COURSE OUTLINE

Course Number
AUT 114
Course Title
Automotive Electricity and Electronics
Credits
3

Hours: lecture/Lab/Other
2/3

Co- or Pre-requisite
AUT 110 and AUT 111

Implementation
sem/year
Spring 2021

Catalog description (as it appears in 2020-2021 edition):
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.

Is course New, Revised, or Modified? Revised

Required texts/other materials: Halderman, James D., Automotive Electricity and Electronics, (Current edition), Pearson Education Publishing
Basic calculator (Does not need graphing capability)

Revision date: Spring 2020

Course coordinator: Jason Evans evansj@mccc.edu, ext. 3776

Information resources: DealerConnect web-site, service manuals, Subaru of America resources, online and self-study courses and the AllData online service information database

Other learning resources: (Describe any other student learning resources that are specific to this course, including any special tutoring or study group support, learning system software, etc.)

Course Competencies/Goals:
The student will be able to:
1. Apply his/her knowledge of Ohm’s Law
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
3. Obtain service repair information and procedures from the appropriate online service information database using the computers found in the automotive facility.
4. Explain the theories of operation and service procedures necessary for vehicle electrical and electronic systems
5. Recognize safety concerns during the service and repair of potentially dangerous electrical systems such as starting, charging, and passive restraint systems
6. Identify the proper tools and equipment necessary for service of electrical and electronic systems 
7. Analyze electronic data with a diagnostic scan tool 
8. Explain the characteristics of each vehicle communication network and provide a comparison between each type

Course-specific Institutional Learning Goals (ILGs)/General Education Goals.

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

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.

Units of study in detail.

Unit I: Review of Basic Electrical Fundamentals

The student will be able to:

• Demonstrate his/her knowledge regarding the rules of voltage, current, and resistance (Course Competency 1; ILG 1)
• Explain the different operating characteristic of series, parallel, and series-parallel circuits (Course Competency 1; ILG 1)
• Explain potential causes of faults in series, parallel, and series-parallel circuits (Course Competencies 1 & 2; ILG 1)

Unit II: Vehicle Communication Networks

The student will be able to:

• Compare and contrast the characteristics of each vehicle communication network (Course Competency 8)
• Use a digital volt ohm meter (DVOM) to take network voltage measurements and evaluate for opens and shorts (Course Competencies 1, 2, & 3; ILG 10)
• Identify vehicle concerns that have potential to be caused by communication network faults (Course Competencies 4 & 8; ILG 11)
• Locate the proper procedures for re-flashing or replacing electronic modules (Course Competencies 3 & 7; ILGs 4 & 10)
• Explain the proper procedures for repairing faults in a vehicle communication network (Course Competencies 1, 3, 4, 5, & 6; ILG 10)

Unit III: The Principals of Automotive Charging Systems

The student will be able to:

• Identify safety concerns when working on and around charging systems (Course Competencies 3 & 5; ILG 4)
• Identify the proper testing equipment necessary to evaluate a vehicle’s charging system (Course Competencies 3 & 6; ILG 4)
• Perform a comprehensive charging system evaluation, including, using amperage and voltage output measurements and voltage drop testing, and recommend repairs and/or required maintenance (Course Competencies 1, 3, 6, & 7; ILGs 4, 10, & 11)
• Remove and install an alternator by following the manufacturer’s published procedures (Course Competencies 3, 5, & 6; ILGs 4 & 10)
• Diagnose a charging system concern using service procedures published by the vehicle manufacturer (Course Competencies 2, 3, & 6; ILGs 4, 10, & 11)

Unit IV: The Principals of Automotive Starting Systems
The student will be able to:
• Identify safety concerns when working on and around starting systems (Course Competency 5; ILGs 1 & 4)
• Identify the proper testing equipment necessary to evaluate a vehicle’s starting system (Course Competencies 2, 5, & 6; ILGs 4 & 10)
• Perform a comprehensive starting system evaluation, including, using amperage draw measurements and voltage drop testing, and recommend repairs and/or required maintenance (Course Competencies 3, 4, & 5; ILGs 4 & 10)
• Remove and install a starter motor by following the manufacturer’s published procedures (Course Competencies 3 & 6; ILGs 4 & 10)
• Diagnose a starting system concern using service procedures published by the vehicle manufacturer (Course Competencies 2, 3, & 6; ILGs 4, 10, & 11)

