

# STRANDS AND STANDARDS

## ASE DIESEL ELECTRICAL SYSTEMS



### Course Description

This course is a follow up course to the Diesel IMMR and is in a sequence that prepares individuals to apply technical knowledge and skills to the specialized maintenance and repair of trucks, buses, and other commercial and industrial vehicles. Instruction covers training in the following areas: safety and electrical/electronic systems. Work ethics and productivity are an integral part of the classroom and lab activities of these courses.

<b>Intended Grade Level</b>	10-12
Units of Credit	1.0
Core Code	
Concurrent Enrollment Core Code	
Prerequisite	Diesel IMMR
Skill Certification Test Number	
Test Weight	
<b>License Area of Concentration</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Diesel Technician
Endorsement 2	
Endorsement 3	

## STRAND 1

Student will participate in personal and leadership development activities through SkillsUSA or another appropriate career and technical student organization.

### Standard 1

Student will use communication skills to effectively communicate with others.

- Understand when it is appropriate to listen and to speak.
- Understand and follow verbal and written instructions for classroom and laboratory activities.

### Standard 2

Student will effectively use teamwork to respectfully work with others.

- Identify and understand different roles in working with a team.

### Standard 3

Student will use critical thinking and problem-solving skills.

- Analyze the cause of the problem.
- Develop a solution to address the problem.
- Implement the plan.
- Evaluate the effectiveness of the plan.

### Standard 4

Student will be dependable, reliable, steady, trustworthy, and consistent in performance and behavior.

- Set and meet goals on attendance and punctuality.
- Prioritize, plan, and manage work to complete assignments and projects on time.

### Standard 5

Student will be accountable for results.

- Use an achievement chart for activities and behaviors in class that encourages a personal evaluation of classroom performance.
- File a regular written report on progress toward completion of assignments and projects.

### Standard 6

Be familiar with the legal requirements and expectations of the course.

- Be familiar with the course disclosure statement and all requirements for successful completion of the course.
- Demonstrate workplace ethics, e.g. fair, honest, disciplined.

## STRAND 2

Student will participate in work-place readiness activities.

### Standard 1

Student will demonstrate employability skills.

- Use a career search network to find career choices.
- Write a resume including a list of demonstrated skills.
- Write a letter of application.

- Complete a job application.
- Participate in an actual or simulated job interview.

## **Standard 2**

Student will participate in a work-based learning experience outside the classroom.

- Student will plan and implement a work-based learning experience aligned with their career goal.

## **STRAND 3**

**Students will understand general shop safety.**

### **Standard 1**

Learn safe working habits and procedures. Pass a safety test with 100 percent.

### **Standard 2**

Review the different types and hazards of solvents used.

### **Standard 3**

Review the different types, purposes, and hazards of automotive greases, oils, and additives.

### **Standard 4**

Review precautions in the use, handling, and storage of various solvents, cleaners, oils, greases, and additives.

### **Standard 5**

Review the gasses encountered in the diesel field and the hazards they present.

### **Standard 6**

Review the hazards and control of asbestos dust.

### **Standard 7**

Comply with safety rules for working with automotive chemicals (SDS).

## **Performance Skills**

- Pass safety test with 100%

## **STRAND 4**

**Students will inspect the General Electrical Systems and determine needed repair.**

### **Standard 1**

Research vehicle service information, including vehicle service history, service precautions, and technical service bulletins.

### **Standard 2**

Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).

**Standard 3**

Demonstrate proper use of test equipment when measuring source voltage, voltage drop (including grounds), current flow, continuity, and resistance.

**Standard 4**

Demonstrate knowledge of the causes and effects of shorts, grounds, opens, and resistance problems in electrical/electronic circuits; identify and locate faults in electrical/electronic circuits.

**Standard 5**

Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.

**Standard 6**

Measure parasitic (key-off) battery drain; determine needed action.

**Standard 7**

Demonstrate knowledge of the function, operation, and testing of fusible links, circuit breakers, relays, solenoids, diodes, and fuses; perform inspection and testing; determine needed action.

**Standard 8**

Inspect, test, repair (including solder repair), and/or replace components, connectors, seals, terminal ends, harnesses, and wiring; verify proper routing and securement; determine needed action.

**Standard 9**

Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings.

