# COURSE OUTLINE

| Course Number | Course Title | Credits |
|---|---|---|
| **AUT 110** | **Introduction to Automotive Electronics** | **3** |

| Hours: Lecture/Lab/Other | Co- or Pre-requisite | Implementation Semester & Year |
|---|---|---|
| **3/1** | **Co: MAT 037 or MAT 042 AND AUT 111** | **Spring 2022** |

**Catalog description:** An introduction to voltage, current, and resistance, series and parallel circuits, batteries, and electronic components. Wiring schematics, wire repair and circuit troubleshooting are also covered. This course is for automotive technology students.

**General Education Category:**
**Not GenEd**

**Course coordinator:**
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**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 though 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. Demonstrate and apply his/her knowledge of electron theory and conventional theory. [Supports ILG # 2, 4, 11; PLO # 1]
2. Predict circuit voltage, current, and resistance of all components, given an automotive electrical schematic of a series circuit. [Supports ILG # 2, 4, 11 ; PLO # 1]
3. Predict circuit voltage, current, and resistance of all components, given an automotive electrical schematic of a parallel circuit. [Supports ILG # 2, 4, 11 ; PLO # 1]
4. Predict circuit voltage, current, and resistance of all components, given an automotive electrical schematic of a series-parallel circuit. [Supports ILG # 2, 4, 11; PLO # 1]
5. Demonstrate an understanding of the proper use of a digital multimeter by successfully measuring voltage, current, resistance, and voltage drop on sample test circuits. [Supports ILG # 4, 10, 11; PLO # 1]
6. Demonstrate the proper procedure for repairing a damaged wire by using electrical soldering tools and supplies. [Supports ILG # 1; PLO # 4]
7. Identify the proper tools, equipment, and materials necessary properly test and repair electrical circuits. [Supports ILG # 1, 4, 10, 11; PLO # 1, 2, 3]
8. Apply his or her knowledge to diagnose basic automotive electrical concerns using electrical testing tools and wiring diagrams, on a live vehicle with an electrical concern or an electrical training aid with an installed electrical fault. [Supports ILG # 3, 4, 10, 11; PLO # 1, 2, 3, 4]
9. Identify potential dangers with testing and repairing electrical systems and components. [Supports ILG # 4, 10, 11; PLO # 2, 3]

## 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** **Introduction to Electricity [Supports Course SLO # 1]**

***Learning Objectives***

***The student will be able to:***

- Demonstrate their understanding of current flow using both conventional theory and electron theory.
- Explain the units of electrical measurement and be able to convert between different units of electrical measurement.
- Explain the differences between conductors, semiconductors, and insulators.
- Describe what components make up a complete circuit.
- Describe the different types of electrical circuit faults.
- Describe Ohm's Law and Watt's Law as they apply to automotive electrical circuits.

**Unit II** **Series Circuits [Supports Course SLOs # 2, 5, 7, 8]**

***Learning Objectives***

***The student will be able to:***

- Explain current flow through a series circuit.
- Apply his or her knowledge of Ohm's Law to calculate voltage, current, and resistance in different components found in a series circuit.
- Describe how different faults in a series circuit will influence the operation of the circuit.
- Explain voltage drop testing and its benefits toward finding excessive electrical resistance in a circuit.
- Apply his or her knowledge of series circuit construction, using a training aid.

**Unit III** **Parallel Circuits [Supports Course SLO # 3, 5, 7, 8]**

***Learning Objectives***

***The student will be able to:***

- Explain current flow through a parallel circuit, using the rules of Kirchhoff's Law.
- Apply his or her knowledge of parallel circuits to calculate voltage, current, and resistance in all parts of a parallel circuit.
- Describe how different faults in a parallel circuit will influence the operation of the circuit.
- Apply voltage drop testing procedures to check the operation of a parallel circuit.
- Apply his or her knowledge of parallel circuit construction, using a training aid.

**Unit IV** **Series-Parallel Circuits [Supports Course SLO # 4, 5, 7, 8]**

***Learning Objectives***

***The student will be able to:***

- Explain current flow through a series-parallel circuit.
- Apply his or her knowledge of compound circuits to calculate voltage, current, and resistance in all parts of a series-parallel circuit.
- Describe how different faults in a series-parallel circuit will influence the operation of the circuit.
- Apply voltage drop testing procedures to check the operation of a series-parallel circuit.
- Apply his or her knowledge of series-parallel circuit construction, using a training aid.

**Unit V** **Electrical Testing Tools and Techniques [Supports Course SLO # 5, 7, 9]**

***Learning Objectives***

***The student will be able to:***

- Explain the application of a fused jumper wire, powered and non-powered 12-volt test light, logic probe, digital volt ohm meter (DVOM), inductive ammeter, and oscilloscope.
- Explain how to check electrical testing tools for functionality prior to using them to test a circuit.
- Demonstrate how to properly operate and connect a DVOM to a circuit to measure voltage, current, and resistance.
- Explain the dangers involved when testing high voltage electrical circuits.

**Unit VI** **Automotive Wiring, Wiring Schematics (Diagram), and Wiring Repair [Supports Course SLO # 6, 7]**

***Learning Objectives***

***The student will be able to:***

- Describe what information is included on an automotive wiring schematic.
- Analyze automotive wiring schematics to locate vehicle components, using the features of online wiring schematics.
- Explain American Wire Gauge (AWG)/metric wire gauge measurement systems and how conductor size influences circuit performance.
- Demonstrate the proper procedure for repairing damaged electrical wiring in an automobile.
- Demonstrate a pin drag test on a live vehicle or sample electrical connector, and explain why such a test is important in electrical concern diagnosis.

**Unit VII** **Capacitance and Electromagnetism [Supports Course SLO # 1, 3, 4, 7, 9]**

***Learning Objectives***

***The student will be able to:***

- Explain the operation and construction of a capacitor.
- Explain where which systems in an automobile may use capacitors.
- Explain the hazards involved with handling capacitors.
- Explain how an automotive component creates an electromagnetic field.
- Explain common areas in a vehicle that require the use of electromagnetism.
- Explain the operation of 12-volt automotive ISO relays, and the purpose of these relays.

**Unit VIII** **Automotive Batteries, Battery Testing, and Battery Service [Supports Course SLO # 1, 5, 7, 8, 9]**

***Learning Objectives***

***The student will be able to:***

- Explain the construction of different 12-volt automotive battery types.
- Explain the specification ratings of 12-volt automotive batteries.
- Explain the discharge and recharge chemistry of a 12-volt automotive battery.
- Identify hazards involved when working near automotive batteries.
- Describe the tools and personal protective equipment (PPE) necessary to test, clean, charge, replace, and safely handle 12-volt automotive batteries.
- Describe the importance of proper recycling of used automotive 12-volt batteries.

**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
- AUT 110 is a prerequisite course to all other automotive courses in the curriculum. Therefore, a minimum course grade of 70% (C) is needed to pass AUT 110.
- 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 35%
Quizzes 15%
Hands-On Lab Assignments 30%
Homework 20%

**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.