

SCOPE AND SEQUENCE



Course Name: Automotive Technology II

Instructor: Chuck Brighenti

Career Cluster: Supply Chain & Transportation

Sub Cluster: Maintenance and Repair

HS Course Credits: 1 science and 2 electives per year

Fast Forward Optional Credits:

Tier 2 Credentials: ASE Entry level Certification : Automotive Service Technology ,Automatic Transmission/Transaxle, Brakes, Electrical/Electronic Systems, Engine Performance, Engine Repair, Heating and Air Conditioning, Maintenance & Light Repair, Manual Drive Train and Axles, and Suspension & Steering, .

Tier 1 Credentials: SP/2 Safety Certification, Mobile Air Climate Systems Association (MACS) 609 Certification,525F, Lift it Right

CTSO/Enrichment: Skills USA, Heritage Auto Group Automotive Challenge

Recommended preparation for success in this course: Auto I, Algebra I or Geometry; Intro to STEM; Mechanical Science



Tagline: Drive your future!

Student appeal: In this course, you'll dive into the daily workings of a real auto repair shop, dealing with actual customers. Alongside classroom sessions focusing on different automotive systems, you'll explore topics like tools and equipment, maintenance, engines, electronics, steering, brakes, and more. Get ready for theory lessons, hands-on lab training, and even computer-based learning. Plus, qualified students can apply for a chance to gain real-world experience through a local work placement. Ready to roll up your sleeves and get started?

Course Description: This 2-year half-day program continues your knowledge of automobiles. In year 2 students will continue learning the day-to-day operations of a fully functional auto repair shop, complete with real customers and real-world challenges while gaining additional experience with Automotive Electrical Systems, Auto HVAC, and Engine Performance. Guided by industry professionals, students will combine hands-on training with classroom learning to master the essential systems of modern automotive technology.

Through engaging theory lectures, student-driven research, computer-based learning tools, and lab exercises, you'll explore a wide range of topics, including:

- Safety, tools, and equipment
- Electrical systems
- HVAC systems
- Engine control systems

Students who qualify will also have the opportunity to participate in a cooperative work experience with local businesses, gaining valuable real-world experience and building connections in the industry.

Whether you see yourself as a service technician, a custom builder, or a future shop owner, a foundation in automotive technology opens the door to a wide range of rewarding careers.

Proficiencies/Learning Targets:

LT1: Shop, Tool, and Industry Safety (Equipment): I can identify and safely use common shop tools and equipment.

LT2: Shop, Tool, and Industry Safety (Disposal / PPE): I can identify shop safety protocols, including PPE, proper automotive fluid and part disposal.

LT3: Electrical (Ohm's Law): I can use Ohm's law to calculate one of the unknowns based on my measurements and can verify my calculations using the DVOM

LT4: Electrical (Schematics/Circuitry): I can read and interpret wiring schematics from the perspective of power flow, component and connector ID, and repair strategies.

LT5: Electrical (DVOM): I can comfortably set up a DVOM to measure voltage, current and resistance through/in a circuit/component and can use this tool to diagnose different circuit types.

LT6: Electrical (Components): I can identify and explain the electronic components found within automotive circuits (switches, relays, sensors, motors, actuators, solenoids, CAN Bus).

LT7: A/C (MACS 609): I can obtain certification in EPA 609 A/C refrigerant safe handling.

LT8: A/C (System Evaluation): I can identify components of and evaluate performance issues within HVAC systems.

LT9: HVAC (System Service): I can evaluate HVAC system components and develop repair strategies.

LT10: Engine Performance (Diag): I can diagnose and service components of engine, emissions, and exhaust systems, including understanding their configurations and identifying necessary actions based on diagnostic trouble codes (DTCs) and system tests.

Standards: Standards are aligned with Vermont's CTE [Automotive Technology, Diesel Technology, Auto Body Collision](#) Critical Proficiencies Anchor Standards (VT), which derive from and are aligned with the Common Career Technical Core Standards for [Transportation, Distribution & Logistics](#) as well as with [Automotive Service Excellence \(ASE\) Automobile Program Standards](#).

