



MERCER
COUNTY COMMUNITY COLLEGE

COURSE OUTLINE

Course Number AUT 114	Course Title Automotive Electricity and Electronics	Credits 3
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Hours:
Lecture/Lab/Other
2/3

Co- or Pre-requisite
AUT 110 and AUT 111

Implementation
Semester & Year
Spring 2022

Catalog description: An examination of electrical/electronic principles applied to current automotive systems. Subjects include electronic control systems, starting and charging systems, wiring diagrams, chassis wiring service, vehicle communication networks, passive restraints, electrical power management, infotainment, navigation, and electrical accessories. Diagnostic skills, testing procedures, and proper service and repair of components emphasized.

General Education Category:
Not GenEd

Course coordinator:
Jason Evans, 609-570-3776, evansj@mccc.edu

Required texts & Other materials: Halderman, James D., Automotive Electricity and Electronics, Edition 6. Pearson Education Publishing, 2021
ISBN-13: 9780135764428

A basic calculator capable of adding, subtracting, multiplying, and dividing numbers. Cell phone calculators are not allowed during quizzes and exams.

Access to a personal laptop computer, tablet, or Chromebook is strongly recommended during class and lab.

Students must purchase safety glasses, work boots, and appropriate clothing to work in the automotive lab. This requirement is reviewed with the students on the first day of class. These items are not needed for the first class meeting of the term.

The following is provided at no charge to the students:
Vehicle service information provided through Stellantis, Subaru of America, Audi of America, or ALLDATA.

Accreditation Statement:

The Automotive Technology, Mopar CAP, Program is Master Automotive Service Technology (MAST) accredited by Automotive Service Excellence Education Foundation.
<https://www.aseeducationfoundation.org/>

Course Student Learning Outcomes (SLO):

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

1. Apply his/her knowledge of Ohm's Law. [Supports ILG # 2, 4, 10; PLO # 1, 3]
2. Apply diagnostic skills to diagnose concerns relating to the electrical and electronic systems used in current passenger vehicles or using an electrical (ATech) training board. [Supports ILG # 2, 3, 4, 11; PLO # 1, 2, 3, 4]
3. Select proper service repair information and procedures from the appropriate online service information database using the computers found in the automotive facility. [Supports ILG # 4, 10; PLO # 3]
4. Explain the theories of operation and service procedures necessary for vehicle electrical and electronic systems. [Supports ILG # 1, 11; PLO # 3, 4]
5. Recognize safety concerns during the service and repair of potentially dangerous electrical systems such as starting, charging, and passive restraint systems. [Supports ILG # 10, 11; PLO # 2, 3]
6. Identify the proper tools and equipment necessary for service of electrical and electronic systems. [Supports ILG # 4, 10; PLO # 3]
7. Analyze electronic data with a diagnostic scan tool. [Supports ILG # 2, 4, 10, 11, PLO # 1, 3]
8. Explain the characteristics of each vehicle communication network and provide a comparison between each type. [Supports ILG # 1, 11; PLO # 3, 4]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 1. Written and Oral Communication in English. Students will communicate effectively in both speech and writing.

Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Institutional Learning Goal 3. Science. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Institutional Learning Goal 10. Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes for Automotive Technology (PLO)

1. Diagnose, service, and repair current automotive technologies.
2. Demonstrate desirable attitudes and work habits while working individually or with others.
3. Obtain service repair information and procedures from online websites and electronic databases.
4. Communicate effectively and professionally with customers and fellow technicians.

Units of study in detail – Unit Student Learning Outcomes:

Unit I Review of Basic Electrical Fundamentals [Supports Course SLO # 1]

Learning Objectives

The student will be able to:

- Demonstrate his/her knowledge regarding the rules of voltage, current, and resistance
- Explain the different operating characteristic of series, parallel, and series-parallel circuits
- Explain potential causes of faults in series, parallel, and series-parallel circuits

Unit II Vehicle Communication Networks [Supports Course SLOs # 1, 2, 3, 4, 5, 6, 7, 8]

Learning Objectives

The student will be able to:

- Compare and contrast the characteristics of each vehicle communication network
- Compare network voltage measurements and evaluate for opens and shorts, using a digital volt ohm meter (DVOM)
- Identify vehicle concerns that have potential to be caused by communication network faults
- Locate the proper procedures for re-flashing or replacing electronic modules
- Explain the proper procedures for repairing faults in a vehicle communication network

Unit III The Principals of Automotive Charging Systems [Supports Course SLO # 1, 2, 3, 4, 5, 6, 7]

Learning Objectives

The student will be able to:

- Identify safety concerns when working on and around charging systems
- Identify the proper testing equipment necessary to evaluate a vehicle's charging system
- Perform a comprehensive charging system evaluation, including, using amperage and voltage output measurements and voltage drop testing, and recommend repairs and/or required maintenance
- Remove and install an alternator by following the manufacturer's published procedures
- Diagnose a charging system concern using service procedures published by the vehicle manufacturer

