

AUT 163 (A6)
ADVANCED AUTOMOTIVE ELECTRICITY AND ELECTRONICS

COURSE DESCRIPTION:

Prerequisites: TRN 120

Corequisites: None

This course covers basic electronic theory, wiring diagrams, test equipment, and diagnosis /repair/replacement of electronics, lighting, gauges, driver Information, horn, wiper, accessories, and body modules. Topics include Networking and module communication, Circuit construction, wiring diagrams, circuit testing, and basic trouble shooting and emerging electrical/electronic systems technologies. Upon completion, students should be able to read and understand wiring diagrams, diagnose, test, and repair basic wiring, lighting, gauges, accessories, modules, and basic electronic concerns. Course Hours Per Week: Class, 2; Lab, 3. Semester Hours Credit, 3.

SAFETY DISCLAIMER:

Automotive work presents many hazards. A moment's carelessness can cause injury to oneself or to others. Such mishaps can occur quickly due, in part, to the nature of the industrial tools used in automotive work. The weight of automobiles and the equipment used to fix them can even cause fatal injuries. Therefore, great care must always be taken in checking out equipment before use, and in using that equipment to work on automobiles.

As we work to insure the safety of everyone in the Durham Tech automotive lab, it is the instructor's responsibility to introduce students to equipment and to advise them on its safe operation. Those health and safety procedures are also presented in each textbook for each course in the automotive program. **Students are responsible for mastery of that safety information.** Durham Tech holds each student in every class responsible for reading and applying all of the information regarding personal and public safety and personal and public health in the required text.

While working in the Durham Tech automotive lab, safety glasses must be worn by everyone. However, safety glasses are only one small requirement so that students remain injury free. All safety recommendations in the text book and from the instructor must be followed. A student with any questions about a safety procedure should immediately ask an instructor for clarification.

Any student using equipment in the automotive lab must be responsible for using that equipment in a safe manner. Durham Tech holds each student in automotive classes responsible for acting to ensure a safe environment and to ensure both the student's own safety and the safety of his classmates.

LEARNING OUTCOMES:

Upon completion of this course the student will be able to:

- a. Observe and perform safety procedures related to electronic systems

- b. Identify vehicle identification numbers, electronic service information, and service repair orders.
- c. Methodically approach and diagnosis problems in electrical/electronic systems, in order to make a direct, thorough and economical diagnosis.
- d. Do basic testing and service on body electrical/electronic systems and basic electrical systems
- e. Perform basic “in-car” diagnostics and repairs.
- f. Understand the basic concepts and procedures to successfully repair late model electrical/electronic systems.

OUTLINE OF INSTRUCTION:

I. Electronics

A. Systems

B. Modules

- 1) Types
- 2) Networking and Communications

II. Circuit Devices/Symbols

A. Diodes

- 1) Zener-Type
- 2) Photo-Type
- 3) LED's

B. Transistors

- 1) NPN
- 2) PNP
- 3) J-FET

C. Sensors

- 1) Hall effect
- 2) Variable reluctance sensor (VRS)
- 3) Piezoelectric
- 4) Piezoresistive
- 5) Thermister
- 6) Photoresister
- 7) Phototransistor
- 8) Potentiometer

III. Lighting Systems (Understand the Typical Operation for Each Circuit)

A. Headlight Circuit

- 1) High beam lamps
- 2) Low beam lamps
- 3) Dimmer switch
- 4) Switch rheostat
- 5) Daytime running lamps (DRLs)
- 6) Wiring
- 7) Test, aim, and replace headlights
- 8) High intensity discharge (HID) lamps

B. Stop Lamp Circuit (Including High Mount Lamp)

- 1) Adjust stop light switch
- 2) Test stop light portion of turn signal switch

- C. Directional Signal Circuit
 - 1) Flasher types
 - 2) Switch replacement
 - 3) Flashing speed
 - 4) Bulb wattage
- D. Hazard Warning Lights
- E. Tail Lamp Circuit
- F. Back-Up Lamp Circuit
- G. Instrument Panel Displays and Interior Lights
 - 1) Printed circuit boards/connectors/wires
 - 2) Liquid Crystal Display (LCD)
- H. Problem/Diagnosis
 - 1) Intermittent, dim, or no headlight operation
 - 2) No dash light brightness control
 - 3) No flash on one or both sides
 - 4) No hazard flasher lights
 - 5) Brighter than normal lights
 - 6) No back-up lights
 - 7) No tail lamps
 - 8) No stop lamps

IV. Accessory Systems

- A. Basic Theory of Operation for Each Component/Circuit
- B. Basic Troubleshooting Procedures (Including Printed Circuits)
 - 1) Oil sending unit
 - 2) Fuel gauge and tank sending unit
 - 3) Temperature warning
 - 4) Horns
 - 5) Constant voltage regulator for dash instruments
 - 6) Buzzer/relays/timers/voice alert
 - 7) Air bags
 - 8) Wiper/washer circuit
 - 9) Power side window and power side mirrors
 - 10) Power tailgate
 - 11) Power seat circuit and heated seat circuit
 - 12) Electric door locks
 - 13) Defogger switches, grid, and blower motors
 - 14) Radio power circuit
 - 15) Radio speaker and antenna (trim procedure)
 - 16) Cruise control cables, regulator, servo, and hoses
 - 17) Clock circuit
 - 18) Cigar lighter circuit
 - 19) Sunroof and convertible top circuits
 - 20) Keyless lock/unlock circuits
 - 21) Anti-theft circuits
 - 22) Electric door lock and illuminated entry
 - 23) Miles-to-empty fuel circuit
 - 24) Key fob transmitter circuit
 - 25) Scan tool diagnostics

C. Problem/Diagnosis

- 1) Slow, intermittent, or no power window operation
- 2) Radio static
- 3) Weak, intermittent, or no radio reception
- 4) Unregulated, intermittent, or no cruise control
- 5) Constant, intermittent, or no horn operation
- 6) Wiper speed control and park problems (including pulsating type)
- 7) No windshield washer operation
- 8) High, low, or no gauge readings
- 9) Constant warning buzzer operation
- 10) Poor rear window defogger operation
- 11) No power seat operation
- 12) No power window operation
- 13) Poor or no electric door lock operation
- 14) No keyless lock/unlock device operation
- 15) No electric sunroof or convertible top operation
- 16) Poor heated mirror operation
- 17) No clock operation

V. New Electrical/Electronics Technologies

REQUIRED TEXTBOOKS AND MATERIALS:

To be announced by the instructor.

NATEF:

This course fulfills 80 hours of the 230 hours required by **NATEF** for A6. See COE 111.