

Automotive Electronics

Course Number - 20105

Rationale Statement:

There is a high demand for trained individuals in the automotive service field. The desire for the students to receive industry-based training at the basic level and step up to the higher level of competency in this field is the ultimate goal of this course. Completion of this course will aide students as they continue their education at the post-secondary level or in the workforce and in the preparation for their ASE certification test. (The examples are NATEF Tasks that the student may complete for their ASE certification)

Suggested Grade Level: 10-12

Topics Covered:

- General electrical systems
- Battery components
- Starting system components
- Charging system components
- Lightning system components
- Horn and wiper/washer components
- Driver information systems
- Accessories systems
- Career exploration

Core Technical Standards & Examples

Indicator #0: Demonstrate automotive technology safety practices, including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements for an automotive repair facility	
Bloom's Taxonomy Level	Standard and Examples
Understand	AE0.1. Demonstrate Shop Safety Examples: <ul style="list-style-type: none">• Summarize the proper use of MSDS (Material Safety Data Sheet)• Demonstrate the proper use of hand and power tools• Examine basic shop safety using OSHA (Occupational Safety Health Administration) standards• Use protect clothing and equipment according to OSHA and EPA requirements• Maintain a portfolio of successfully completed safety and equipment exams

Indicator #1: Properly test, diagnose, service, and repair general electrical systems

Bloom's Taxonomy Level	Standard and Examples
Understand	<p>AE1.1. Demonstrate how to complete a work order Examples:</p> <ul style="list-style-type: none"> • Complete customer information • Fill in Vehicle information • Enter customer concern, causes, and corrections • Fill in service history
Apply	<p>AE1.2. Apply Ohm's law Examples:</p> <ul style="list-style-type: none"> • Use Ohm's law to calculate series circuits • Use Ohm's law to calculate parallel circuits • Use Ohm's law to calculate series-parallel circuits
Analyze	<p>AE1.3. Use a digital multimeter (DMM) to diagnose electrical circuits Examples:</p> <ul style="list-style-type: none"> • Measure voltage and calculate voltage drops • Analyze current flow • Test continuity and resistance • Evaluate key-off battery drain (parasitic draw) for acceptability
Analyze	<p>AE1.4. Identify and interpret electrical systems Examples:</p> <ul style="list-style-type: none"> • Analyze wiring diagrams to diagnose electrical problems • Analyze wiring diagrams to locate components
Evaluate	<p>AE1.5. Repair electrical problems Examples:</p> <ul style="list-style-type: none"> • Locate and analyze shorts, grounds, open, and resistance problems • Inspect and test fusible links, circuit breakers, and fuses • Test switches, connectors, relays, solid state devices, and wires
Evaluate	<p>AE1.6. Repair wiring problems Examples:</p> <ul style="list-style-type: none"> • Remove and replace terminal ends • Repair connectors and terminal ends • Repair wiring harness (including CAN/BUS systems) • Perform soldering repair on electrical wiring

Indicator #2: Properly test, diagnose, service, and repair a battery system

Bloom's Taxonomy Level	Standard and Examples
Analyze	<p>AE2.1. Service a battery system Examples:</p> <ul style="list-style-type: none"> • Identify electronic modules, security systems and/ or radios that require re-initialization or code entry following battery disconnect • Maintain or restore electronic memory functions • Inspect and clean battery cables, connectors, clamps ,and hold downs
Analyze	<p>AE2.2. Test and repair battery systems Examples:</p> <ul style="list-style-type: none"> • Perform battery state-of-charge test • Perform battery capacity test (or conductance test) • Calculate and confirm proper battery capacity for vehicle • Perform slow/fast charge • Start vehicle using jumper cables or auxiliary power supply
Understand	<p>AE2.3. Identify hybrid vehicle electrical systems Examples:</p> <ul style="list-style-type: none"> • Identify high voltage circuits and related safety precautions • Identify auxiliary (12V) battery service, repair, and testing

