD-HSE.1 Describe the health,safety and environmental rules and regulations in transportation, distribution and logistics workplaces.

- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
- 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information.
- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.

Essential Question(s)

- How often should an engine receive a Tune-up and how would the tech know?
- What does a tune up receive
- If a misfire code P0303 is present, what should be the first procedure a tech should perform?
- What should be the first operation while diagnosing an engine performance problem?
- Why should basic engine mechanical equipment always be checked before repairing performance problems?
- Which test procedure would give better detailed data steam and why? Global OBD II or Vehicle specific?
- Explain the difference between a hot and cold spark plug.
- What is direct ignition?
- Describe how to test an ignition coil.
- How is the octane rating of gasoline a measurement of the fuel's ability to resist knocking or pinging?
- Explain the proper procedure for testing fuel pressure.
- What type of light should be used while working on a fuel system and why?
- Do all vehicles use a fuel filter?
- Describe fuel pressure testing of a fuel pressure regulator.

Content

- Light
- Light Bulbs
- Lighting Systems
- Light System Service
- Dash Instrumentation
- Windshield Wipers
- Horns
- Radio
- Power Seats
- Power Windows
- Power Door Locks
- Power Trunk Release
- Power Steering
- Heated Windshield
- Reminder System
- Cruise Control
- System
- Power Mirrors
- Driver Information
- Center
- Vehicle Degaussing
-

Skills

- 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).
- Identify electrical/electronic system components and configurations.
- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
- Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
- Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.
- Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
- Describe types of test lights; use appropriate test lights to check operation of electrical circuits per service information.
- Use fused jumper wires to check operation of electrical circuits per service information.
- Use wiring diagrams during the diagnosis of electrical/electronic circuit problems.
- Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.
- Inspect and test fusible links, circuit breakers, and fuses; determine needed action.
- Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.
- Test and measure circuit using an oscilloscope and/or graphing multimeter (GMM); interpret results; determine needed action.
- Explain the operating principles of automotive light, wiper, and horn systems.
- Diagnose problems in light, wiper, and horn systems.
- Summarize automatic light and wiper systems.
- Replace burned-out bulbs.
- Explain how to aim headlights.
- Diagnose vehicle comfort, convenience, access, safety, and related systems operation; determine needed action

- Remove and reinstall the door panel.
- Diagnose operation of security/anti-theft systems and related circuits (such as: theft deterrent, door locks, remote keyless entry, remote start, and starter/fuel disable); determine needed action.
- Describe disabling and enabling procedures for supplemental restraint system (SRS); verify indicator lamp operation.
- Verify windshield wiper and washer operation; replace wiper blades.
- Diagnose operation of entertainment and related circuits (such as: radio, DVD, remote CD changer, navigation, amplifiers, speakers, antennas, and voice-activated accessories); determine needed action.
- Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, parking assist, and back-up camera); determine needed action.
- Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action.
- Describe the process for software transfer, software updates, or reprogramming of electronic modules.
- Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators as required.
- Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action.
- Diagnose the causes of incorrect operation of warning devices and other driver information systems; determine needed action.

Assessments

- Several quizzes weekly written and proficiency
- Written and proficiency Test
- Written and proficiency rubrics
- Observation and verbal quizzes
- Workbook and note taking

- ASE Education Foundation Task Sheets

Course: Engine Management Systems	Length: 1 Semester

Standards

- 9.3.12.TD-HSE.1 Describe the health,safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.
- • 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8). •
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

- 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). "

Essential Question(s)

- What should be the first operation while diagnosing an engine performance problem?
- Why should basic engine mechanical always be checked before repairing performance problems?
- Which test procedure would give better detailed data steam and why? Global OBD II or Vehicle specific?
- How would a tech install an oscilloscope?
- Can a scope test the amount of time?
- Can a scope test amperage?
- Can a scope measure time?
- If a misfire code P0303 is present, what should be the first procedure a tech should perform?
- Explain the proper procedure for testing fuel pressure.
- What type of light should be used while working on a fuel system and why?
- How is the octane rating of gasoline a measurement of the fuel's ability to resist knocking or pinging?

Content

- Ignition System Fundamentals
- Ignition Coils
- Distributorless Ignition System
- Direct Ignition System
- Distributor Ignition System
- Distributor Cap and Rotor
- Engine Firing Order

- Ignition Timing
- Ignition Coil Service
- Ignition Switch Service
- Ignition Control module Service
- Distributorless Ignition System Service
- Direct Ignition System

Skills

- List the symptoms produced by faulty ignition system components.
- Diagnose typical ignition system problems.
- Describe common tests used to find ignition system troubles.
- Explain how to replace or repair ignition system parts.
- Describe safety practices to follow when testing or repairing an ignition system
- Explain octane and octane ratings
- Describe normal and abnormal combustion of gasoline and diesel fuel.
- Define the major parts of a fuel supply system.
- Describe the operation of mechanical and electric fuel pumps
- Explain the tests used to diagnose problems with fuel pumps, fuel filters, and fuel lines.
- Repair a fuel line or replace a fuel hose.
- Locate and replace fuel filters in both gasoline and diesel fuel systems
- State safety rules for working on fuel supply systems
- Summarize the operation of oxygen sensors to control an engine air-fuel ratio
- Diagnose problems in a gasoline injection system using a scan tool, multimeter, and scope.
- Compare the scope waveforms for common injector circuits.
- Use a scan tool to relieve fuel pressure and to test fuel pumps, fuel pressure regulators, and high-pressure fuel injectors
- Perform a fuel injector balance test Perform on-car injector flow tests.

