



Western Technical College

32404304 Basic Electrical Systems

Course Outcome Summary

Course Information

Description	Diagnose, test, repair and replace basic automotive electrical system components. Includes an introduction to tools and equipment, automobile and shop safety and safety sheets are signed. Adequate shop time is provided for practical applications.
Career Cluster	Transportation, Distribution and Logistics
Instructional Level	Technical Diploma Courses
Total Credits	3
Total Hours	108

Pre/Corequisites

Pre/Corequisite 32404302 Introduction to Automotive Technology

Textbooks

Fundamentals of Automotive Technology. 3rd Edition. Copyright 2023. VanGelder, Kirk. Publisher: Jones & Bartlett Publishers. **ISBN-13:** 978-1-284-23035-2. Required.

Learner Supplies

Uniform: Three short sleeve, black/red shirts with embroidered name. **Vendor:** Campus Shop. Required.

Safety glasses with side eye protection that meet Z87 OSHA guidelines. **Vendor:** To be discussed in class. Required.

Six inch ankle high, quality leather work shoes - \$75.00-100.00. **Vendor:** To be discussed in class. Required.

Pocket knife, six inch metal pocket ruler (English/metric measurement), small pocket flashlight, and pocket flat head screwdriver - \$20.00. **Vendor:** To be discussed in class. Required.

Program Outcomes

1. Demonstrate professionalism appropriate for the auto service industry
2. Perform diagnosis, service, and repair of automotive electrical and electronic systems

Course Competencies

1. Explore basic electrical theory

Assessment Strategies

- 1.1. Simulation
- 1.2. Written Product
- 1.3. Written Objective Test

Criteria

You will know you are successful when:

- 1.1. you identify electrical circuit laws.
- 1.2. you demonstrate proper use of digital multimeter (DMM).
- 1.3. you demonstrate proper use of a test light and fuse jumpers to test an electrical circuit.
- 1.4. you apply electrical circuit knowledge to diagnose shorts, grounds, opens, and resistance problems.

Learning Objectives

- 1.a. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
- 1.b. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.
- 1.c. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
- 1.d. Demonstrate proper use of a test light on an electrical circuit.
- 1.e. Use fused jumper wires to check operation of electrical circuits.

2. Demonstrate correct methods of wire repair

Assessment Strategies

- 2.1. Skill Demonstration
- 2.2. Product

Criteria

You will know you are successful when:

- 2.1. you select the correct [TOOLS, EQUIPMENT, INSTRUMENTS, MATERIALS, SUPPLIES]
- 2.2. you strip insulation from wires.
- 2.3. you crimp terminal onto wires.
- 2.4. you solder connection to wires.
- 2.5. you insulate connection.

Learning Objectives

- 2.a. Replace electrical connectors and terminal ends.
- 2.b. Repair wiring harness.
- 2.c. Perform solder repair of electrical wiring.

3. Analyze driver information systems

Assessment Strategies

- 3.1. Written Objective Test

3.2. Written Product

Criteria

You will know you are successful when:

- 3.1. you check message center and driver warning indicators.
- 3.2. you determine potential cause.
- 3.3. you recommend potential repairs.

Learning Objectives

- 3.a. Check operation of drivers warning and information systems.
- 3.b. Determine potential cause of warning or message.
- 3.c. Determine necessary action for repair.

4. Evaluate lighting and horn systems

Assessment Strategies

- 4.1. Skill Demonstration
- 4.2. Written Objective Test
- 4.3. Written Product

Criteria

You will know you are successful when:

- 4.1. you select the correct [TOOLS, EQUIPMENT, INSTRUMENTS, MATERIALS, SUPPLIES]
- 4.2. you employ proper technique
- 4.3. you research vehicle service information.
- 4.4. you inspect lights.
- 4.5. you identify abnormal lamp operation.
- 4.6. you diagnose electrical circuits with the wiring diagram.

Learning Objectives

- 4.a. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 4.b. Check operation of brake stop light system.
- 4.c. Check operation of interior and exterior lighting systems
- 4.d. Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action.
- 4.e. Identify system voltage and safety precautions associated with high-intensity discharge headlights.
- 4.f. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.