Additional standards alignment includes:

PAHCC [Habits of Work](#): Safety, Work Ethic, Reliability, People Skills

PAHCC [Transferable Skills](#): Creative and practical problem solving; Inquiry; Informed and Integrated Thinking.

[CCTC - Career Ready Practices](#):

Unit and Essential Question(s)	Estimated # of Classes Periods (assumes 120-minute classes)	Learning Targets
Unit 1: Shop, Tool, and Industry Safety IRC: SP2.ORG, Lift it Right Certification Essential Questions • <i>How can you ensure the safe and legal disposal of shop by-products, including parts and fluids, while adhering to environmental regulations?</i> • <i>What are the key safety precautions and emergency procedures you should follow when working with shop tools, equipment, and hazardous materials, and how do they align with local, state, and federal regulations?</i>	15 Classes	LT1: Shop, Tool, and Industry Safety (Equipment): I can identify and safely use common shop tools and equipment. LT2: Shop, Tool, and Industry Safety (Disposal / PPE): I can identify shop safety protocols, including PPE, proper automotive fluid and part disposal. Indicators/Tasks: 1. Identify and explain laws and workplace policies. 2. Describe personal and environmental safety practices associated with clothing and proper Personal Protection Equipment (PPE); hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. 3. Identify vehicle system precautions and/or inspections to include but not limited to Supplemental Restraint System (SRS) Inspection, Advanced Driver Assistance Systems (ADAS), hybrid/electric/alternative fuel vehicles, locations and recommended procedures before inspecting or replacing components.

Unit 2: Electronics/ Electrical Essential Questions • <i>How can you effectively use vehicle service information, such as technical service bulletins and recalls, to diagnose and service electrical and electronic systems, including those with advanced driver assistance systems (ADAS)?</i> • <i>What are the key principles of electrical circuits (Ohm's Law), and how do you apply this knowledge to diagnose and repair shorts, grounds, and resistance issues in automotive electrical systems?</i> • <i>How do you properly use diagnostic tools like digital multimeters, test lights, and wiring diagrams to measure, test, and troubleshoot the electrical circuits and components in a vehicle?</i> • <i>What are the proper procedures for testing, maintaining, and diagnosing issues in automotive starting and charging systems, including performing tests for current draw, voltage drops, and generator (alternator) performance?</i>	50 Classes	LT3: Electrical (Ohm's Law): I can use Ohm's law to calculate one of the unknowns based on my measurements and can verify my calculations using the DVOM LT4: Electrical (Schematics/Circuitry): I can read and interpret wiring schematics from the perspective of power flow, component and connector ID, and repair strategies. LT5: Electrical (DVOM): I can comfortably set up a DVOM to measure voltage, current and resistance through/in a circuit/component and can use this tool to diagnose different circuit types. General 1. Identify electrical/electronic system components and configurations. 2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). 3. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance. 4. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. 5. Describe types of test lights; use appropriate test light to check operation of electrical circuits per service information 6. Use fused jumper wires to check operation of electrical circuits per service information. 7. Use wiring diagrams to trace electrical/electronic circuits. 8. Measure key-off battery drain (parasitic draw). 9. Inspect and test fusible links, circuit breakers, and fuses. 10. Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair).
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- *How do you diagnose and repair issues in vehicle body electrical systems, such as security, comfort, convenience, and safety systems, and what role does software transfer or reprogramming play in their functionality?*

LT6: Electrical (Components): I can identify and explain the electronic components found within automotive circuits (switches, relays, sensors, motors, actuators, solenoids, CAN Bus).