- Use a noid light and handheld scope to analyze fuel injector operation.
- Describe the symptoms for common engine performance problems.
- Explain typical causes of engine performance problems.
- Use a systematic approach when diagnosing engine performance problems.
- Use scan tool data to find mechanical and electrical problems that adversely affect gasoline engine smoothness, efficiency, power, and emissions
- Use a breakout box to measure circuit values Identify electromagnetic interference (EMI).
- Use an oscilloscope on any type of analog sensor or digital sensor
- Summarize how to use an engine analyzer to find problems caused by part or component failures.
- Evaluate waveforms from scope test patterns to analyze the operation of sensors, actuators, and other electrical-electronic devices.
- Explain service operations commonly performed during a tune-up.
- List the safety precautions that should be remembered during a tuneup.
- Name parts that may need replacement during a tune-up.

Assessments

- Several quizzes weekly written and proficiency
- Written and proficiency Test
- Written and proficiency rubrics
- Observation and verbal quizzes
- Workbook and note taking
- ASE Education Foundation Task Sheets

Course: Light Duty Diesel	Length: 1 Semester

Standards

- 9.3.12.TD-HSE.1 Describe the health,safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
- 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information.
- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.
- 9.4.12.DC.3: Evaluate the social and economic implications of privacy in the context of safety, law, or ethics (e.g., 6.3.12.HistoryCA.1)

Essential Question(s)

- Why do diesel engines not have spark plugs?
- Why diesel engine doesn't generate enough vacuum to operate a vacuum-controlled device
- Where Is the Block Heater Located?
- What Is the Difference between Girdle & Bedplate?
- What are the advantages of DOHC as opposed to cam-in-block design?
- Why do some dual overhead cam engines may have a different camshaft profile for each of the intake valves and exhaust valves?
- What is the Relationship Between Miles Driven and Engine Hours?

Content

- Engine Bottom End
- Engine Top End
- Engine Front End
- Engine Classification
- Cylinder Arrangement
- Alternative Engines
- Cylinder head
- construction
- Valve Train
- Construction
- Intake Manifold
- Construction
- Exhaust Manifold
- Construction
- Cylinder Block
- Construction
- Piston Construction
- Piston Ring

- Construction
- Piston Pin
- Construction
- Connecting Rod
- Construction
- Crankshaft
- Construction
- Engine Bearing
- Construction
- Rear Main Bearing Oil
- Seal Construction
- Balancer Shafts
- Vibration Damper
- Construction
- Camshaft Drives
-

Skills

- Explain how a four-stroke cycle engine operates.
- List the various characteristics by which vehicle engines are classified.
- Discuss how a compression ratio is calculated.
- Explain how engine size is determined.
- Describe how displacement is affected by the bore and stroke of the engine
- Discuss the difference between gray cast iron and compacted graphite iron (CGI).
- Explain the difference between a girdle and a bedplate engine design.
- Explain the purpose of Nitriding and Tuftriding.
- Describe how surface finish is measured.
- Discuss engine bearing types and materials used in diesel engines.

- Discuss airflow requirements and volumetric efficiency of engines.
- Explain forced induction principles.
- Discuss turbochargers.
- Explain boost control
- Identify the components of the air induction system.
- Identify the components of the EGR systems.
- Describe the function of each of the components in the air induction system.
- Explain the function of each of the components in the EGR systems.
- Discuss the diagnosis of driveability concerns related to the air induction and EGR systems.
- Describe the function of the low-pressure fuel systems.
- Identify the components in the low-pressure fuel system.
- Discuss the need for service and repair of the low pressure fuel system.
- Explain the need for controlling the temperature of the fuel.
- Discuss the need to service the intake air system.
- Identify the correct oil and filter for the engine being serviced.
- Discuss the need for servicing the cooling system.
- Explain how to service the fuel system on a modern diesel engine.
- Discuss how to service the diesel exhaust fluid system on an equipped vehicle
- Identify the components of a HEUI injection system.
- Discuss the operation of a HEUI injector.
- Explain the advantage of a HEUI injection system over a mechanical system.
- Determine the need for service and repair of HEUI injection systems
- Perform the maintenance pre-check on a modern diesel equipped light-duty vehicle.