5. Repair lighting and horn systems

Assessment Strategies

- 5.1. Skill Demonstration

Criteria

You will know you are successful when:

- 5.1. you research vehicle service information.
- 5.2. you repair electrical circuits using wiring diagrams.
- 5.3. you inspect, replace, and aim vehicle lights.
- 5.4. you construct a horn circuit using wiring diagram and training board.

Learning Objectives

- 5.a. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 5.b. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.
- 5.c. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
- 5.d. Aim headlights.

6. Evaluate battery systems

Assessment Strategies

- 6.1. Skill Demonstration

- 6.2. Written Objective Test
- 6.3. Written Product

Criteria

You will know you are successful when:

- 6.1. you employ proper technique
- 6.2. you select the correct [TOOLS, EQUIPMENT, INSTRUMENTS, MATERIALS, SUPPLIES]
- 6.3. you perform complete battery test.
- 6.4. you inspect hardware and test all related switches and connections.

Learning Objectives

- 6.a. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.
- 6.b. Inspect and test fusible links, circuit breakers, and fuses; determine needed action.
- 6.c. Perform battery state-of-charge test; determine needed action.
- 6.d. Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action.
- 6.e. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.

7. Repair battery systems

Assessment Strategies

- 7.1. Skill Demonstration

Criteria

You will know you are successful when:

- 7.1. you research vehicle service information.
- 7.2. you perform maintenance on battery and associated hardware while maintaining vehicle memory.
- 7.3. you replace battery and associated hardware while maintaining vehicle memory.
- 7.4. you charge battery per manufacturer's recommendation.
- 7.5. you will perform a vehicle-to-vehicle jump-start procedure.
- 7.6. you perform a jump start with auxiliary power supply.

Learning Objectives

- 7.a. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 7.b. Maintain or restore electronic memory functions.
- 7.c. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.
- 7.d. Perform slow/fast battery charge according to manufacturer's recommendations.
- 7.e. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
- 7.f. Remove and install battery in vehicle.

8. Evaluate starting systems

Assessment Strategies

- 8.1. Skill Demonstration
- 8.2. Written Objective Test
- 8.3. Written Product

Criteria

You will know you are successful when:

- 8.1. you employ proper technique
- 8.2. you select the correct [TOOLS, EQUIPMENT, INSTRUMENTS, MATERIALS, SUPPLIES]
- 8.3. you perform starter system test.
- 8.4. you diagnosis starter system concerns.
- 8.5. you test associated switches, connectors, and wiring.
- 8.6. you determine if engine mechanical issue is effecting starter system.

Learning Objectives

- 8.a. Perform starter current draw tests; determine needed action.
- 8.b. Perform starter circuit voltage drop tests; determine needed action.
- 8.c. Inspect and test starter relays and solenoids; determine needed action.
- 8.d. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank

condition.

8.e. Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.

9. Repair starting systems

Assessment Strategies

9.1. Skill Demonstration

Criteria

You will know you are successful when:

- 9.1. you research vehicle service information.
- 9.2. you remove the starter.
- 9.3. you replace the starter.

Learning Objectives

- 9.a. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 9.b. Remove and install starter in a vehicle.

10. Evaluate charging systems

Assessment Strategies

- 10.1. Skill Demonstration
- 10.2. Written Objective Test
- 10.3. Written Product

Criteria

You will know you are successful when:

- 10.1. you employ proper technique
- 10.2. you select the correct [TOOLS, EQUIPMENT, INSTRUMENTS, MATERIALS, SUPPLIES]
- 10.3. you perform a charging system test.
- 10.4. you diagnosis charging system concern.
- 10.5. you test associated switches, connectors, and wiring.

Learning Objectives

- 10.a. Perform charging system output test; determine needed action.
- 10.b. Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.
- 10.c. Perform charging circuit voltage drop tests; determine needed action.

11. Repair charging systems

Assessment Strategies

11.1. Skill Demonstration

Criteria

You will know you are successful when:

- 11.1. you research vehicle service information.
- 11.2. you remove alternator.
- 11.3. you replace alternator.
- 11.4. you remove, inspect, and replace belt.

Learning Objectives

- 11.a. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 11.b. Remove, inspect, and/or replace generator (alternator).
- 11.c. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.