Indicator #3: Properly test, diagnose, service and repair starting system

Bloom's Taxonomy Level	Standard and Examples
Evaluate	<p>AE3.1. Test starting system Examples:</p> <ul style="list-style-type: none"> • Perform starter current draw test • Perform and calculate starter circuit voltage drop test • Inspect and test starter relays and solenoids • Inspect and test starter control circuit switches, connectors, and wires
Apply	<p>AE3.2. Service starter system Examples:</p> <ul style="list-style-type: none"> • Remove and install starter • Inspect and test switches, connectors, relays, and wires of starter control circuits

Create	AE3.3 Diagnose starter system Examples: <ul style="list-style-type: none"> • Differentiate between electrical and engine mechanical problems that cause slow or no crank • Develop a trouble shooting flow chart
Indicator #4: Properly test, diagnose, service and repair charging system	
Bloom's Taxonomy Level	Standard and Examples
Analyze	AE4.1. Test charging system Examples: <ul style="list-style-type: none"> • Perform charging system output test • Perform and calculate charging circuit voltage drop test • Analyze cause of under, over, and no charge
Evaluate	AE4.2. Service charging system Examples: <ul style="list-style-type: none"> • Remove inspect, and install generator (alternator) • Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioner; also check pulley and belt alignment

Indicator #5: Properly test, diagnose, service and repair lighting systems	
Bloom's Taxonomy Level	Standard and Examples
Evaluate	AE5.1. Test lighting system Examples: <ul style="list-style-type: none"> • Diagnose the cause of brighter than normal, intermittent, dim, or no light Inspect and diagnose incorrect turn signal or hazard light operation
Apply	AE5.2. Inspect lighting system Examples: <ul style="list-style-type: none"> • Inspect and replace headlamp bulbs • Aim headlamps
Understand	AE5.3. Identify safety precautions Examples: <ul style="list-style-type: none"> • Identify system voltages associated with high intensity discharge (HID) headlamps
Indicator #6: Properly test, diagnose, service and repair horn and wiper/washer systems	

Bloom's Taxonomy Level	Standard and Examples
Analyze	<p>AE6.1. Test horn & wiper/washer system</p> <p>Examples:</p> <ul style="list-style-type: none"> • Diagnose and correct improper horn operation • Identify and repair incorrect wiper operation • Analyze and repair incorrect washer operation

Indicator #7: Properly test, diagnose, service, and repair gauges, warning devices and driver information systems

Bloom's Taxonomy Level	Standard and Examples
Analyze	<p>AE7.1. Test warning devices and driver operation</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify and repair incorrect operation of warning devices • Analyze and correct improper operation of driver information systems
Evaluate	<p>AE7.2. Test gauge devices</p> <p>Examples:</p> <ul style="list-style-type: none"> • Diagnose gauge and sending units for intermittent, high, low, or no gauge readings • Evaluate and test connectors, wires, and printed circuit boards • Examine sensors, connectors, and wires for digital instrument circuits

Indicator #8: Properly test, diagnose, service and repair accessories

Bloom's Taxonomy Level	Standard and Examples
Evaluate	<p>AE8.1. Test body accessories</p> <p>Examples:</p> <ul style="list-style-type: none"> • Inspect operation of motor-driven accessories • Diagnose incorrect operation of heated glass, mirror, and seat operation • Disarm and enable supplemental restraint system (SRS) operation • Diagnose radio static and weak, intermittent, or no radio reception • Analyze body electrical system circuits using a scan tool • Evaluate incorrect operation of cruise control system • Check for module communication (including CAN/BUS system)

Indicator #9: Students explore career opportunities in the transportation, distribution, and logistics career cluster and develop leadership skills.

Bloom's Taxonomy Level	Standard and Examples
Understand	<p>AE9.1 Research career opportunities in the Transportation, Distribution and Logistics (TD&L) fields.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Utilizing career exploration software, research and write a report on career opportunities in the TD&L field • Utilizing career exploration software, research educational requirements for a chosen career path • Utilizing career exploration software, update student's portfolio