**Standard 10**

Diagnose faults in the data bus communications network; determine needed action.

**Standard 11**

Identify electrical/electronic system components and configuration.

**Standard 12**

Check frequency, pulse width, and waveforms of electrical/electronic signals using appropriate test equipment; interpret readings; determine needed repairs.

**Standard 13**

Understand the process for software transfer, software updates, and/or reprogramming of electronic modules.

**Performance Skills**

- Research vehicle service information, including vehicle service history, service precautions, and technical service bulletins.
- Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
- Demonstrate proper use of test equipment.
- identify and locate faults in electrical/electronic circuits.
- Use wiring diagrams during the diagnosis.
- Measure parasitic (key-off) battery drain

- Demonstrate knowledge of the function, operation, and testing of fusible links, circuit breakers, relays, solenoids, diodes, and fuses.
- Inspect, test, repair (including solder repair), and/or replace components, connectors, seals, terminal ends, harnesses, and wiring.
- Check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings.
- Diagnose faults in the data bus communications network.
- Identify electrical/electronic system components and configuration.
- Check frequency, pulse width, and waveforms of electrical/electronic signals using appropriate test equipment.
- Understand the process for software transfer, software updates, and/or reprogramming of electronic modules.

## **STRAND 5**

**Students will inspect the Battery System and determine needed repair.**

### **Standard 1**

Identify battery type and system configuration.

### **Standard 2**

Confirm proper battery capacity for application; perform battery state-of-charge test; perform battery capacity test, determine needed action.

### **Standard 3**

Inspect battery, battery cables, connectors, battery boxes, mounts, and hold-downs; determine needed action.

### **Standard 4**

Charge battery using appropriate method for battery type.

### **Standard 5**

Jump-start vehicle using a booster battery and jumper cables or using an appropriate auxiliary power supply.

### **Standard 6**

Identify low voltage disconnect (LVD) systems; determine needed action.

### **Standard 7**

Inspect, clean, and service battery; replace as needed.

### **Standard 8**

Inspect and clean battery boxes, mounts, and hold-downs; repair or replace as needed.

### **Standard 9**

Test, and clean battery cables and connectors; repair or replace as needed.

### **Standard 10**

Identify electrical/electronic modules, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery.

## Performance Skills

- Identify battery type and system configuration.
- Perform battery tests.
- Inspect battery, battery cables, connectors, battery boxes, mounts, and hold-downs.
- Charge battery using appropriate method.
- Jump-start vehicle using a booster battery and jumper cables or using an appropriate auxiliary power supply.
- Identify low voltage disconnect (LVD) systems.
- Inspect, clean, and service battery.
- Inspect and clean battery boxes, mounts, and hold-downs.
- Test, and clean battery cables and connectors.
- Identify electrical/electronic modules, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery.

## STRAND 6

**Students will inspect the Starting System and determine needed repair.**

### Standard 1

Demonstrate understanding of starter system operation.

### Standard 2

Perform starter circuit cranking voltage and voltage drop tests; determine needed action.

### Standard 3

Inspect and test starter control circuit switches (key switch, push button, and/or magnetic switch), relays, connectors, terminals, wires, and harnesses (including over-crank protection); determine needed action.

### Standard 4

Diagnose causes of no-crank or slow crank condition; differentiate between electrical and engine mechanical problems; determine needed action.

### Standard 5

Perform starter current draw tests; determine needed action.

### Standard 6

Remove and replace starter; inspect flywheel ring gear or flex plate.

## Performance Skills

- Demonstrate understanding of starter system operation.
- Perform starter circuit cranking voltage and voltage drop tests.
- Inspect and test starter control circuit switches, relays, connectors, terminals, wires, and harnesses.
- Diagnose causes of no-crank or slow crank condition; differentiate between electrical and engine mechanical problems.
- Perform starter current draw tests.
- Remove and replace starter; inspect flywheel ring gear or flex plate.

## STRAND 7

Students will inspect the Charging System and determine needed repair.

### Standard 1

Identify and understand operation of the generator (alternator).

### Standard 2

Test instrument panel mounted voltmeters and/or indicator lamps; determine needed action.

### Standard 3

Inspect, adjust, and/or replace generator (alternator) drive belt; check pulleys and tensioners for wear; check fans and mounting brackets; verify proper belt alignment; determine needed action.