Unit IV The Principals of Automotive Starting Systems [Supports Course SLO # 1, 2, 3, 4, 5, 6, 7]

Learning Objectives

The student will be able to:

- Identify safety concerns when working on and around starting systems
- Identify the proper testing equipment necessary to evaluate a vehicle's starting system
- Demonstrate knowledge of a comprehensive starting system evaluation, including, using amperage draw measurements and voltage drop testing, and recommend repairs and/or required maintenance
- Show his or her knowledge of removal and installation procedures for a starter motor, by following the manufacturer's published procedures
- Demonstrate his or her knowledge of starting system concern diagnosis, using service procedures published by the vehicle manufacturer

Unit V **Electrical Power Management and Electronic Control Systems**
[Supports Course SLO # 1, 2, 3, 4, 7, 8]

Learning Objectives

The student will be able to:

- Locate appropriate wiring diagrams to aid in the diagnosis of faults in an automotive electrical system
- Demonstrate the diagnose of faults in driver-controlled electronic systems
- Produce a power-off-draw test to determine parasitic draw on a vehicle's electrical system
- Demonstrate his/her ability to diagnose electronic control circuits using ATech training boards (Receive a passing score on the Electronic Control Systems Skills Verification Assessment (Mopar CAP students only)

Unit VI **Infotainment Systems, Navigation Systems, and Accessories [Supports Course SLO # 2, 3, 4, 7]**

Learning Objectives

The student will be able to:

- Show the replacement of an instrument cluster by follow published service procedures
- Analyze the performance of a vehicle's infotainment and navigation system
- Explain the operation of navigation systems found in passenger vehicles
- Explain the operation of Bluetooth capability, hands-free connectivity, auxiliary stereo inputs, and wireless cellular telephone charging
- Analyze inputs to electronic convenience features, using a computerized diagnostic scan tool
- Analyze the operation of infotainment systems to verify or validate common customer concerns, using the proper special service tools

Unit VII **Occupant Restraint and Passenger Safety Systems [Supports Course SLO # 1, 2, 3, 4, 5, 6, 7]**

Learning Objectives

The student will be able to:

- Identify the different passive restraint systems in a given vehicle
- Explain which components in a passive restraint systems require replacement following an air bag deployment event
- Analyze the cause of passive restraint system faults
- Use published safety procedures when servicing passive restraint systems
- Describe the design, operation, and purpose of all air bag types, air bag modules, crash sensors, occupant classification systems, seat belt retraction systems, seat belt pretensioner devices, body structural members, and interior trim components as they contribute to passenger safety during a vehicle collision or roll over event
- Use published service procedures to remove and install a passenger air bag assembly
- Use published service procedures to remove and install a clock spring assembly

Evaluation of student learning:

Students are evaluated using weekly quizzes, a mid-term exam, a final exam, graded homework assignments, and hands-on work assignments in the automotive laboratory. Students are expected to read the assigned textbook chapters, handouts, and complete vehicle manufacturers' training material (if applicable) outside of class and at appropriate times throughout the course.

Please note that:

- Any student who scores below a 60% (D) on the final exam must repeat the course
- Students enrolled in the any automotive program option sponsored by a vehicle manufacturer (Mopar CAP, Subaru University, or Audi AEP) must complete all vehicle manufacturer web courses, post-tests, and proctored assessments assigned at the start of the semester. The assigned web courses, post-test, and proctored assessments are in addition to the standard course assignments shown below. Due dates for each assigned web course, post-test, and proctored assessment is discussed in class, but all of them must be finished and passed before the beginning of the last week of the term.

Below is a list of the tools used for assessing student learning outcomes in this course. The percentages shown after each assessment tool refers to the weight each assessment has on a student's final course grade. Percentages are approximate.

Exams 40%

Quizzes 20%

Hands-On Lab Assignments 30%

Homework 10%

Policy Statement for Missed Lab Demonstrations:

Due to the concerns for student and staff safety, a student who does not attend tool, equipment, and procedure demonstrations performed by the course instructor, prior to a hands-on learning activity, may be excluded from participating in the hands-on activity. This occurs because the tools, equipment, and chemicals necessary to complete automotive diagnosis and service often present safety hazards for users and observers if the correct handling procedures are not followed.

Reasons for not attending demonstrations may include full or partial absence during the demonstration, or if a student does not give his or her full attention during the demonstration. Enforcement of this classroom policy is at the discretion of the course instructor, and is based largely on the dangers involved with the use of the necessary tools, equipment, and chemicals required to complete the hands-on activity, and the time necessary to complete a make-up demonstration.