



Course Outline

LAST REVIEW: 1999-2000

NEXT REVIEW: 2004-2005

STATUS: A

COURSE TITLE: Electrical Systems

COMMON COURSE NUMBER: AER1698C

CREDIT HOURS: 4

CONTACT HOUR BREAKDOWN

(per 16 week term)

CLOCK HOURS:

Lecture: 64 Lab: 48

(Voc. Course ONLY)

Clinic: Other: 73

PREREQUISITE(S):

COREQUISITE(S):

PRE/COREQUISITE(S):

COURSE DESCRIPTION: A course designed to teach the principles and operations of the basic electrical systems found in automotive equipment and to provide practical experience in the service and repair of or adjustment to these systems. Topics include batteries, starters, alternators, regulators, ignition systems, chassis electrical circuits, and electrical accessory circuits. Special emphasis will be given to safety procedures and the specific tools and equipment to be used.

UNIT TITLES:

1. Electrical and Electronic Fundamentals
2. Automotive Charging Systems
3. Automotive Cranking Systems
4. Automotive Ignition Systems
5. Lighting, Instruments, and Accessories

Course Overview:

Upon successful completion of this course, the students should be able to diagnose, replace, repair, and adjust automotive electrical and electronic systems.

II. Units:

Unit 1. Electrical and Electronic Fundamentals

General Outcome:

- 1.0 The students should be able to discuss the fundamental principles of electricity.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 1.1 Describe the principles of electricity and magnetism.
- 1.2 Define the concepts of voltage, amperage, resistance, conductivity, and insulation.
- 1.3 Describe series, parallel, and series parallel circuits.
- 1.4 Describe opens, grounds, shorts to power, shorts to ground and excessive resistance.
- 1.5 Demonstrate the proper use of digital and analog voltmeters, ammeters, ohmmeters, and test lights for basic circuit diagnosis.
- 1.6 Identify each of the following components:
 - 1.6.1 Wires
 - 1.6.2 Connectors
 - 1.6.3 Switches
 - 1.6.4 Fuses
 - 1.6.5 Fusible Links
 - 1.6.6 Circuit Breakers
 - 1.6.7 Voltage Limiters
 - 1.6.8 Resistors



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- 1.6.9 Capacitors
- 1.6.10 Transducers
- 1.6.11 Semiconductors
- 1.6.12 Diodes
- 1.6.13 Transistors
- 1.7 Describe the operation of each of the above components.
- 1.8 Describe the principles and operation of computers and micro-processors.
- 1.9 Define the following:
 - 1.9.1. Electronic control unit
 - 1.9.2. Electronic control module
 - 1.9.3. Central processing unit
 - 1.9.4. Microprocessor
 - 1.9.5. Digital fuel injection
 - 1.9.6. Electronic fuel injection
 - 1.9.7. Electronic spark control
 - 1.9.8. Electronic spark timing
 - 1.9.9. Electronic ignition
 - 1.9.10. Electronic voltage regulator
 - 1.9.11. Data panel
 - 1.9.12. Microprocessor control unit
 - 1.9.13. L.E.D. display or readout.
- 1.10 Describe the purpose and meaning of standard 1930 of the Society of Automotive Engineers.

Unit 2. Automotive Charging Systems

General Outcome:

- 2.0 The students should be able to describe the purpose, construction, and operation of charging systems.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 2.1 Identify the precautions necessary when working with lead-acid batteries.
- 2.2 Clean and test any automotive battery and properly interpret the test results.
- 2.3 Define the various battery ratings.
- 2.4 Discuss battery efficiency and variation in battery voltage.
- 2.5 Explain the construction and operation of various automotive storage batteries.
- 2.6 Charge and replace a battery in a vehicle.
- 2.7 Describe the purpose, construction, and operation of diode rectified generators and voltage regulators.
- 2.8 Diagnose charging system faults.
- 2.9 Remove, test, recondition, replace, and adjust faulty charging system components according to the manufacturer's specifications.



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Unit 3. Automotive Cranking Systems

General Outcome:

- 3.0 The students should be able to describe the purpose, construction, and operation of cranking systems.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 3.1 Describe the purpose, construction, and operation of cranking motors, including permanent magnet starters, starter switches, relays, solenoids, and inertia and overrunning clutch motor drives.
- 3.2 Diagnose cranking system problems.
- 3.3 Remove, recondition, adjust, and replace cranking systems components in accordance with manufacturer's specifications.

Unit 4. Automotive Ignition Systems

General Outcome:

4.0 The students should be able to describe the purpose, construction, and operation of ignition systems.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 4.1 Describe the purpose, construction, and operation of the electronic ignition system and its components, including distributor less ignition.
- 4.2 Describe the purpose, construction, and operation of the contact point ignition system and its components, including the ignition coil, distributor, high-tension wires, and spark plugs.
- 4.3 Remove, test, recondition, adjust, or replace faulty components according to the manufacturer's specifications.



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Unit 5. Lighting Instruments and Accessories

General Outcome:

5.0 The students should be able to discuss the purpose, construction, and operation of lighting systems, instruments, accessories, and wiring.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 5.1 Describe the purpose, construction, and operation of common lighting systems, regular and electronic instruments, accessories, and their components.
- 5.2 Diagnose problems in automotive lighting systems, regular and electronic instruments, accessories, and wiring, including parasitic drain.
- 5.3 Remove, test, adjust, and repair components of automotive lighting systems, regular and electronic instruments, and accessories, including windshield wiper and washer systems, power windows, seats, door locks, speed controls, automotive leveling systems, audible warning devices, and horns.
- 5.4 Remove, adjust and repair accessories, including windshield wiper and washer systems, power windows, seats, door locks, speed controls, automotive leveling systems, audible warning devices, retained accessory power systems remote keyless entry systems, remote power sliding doors, anti-theft devices, data and bus systems.