Assessments

- Several quizzes weekly written and proficiency
- Written and proficiency Test
- Written and proficiency rubrics

- Observation and verbal quizzes
- Workbook and note taking
- ASE Education Foundation Task Sheets

Course: Hybrid and Electric Vehicle Technology	Length: 1 Semester

Standards

- 9.3.12.TD-HSE.1 Describe the health,safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.
- • 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8). •
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
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Essential Question(s)

- What is the difference between a naturally aspirated (NA) engine and a supercharged or turbocharged engine.
- What is the difference between CCA & CA ratings?
- What factors affect battery's CCA and CA ratings?
- Why are normal automotive batteries not designed for repeated deep cycling. What vehicles are likely to use deep cycle batteries?
- What is the importance of using leather gloves over insulated gloves..
- What should be done before each use of gloves?
- What is the relationship between the strength of magnetic fields and Starter torque?

Content

- Battery
- Motors
- Regenerative Braking
- Volts
- Amp
- Ohms
- Atomic Structure
- Electricity
- Magnetism
- Electric Circuits
- Conventional and Electron Theory
- Direct and Alternating Current
- Circuit Types
- Ohm's Law
- Circuit Calculations

- Prefixes of Electrical Units
- Electric Components
- Electrical Repair Tools
- Electrical Test Equipment
- Automotive Wiring
- Cutting Stripping Wire
- Soldering
- Connectors
- Wiring Repairs
- Wiring Diagrams
- Basic Circuit Problems
- Electrical Diagnosis and Repair
- Types of Circuit Problems
- Using Test Devices
- Using a Multimeter
- Basic Component Tests
- Cybernetics

Skills

- Describe the different types of hybrid electric vehicles.
- Explain how a hybrid vehicle is able to achieve an improvement in fuel economy compared to a conventional vehicle design.
- Discuss the advantages and disadvantages of the various hybrid designs.
- Describe HEV components, including motors, energy sources, and motor controllers.
- Discuss the operation of a typical hybrid electric vehicle

- Explain how a four-stroke cycle gasoline engine operates.
- Explain the Atkinson cycle and how it affects engine efficiency.
- List the various methods by which vehicle engines are classified and measured.
- Describe the importance of using the specified oil in the engine of a hybrid electric vehicle.
- Describe how the fuel injection and ignition systems work on hybrid gasoline engines.
- Explain how active control engine mounts function.
- Describe how wide-band oxygen sensors work.
- Explain how variable valve timing is able to improve engine power and reduce exhaust emissions
- Describe how auxiliary 12-volt and high-voltage hybrid vehicle batteries work.
- List battery ratings.
- Describe deep cycling.
- List the safety precautions necessary when working with batteries.
- Explain how to safely charge a battery.
- Describe how to perform a battery load test.
- Explain how to perform a conductance test.
- Discuss how to jump start a vehicle safely.
- Discuss hybrid electric vehicle auxiliary batteries.
- Explain the types of high-voltage batteries used in most hybrid electric vehicles.
- Describe the operation of DC and AC electric motors.
- Explain how a brushless DC motor works.
- Discuss the advantages and disadvantages of using electric motors in hybrid electric vehicles.
- Explain how electric power steering works.
- Describe how a DC-to-DC converter works.
- Discuss how a DC-to-AC inverter works
- Describe the function of a hybrid electric vehicle (HEV) transmission.
- Understand the relationship required between the ICE and electric motor(s).
- Describe how the idle stop function is related to the needs of the automatic transmission operation.
- Discuss modifications made to automatic transmissions installed in hybrid electric vehicles.
- Explain the operation of continuously variable transmissions (CVTs).

- Explain the operation of the ICE cooling system.
- Explain the operation of the motor/electronics cooling system in a hybrid electric vehicle.
- Explain the operation of a coolant heat storage system.
- Describe the function of a vehicle's heating and A/C system.
- Discuss the operation and unique service procedures for electric-drive A/C compressors.
- Safely de-power a hybrid electric vehicle.
- Safely perform high-voltage disconnects.
- Understand the unique service issues related to HEV high-voltage systems.
- Correctly use appropriate personal protective equipment (PPE).
- Perform routine vehicle service procedure on a hybrid electric vehicle.
- Explain hazards while driving, moving, and hoisting a hybrid electric vehicle.
- Follow first responder standard operating procedures.
- Identify a hybrid electric vehicle.
- Safely depower a hybrid electric vehicle.
- Safely handle spills from a hybrid electric vehicle.
- Discuss first responder issues involving alternative-fuel vehicles.

Assessments

- Several quizzes weekly written and proficiency
- Written and proficiency Test
- Written and proficiency rubrics
- Observation and verbal quizzes
- Workbook and note taking
- ASE Education Foundation Task Sheets

Resources

➔ Course Resources

1.Textbooks

a. Gilles, Automotive Service, Delmar Publishers, 2020

b. Duffy, Modern Automotive Technology, GW Publishers, 2020

c. VanGelder, Fundamentals of Automotive Technology, Principles and Practice, Jones Bartlett Publisher, 2020

d. Halderman, Automotive Technology, Principles, diagnosis and Service. Peterson, 2020

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