



Electrical/Electronic Systems and Heating Ventilation Air Conditioning (HVAC)

Career Cluster	Transportation, Distribution & Logistics
Course Code	20105
Prerequisite(s)	Introduction to Vehicle Systems and Maintenance or Maintenance and Light Repair - Recommended
Credit	1.0
Program of Study and Sequence	Foundational courses – Introduction to Vehicle Systems and Maintenance or Maintenance and Light Repair – Electrical/Electronic Systems and HVAC – Capstone Experience
Student Organization	SkillsUSA
Coordinating Work-Based Learning	N/A
Industry Certifications	Automotive Service Excellence (ASE) Student Certification
Dual Credit or Dual Enrollment	See: https://sdmylife.com/images/Approved-CTE-Dual-Credit.pdf
Teacher Certification	Transportation, Distribution & Logistics Cluster Endorsement; Automotive Technology Pathway Endorsement; *Automotive Technology
Resources	N/A

Course Description

Students in Electrical/Electronic Systems and Heating Ventilation Air Conditioning (HVAC) will learn theory and operation as well as diagnosis and repair of Electrical/Electronic and HVAC systems. Completion of this course will aid students as they continue their education at the post-secondary level or in the workforce and in preparation for the ASE certification test. Course standards are based on the Maintenance and Light Repair (MLR) standards for ASE MLR.

Program of Study Application

Electrical/Electronic Systems and Heating Ventilation Air Conditioning (HVAC) is an advanced pathway course in the Transportation, Distribution and Logistics career cluster, automotive technology pathway.

Course Standards

EEHVAC 1: Students will demonstrate automotive technology safety practices, including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements, for an automotive repair facility.	
<i>Webb Level</i>	<i>Sub-indicator</i>
Two Skills/Concepts	EEHVAC 1.1 Demonstrate automotive technician safety practices. <ul style="list-style-type: none"> ● Use protective clothing and safety equipment according to OSHA and EPA requirements ● Summarize the proper use of safety data sheet (SDS) ● Demonstrate the proper use of hand and power tools ● Examine basic shop safety using OSHA standards ● Maintain a portfolio of successfully completed safety and equipment exams

EEHVAC 2: Students will perform maintenance, diagnostic and repair procedures of electrical/electronic systems.	
<i>Webb Level</i>	<i>Sub-indicator</i>
Three Strategic Thinking	EEHVAC 2.1 Demonstrate knowledge of the vehicle electrical system. <ul style="list-style-type: none"> ● Research vehicle service information including vehicle service history, service precautions, and technical service bulletins ● Demonstrate knowledge of electrical/electronic series, parallel, and series and 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 ● Identify electrical/electronic system components and configuration
Two Skills/Concepts	EEHVAC 2.2 Test and repair electrical problems. <ul style="list-style-type: none"> ● Use a test light to check operation of electrical circuits ● Use fused jumper wires to check operation of electrical circuits ● Measure key-off battery drain (parasitic draw) ● Inspect and test fusible links, circuit breakers, and fuses; determine necessary action ● Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair) ● Use wiring diagrams to trace electrical/electronic circuits

EEHVAC 3: Students will perform maintenance, diagnostic and repair procedures while also identifying characteristics of high voltage battery systems.	
<i>Webb Level</i>	<i>Sub-indicator</i>

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One Recall	<p>EEHVAC 3.1 Identify battery requirements.</p> <ul style="list-style-type: none"> ● Identify safety precautions for high voltage systems on electric, hybrid electric, and diesel vehicles ● Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery ● Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures
Two Skills/Concepts	<p>EEHVAC 3.2 Service battery.</p> <ul style="list-style-type: none"> ● Perform battery state-of-charge test; determine necessary action ● Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine necessary action ● Maintain or restore electronic memory functions ● Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs ● Perform slow/fast battery charge according to manufacturer's recommendations ● Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply

EEHVAC 4: Students will perform maintenance, diagnostic and repair procedures of starting systems.	
<i>Webb Level</i>	<i>Sub-indicator</i>
One Recall	<p>EEHVAC 4.1 Explain starting system operation.</p> <ul style="list-style-type: none"> ● Demonstrate knowledge of an automatic idle-stop/start-stop system
Two Skill/Concept	<p>EEHVAC 4.2 Inspect and repair starting system.</p> <ul style="list-style-type: none"> ● Perform starter current draw test; determine necessary action ● Perform starter circuit voltage drop tests; determine necessary action ● Inspect and test starter relays and solenoids; determine necessary action ● Remove and install starter in a vehicle ● Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action

EEHVAC 5: Students will perform maintenance, diagnostic and repair procedures of the charging system.	
<i>Webb Level</i>	<i>Sub-indicator</i>
Two Skill/Concept	<p>EEHVAC 5.1 Remove, inspect, and replace charging system components.</p> <ul style="list-style-type: none"> ● Perform charging system output test; determine necessary action ● Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment ● Remove, inspect, and/or replace generator (alternator) ● Perform charging circuit voltage drop tests; determine necessary action

EEHVAC 6: Students will identify and perform repair procedures of electrical systems.	
<i>Webb Level</i>	<i>Sub-indicator</i>
Two Skill/Concept	EEHVAC 6.1 Identify and inspect lighting, instrument cluster, driver information, and body electrical systems and verify operation. <ul style="list-style-type: none"> ● Identify system voltage and safety precautions associated with high-intensity discharge headlights ● Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed ● Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators ● Verify windshield wiper and washer operation; replace wiper blades ● Describe the operation of keyless entry/remote-start systems
Two Skill/Concept	EEHVAC 6.2 Perform the following repair operations. <ul style="list-style-type: none"> ● Aim headlights ● Disable and enable supplemental restraint system (SRS) and verify indicator lamp operation ● Remove and reinstall door panel

EEHVAC 7: Students will research and identify heating, ventilation, and air conditioning components.	
<i>Webb Level</i>	<i>Sub-indicator</i>
One Recall	EEHVAC 7.1 Obtain vehicle service information on heating and air conditioning components. <ul style="list-style-type: none"> ● Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins ● Identify heating, ventilation and air conditioning (HVAC) components and configuration

EEHVAC 8: Students will inspect and understand repair procedures for the refrigeration system.	
<i>Webb Level</i>	<i>Sub-indicator</i>
Two Skill/Concept	EEHVAC 8.1 Inspect and demonstrate understanding of repair procedures for refrigeration system components. <ul style="list-style-type: none"> ● Inspect and replace A/C compressor drive belts, pulleys, and tensioners; visually inspect A/C components for signs of leaks; determine necessary action ● Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions ● Inspect A/C condenser for airflow restrictions; determine necessary action

EEHVAC 9: Students will perform repair procedures for the heating and cooling system.	
<i>Webb Level</i>	<i>Sub-indicator</i>

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Two Skill/Concept	EEHVAC 9.1 Analyze heating and engine cooling systems problems. <ul style="list-style-type: none"> ● Inspect engine cooling and heater systems hoses and pipes; determine necessary action
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EEHVAC 10: Students will perform inspection and identification procedures for the heating, ventilation and air conditioning (HVAC) system.	
<i>Webb Level</i>	<i>Sub-indicator</i>
Two Skill/Concept	EEHVAC 10.1 Inspect and identify operating systems and related controls. <ul style="list-style-type: none"> ● Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; determine necessary action ● Identify the source of A/C system odors

EEHVAC 11: Students will understand and apply appropriate business practices.	
<i>Webb Level</i>	<i>Sub-indicator</i>
Three Strategic Thinking	EEHVAC 11.1 Demonstrate the importance of, and the procedures for, maintaining accurate records.
Three Strategic Thinking	EEHVAC 11.2 Understand the concept and application of ethical business practices.
Three Strategic Thinking	EEHVAC 11.3 Understand the concept and application of excellent customer relations practices.