Batteries (Conventional 12-volt)

1. Perform battery state-of-charge test; determine needed action.
2. Confirm proper battery capacity, size, type, and vehicle application; perform battery capacity and load test; determine needed action.
3. Maintain or restore electronic memory functions as recommended by the manufacturer.
4. Inspect and clean the battery; fill battery cells (if applicable); check battery cables, connectors, clamps, and hold-downs.
5. Perform battery charging according to the manufacturer's recommendations.
6. Jump-start the vehicle using jumper cables, a booster battery, or an auxiliary power supply.
7. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting the vehicle battery.

Starting System

1. Perform starter current draw test; determine needed action.
2. Perform starter circuit voltage drop tests; determine needed action.
3. Inspect and test starter relays and solenoids; determine needed action.
4. Remove and install the starter in a vehicle.
5. Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.
6. Demonstrate knowledge of automatic idle-stop/start-stop system.
7. Differentiate between electrical and engine mechanical problems that cause a slow crank or a no-crank condition.
8. Diagnose a no-crank condition using a wiring diagram and test equipment; determine needed action.

		Charging System 1. Perform charging system output test; determine needed action. 2. Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment; determine needed action. 3. Remove, inspect, and/or replace the generator (alternator); determine the needed action. 4. Perform charging circuit voltage drop tests; determine needed action. 5. Diagnose the charging system for causes of undercharge, no-charge, or overcharge conditions; determine needed action. Lighting Systems 1. Inspect interior and exterior lamps and sockets, including headlights and auxiliary lights (fog lights/driving lights); determine needed action. 2. Aim headlights. 3. Diagnose the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action. Instrument Cluster and Driver Information Systems 1. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators as required. 2. Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action. 3. Diagnose the causes of incorrect operation of warning devices and other driver information systems; determine needed action. Body Electrical Systems 1. Diagnose vehicle comfort, convenience, access, safety, and related systems operation; determine needed action. 2. Remove and reinstall the door panel. 3. Diagnose operation of security/anti-theft systems and related circuits (such as theft deterrent, door locks, remote keyless
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		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 pre-tensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, parking assist, and back-up camera); determine needed action. - Diagnose body electronic system circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action. - Describe the process for software transfer, updates, or reprogramming of electronic modules.
Unit 3: A/C MAC 609 Certification (IRC) Essential Question: <i>How do you properly handle refrigerants in accordance with EPA regulations to ensure environmental safety and compliance during the servicing, recovery, and recycling of air conditioning systems in vehicles?</i>	10 Classes	LT7: A/C (MACS 609): I can obtain certification in EPA 609 A/C refrigerant safe handling. - Best Service Practices for Mobile A/C Systems - The Switch to Climate-Friendly Refrigerants - Refrigerant Recycling and Service Procedures for Mobile Air Conditioning Technicians - Best Service Practices for HFO-1234yf Systems Refrigerant Recovery, Recycling, and Handling - 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.
Unit 4: Heating, Ventilation, Air Conditioning Part 1: General Part 2: Refrigeration System Components Part 3: Operating Systems and Related Controls Part 4: Refrigerant Recovery, Recycling, and Handling Part 5: Identify heating, ventilation, and air conditioning (HVAC) components and configurations. Part 6: Heating, Ventilation, and Engine Cooling Systems Essential Questions: General <i>How can you effectively diagnose and troubleshoot HVAC system issues, including identifying abnormal noises, refrigerant type, and performing system tests, to determine the necessary actions for proper system performance?</i> Refrigeration System Components	35 Classes	LT8: HVAC (System Evaluation): I can identify components of and evaluate performance issues within HVAC systems. - Identify heating, ventilation, and air conditioning (HVAC) components and configurations. - Perform HVAC system performance test; interpret results; determine needed action - Leak test HVAC system; determine needed action. - Identify refrigerant type; test for sealant; select and connect proper gauge set/test equipment; record temperature and pressure readings. - Determine recommended oil and oil capacity for system application and component(s) replacement. - Identify steps of an HVAC performance test - Identify abnormal operating noises in the HVAC system - Visually inspect the HVAC system for signs of leaks. - Identify and interpret heating and air conditioning problems. - Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; determine needed action. LT9: HVAC (System Service): I can evaluate HVAC system components and develop repair strategies. - 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 the evaporator housing condensation drain; determine needed action. - Inspect, test, and/or service A/C compressor clutch components and/or assembly; determine needed action.