Unit V: Electrical Power Management and Electronic Control Systems
The student will be able to:
• Locate appropriate wiring diagrams to aid in the diagnosis of faults in an automotive electrical system (Course Competency 3; ILG 4)
• Diagnose and explain the necessary repairs for faults in driver controlled electronic systems (Course Competencies 2, 3, & 6; ILGs 10, & 11)
• Perform a power-off-draw test to determine parasitic draws on a vehicle’s electrical system (Course Competencies 1, 3, 6, & 7; ILGs 4 & 10)
• 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)) (Course Competencies 1, 2, & 6; ILGs 4 & 10)

Unit VI: Infotainment Systems, Navigation Systems, and Accessories
The student will be able to:
• Follow published procedures to perform the replacement of an instrument cluster (Course Competencies 3 & 6; ILGs 4 & 10)
• Evaluate the performance of a vehicle’s infotainment and navigation system (Course Competencies 3 & 4; ILGs 4 & 10)
• Explain the operation of navigation systems found in passenger vehicles (Course Competency 4; ILG 1)
• Explain the operation of Bluetooth capability, hands-free connectivity, auxiliary stereo inputs, and wireless cellular telephone charging (Course Competency 4; ILG 1)
• Use a diagnostic scan tool to check inputs to electronic convenience features (Course Competency 7; ILG 4)
• Use the proper special service tools to evaluate the operation of infotainment systems to verify or invalidate common customer concerns (Course Competencies 3, 4, & 6; ILGs 4 & 10)

Unit VII: Occupant Restraint and Passenger Safety Systems

The student will be able to:

• Identify the different passive restraint systems in a given vehicle (Course Competency 3; ILG 4)
• Explain which components in a passive restraint systems require replacement following an air bag deployment event (Course Competency 3; ILG 4)
• Diagnose passive restraint system faults (Course Competencies 2, 3, 5, 6, & 7; ILGs 4, 10, & 11)
• Exercise published safety procedures when servicing passive restraint systems (Course Competencies 3, 5, & 6; ILGs 4 & 10)
• 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 pre-tensioner devices, body structural members, and interior trim components as they contribute to passenger safety during a vehicle collision or roll over event (Course Competencies 3 & 4; ILG 4)
• Remove and install a passenger air bag assemblies by following published service procedures (Course Competencies 3 & 5; ILGs 4 & 10)
• Remove and install a clock spring assembly by following published service procedures (Course Competencies 3 & 5; ILGs 4 & 10)

Policy Statement for Missed Lab and Equipment Demonstrations:

Due to the technical nature of the Automotive Program and hazards involved with the use of specialty tools and equipment, a student that is absent from lab instruction, where demonstrations are performed by the course instructor, will not be permitted to complete the related lab work upon their return. This includes full-day absences and partial-day absences that result in missing the lab demonstration(s). Enforcement of these policies will be at the discretion of the course instructor.

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 manufacturers’ training material (if applicable) 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 Mopar Career Automotive Program (Mopar CAP) must complete all course-related Fiat Chrysler Automobiles (FCA) web courses and post-tests assigned at the start of the semester. The Mopar CAP requirements are in addition to the requirements stated above.
**Academic Integrity Statement:**

A student who knowingly represents the work of others as his/her own, uses or obtains unauthorized assistance in the execution of any academic work, gives fraudulent assistance to another student, or inappropriately or unethically uses technological means for academic gain is guilty of cheating. Submitting your own work from a previous course without the permission of your current course instructor is also deemed an academic integrity violation (See Student Handbook). Any student who violates this policy is subject to receive a failing grade for the assignment and will be reported to the Office of Student Affairs for further disciplinary action. Possible dismissal from the course could result.

**Reasonable Accommodations for Students with Documented Disabilities**

Mercer County Community College is committed to supporting all students in their academic and co-curricular endeavors. Each semester, a significant number of students document disabilities, which may require learning, sight, hearing, manual, speech, or mobility accommodations to ensure access to academic and co-curricular activities. The college provides services and reasonable accommodations to all students who need and have a legal entitlement to such accommodations.

For more information regarding accommodations, you may visit the Office of Academic Support Services in FA129 or contact them at 609.570.3422

Mercer County Community College is in compliance with both the ADA and section 504 of the Rehabilitation Act. If you have, or believe you have, a differing ability that is protected under the law, please see Arlene Stinson in LB216, at 609-570-3525 or at stinsona@mccc.edu for information regarding support services.