### Standard 4

Inspect cables, wires, and connectors in the charging circuit.

### Standard 5

Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action.

### Standard 6

Perform charging circuit voltage drop tests; determine needed action.

### Standard 7

Remove, inspect, and/or replace generator (alternator).

## Performance Skills

- Identify and understand operation of the generator.
- Test instrument panel mounted voltmeters and/or indicator lamps.
- Inspect, adjust, and/or replace generator (alternator) drive belt; check pulleys and tensioners for wear; check fans and mounting brackets; verify proper belt alignment.
- Inspect cables, wires, and connectors in the charging circuit.
- Perform charging system voltage and amperage output tests; perform AC ripple test.
- Perform charging circuit voltage drop tests.
- Remove, inspect, and/or replace generator.

## STRAND 8

Students will inspect the Lighting Systems and determine needed repair.

### Standard 1

Diagnose causes of brighter-than-normal, intermittent, dim, or no-light operation; determine needed action.

### Standard 2

Test, replace, and aim headlights.

### Standard 3

Inspect cables, wires, and connectors in the lighting systems.

**Standard 4**

Inspect cables, wires, and connectors in the charging circuit. Diagnose faults in tractor-to-trailer multi-wire connector(s), cables, and holders; determine needed action.

**Standard 5**

Diagnose faults in switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of exterior lighting systems; determine needed action.

**Standard 6**

Diagnose faults in switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of interior lighting systems; determine needed action.

**Standard 7**

Diagnose faults in switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of auxiliary lighting circuits; determine needed action.

**Performance Skills**

- Diagnose causes of brighter-than-normal, intermittent, dim, or no-light operation.
- Test, replace, and aim headlights.
- Inspect cables, wires, and connectors in the lighting systems.
- Diagnose faults in tractor-to-trailer multi-wire connector(s), cables, and holders.
- Diagnose faults in switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of exterior lighting systems.
- Diagnose faults in switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of interior lighting systems.
- Diagnose faults in switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of auxiliary lighting circuits.

**STRAND 9**

**Students will Inspect and Repair the Instrument Cluster and Driver Information Systems.**

**Standard 1**

Check gauge and warning indicator operation.

**Standard 2**

Diagnose faults in the sensor/sending units, gauges, switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, printed circuits, and control components/modules of the instrument cluster, driver information systems, and warning systems; determine needed action.

**Standard 3**

Inspect, test, replace, and calibrate (if applicable) electronic speedometer, odometer, and tachometer systems.

**Performance Skills**

- Check gauge and warning indicator operation.
- Diagnose faults in the sensor/sending units, gauges, switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, printed circuits, and control components/modules of the instrument cluster, driver information systems, and warning systems.



- Inspect, test, replace, and calibrate (if applicable) electronic speedometer, odometer, and tachometer systems

## **STRAND 10**

### **Students will Inspect and Repair the Cab and Chassis Electrical Systems**

#### **Standard 1**

Diagnose operation of horn(s), wiper/washer, and occupant restraint systems.

#### **Standard 2**

Understand operation of safety systems and related circuits (such as: speed control, collision avoidance, lane departure, and camera systems).

#### **Standard 3**

Understand operation of comfort and convenience systems and related circuits (such as: power windows, power seats, power locks, remote keyless entry, steering wheel controls, and cruise control).

#### **Standard 4**

Understand operation of entertainment systems and related circuits (such as: radio, DVD, navigation, speakers, antennas, and voice-activated accessories).

#### **Standard 5**

Understand the operation of power inverter, protection devices, connectors, terminals, wiring, and control components/modules of auxiliary power systems.

#### **Standard 6**

Understand operation of telematics systems.

#### **Standard 7**

Diagnose faults in engine block and engine oil heater(s); determine needed action.

### **Performance Skills**

- Diagnose operation of horn(s), wiper/washer, and occupant restraint systems.
- Understand operation of safety systems and related circuits.
- Understand operation of comfort and convenience systems and related circuits.
- Understand operation of entertainment systems and related circuits.
- Understand the operation of power inverter, protection devices, connectors, terminals, wiring, and control components/modules of auxiliary power systems.
- Understand operation of telematics systems.
- Diagnose faults in engine block and engine oil heater.