- *What are the proper procedures for inspecting, testing, and replacing key refrigeration system components, such as the A/C compressor, condenser, and expansion valve, and how do these actions ensure optimal system operation?*

Operating Systems and Related Controls

- *How do you diagnose and repair malfunctions in HVAC system components like blower motors, control panels, and temperature control systems to maintain system efficiency and comfort ?*

Refrigerant Recovery, Recycling, and Handling

- *What are the essential procedures for the safe recovery, recycling, and handling of refrigerants, and how do these practices align with environmental and regulatory standards?*

Unit 5: Engine Control Systems Part 1: General Part 2: Computerized Controls Part 3: Ignition System Part 4: Fuel, Air Induction, and Exhaust Systems Part 5: Emissions Control Systems Essential Questions: • <i>How do you diagnose and service components of engine, emissions, and exhaust systems, including understanding their configurations and identifying necessary actions based on diagnostic trouble codes (DTCs) and system tests?</i> • <i>What are the key considerations in maintaining and repairing computerized control systems, ignition systems, and components of the fuel, air induction, and exhaust systems to ensure optimal engine performance and emissions control?</i> • <i>How do OBD (On-Board Diagnostics) systems and I/M (Inspection and Maintenance) monitors assist in diagnosing vehicle issues, and how can they be used effectively alongside wiring diagrams and service information to ensure proper vehicle maintenance and repair?</i>	30 Classes	LT10: Engine Performance (Diag): I can diagnose and service components of engine, emissions, and exhaust systems, including understanding their configurations and components. General 1. Demonstrate understanding of proper engine cooling system operation. 2. Demonstrate understanding of camshaft timing including engines equipped with variable valve timing (VVT) systems. Ignition System 1. Identify computerized control system components and configurations. 2. Remove and replace spark plugs; inspect secondary ignition components for wear and damage. Fuel, Air Induction, and Exhaust Systems 1. Identify fuel, air induction, and exhaust system components and configurations. 2. Replace fuel filter(s) where applicable 3. Inspect, service, or replace air filters, filter housings, and intake duct work. 4. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields. 5. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields 6. Check and refill diesel exhaust fluid (DEF). LT11: Engine Performance (OBD and Emissions): I can utilize OBD (On-Board Diagnostics) systems and I/M (Inspection and Maintenance) monitors to assist in diagnosing vehicle performance issues. Computerized Controls 1. Identify computerized control system components and configurations
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		2. Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed. Emissions Control Systems 1. Identify emission control system components and configurations. 2. 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. 3. Diagnose emissions and driveability concerns caused by the evaporative emissions control (EVAP) system; determine needed action. 4. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.
Transferable Skills: Throughout Semester	Throughout	TRANSFERABLE SKILL - CREATIVE AND PRACTICAL PROBLEM SOLVING: I analyze, evaluate, and synthesize new and old information from multiple sources to build on knowledge and imagination to envision next steps. I observe and evaluate situations in order to define problems. I flexibly examine new approaches and ideas. TRANSFERABLE SKILL - EXPRESSION (SPEAKING, LISTENING, READING, WRITING, NON-VERBAL): I adjust communication based on the audience, context, and purpose. I demonstrate clear and concise communication: active listening, oral, written, multimedia, and/or performance. I use a positive voice and body. TRANSFERABLE SKILL - PRINCIPLED: I act with integrity and honesty. I use technology efficiently and appropriately to obtain, analyze, cite and use information demonstrating responsible digital citizenship.

The Patricia A. Hannaford Career Center ensures equal employment and educational opportunities regardless of race, color, creed, gender, age, handicapping condition/disability, national origin, or sexual orientation, in compliance with federal and state law