

AUTO 011B: AUTO ELECTRONICS & ELECTRICAL SYSTEMS

Originator

dredman

Co-Contributor(s)**Name(s)**

Anderson, Dorothy

Justification / Rationale

The Automotive Faculty are reviewing and/or updating this course to assure compliance with local, State, and Federal regulations; support consistency within the curriculum; practice relevance in regard to automotive industry and community; and to make improvements that will strengthen the learning environment this course creates thus benefiting the learners.

Effective Term

Fall 2022

Credit Status

Credit - Degree Applicable

Subject

AUTO - Automotive Technology

Course Number

011B

Full Course Title

Auto Electronics & Electrical Systems

Short Title

AUTO ELEC

Discipline**Disciplines List**

Automotive Technology

Modality

Face-to-Face

Hybrid

Catalog Description

This course provides theory and hands-on experience in the fundamentals of automotive electricity and electronics including basic electrical principles, circuit components, circuit types, electrical system service and maintenance, diagnosis and repair of common circuit malfunctions. The focus is then placed on foundational automotive electrical components and systems including: batteries, starting systems and charging systems with an emphasis on troubleshooting, diagnosis and repair of common electrical system malfunctions. A \$20.00 test fee for the appropriate Automotive Service Excellent (ASE) Student Exam is required. A uniform is required for this course.

Schedule Description

This class provides lecture/discussion and hands-on experience understanding, servicing, troubleshooting, diagnosing and repairing fundamental automotive electrical circuit and system malfunctions. A \$20.00 test fee for the appropriate Automotive Service Excellent (ASE) Student Exam is required. A uniform is required for this course.

Prerequisite: AUTO 010 or concurrent enrollment

Lecture Units

3

Lecture Semester Hours

54

Lab Units

1

Lab Semester Hours

54

In-class Hours

108

Out-of-class Hours

108

Total Course Units

4

Total Semester Hours

216

Prerequisite Course(s)

AUTO 010 or concurrent enrollment

Required Text and Other Instructional Materials**Resource Type**

Book

Open Educational Resource

No

Author

Various authors

Title

ASE Automotive Suite (Text, shop manual, and workbook for all 8 ASE automotive categories)

Edition

7th

City

Tinley Park, Illinois

Publisher

Goodheart-Wilcox

Year

2021

College Level

Yes

Flesch-Kincaid Level

11.7

ISBN #

978-1-64564-559-7

Resource Type

Book

Author

M. Ellison

Title

Automobiles Have Computers

Edition

1

City

Dubuque, IA

Publisher

Kendal Hunt

Year

2022

College Level

Yes

Flesch-Kincaid Level

13

ISBN #

978-1-7924-9479-6

Class Size Maximum

24

Entrance Skills

Perform starter current draw tests; determine necessary action. Perform starter circuit voltage drop tests; determine necessary action. Inspect and test starter relays and solenoids; determine necessary action. Remove and install a starter in a vehicle.

Requisite Course Objectives

AUTO 010-Describe shop safety practices and proper procedures regarding handling hazardous material.
AUTO 010-Properly position and lift a vehicle using a floor jack and jack stands and a vehicle hoist.

Entrance Skills

Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action.

Requisite Course Objectives

AUTO 010-Describe shop safety practices and proper procedures regarding handling hazardous material.
AUTO 010-Locate applicable vehicle service specifications and procedures using the latest online service information.
AUTO 010-Test drive a vehicle to verify the concern and the repair.

Entrance Skills

Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law). Use wiring diagrams during diagnosis of electrical circuit problems. Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems.

Requisite Course Objectives

AUTO 010-Describe shop safety practices and proper procedures regarding handling hazardous material.
AUTO 010-Locate applicable vehicle service specifications and procedures using the latest online service information.
AUTO 010-Properly connect a digital multimeter and read volts, amps and ohms on a basic electrical circuit.

Entrance Skills

Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action. Measure and diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.

Requisite Course Objectives

AUTO 010-Identify and describe the purpose of the following components and systems: engine, transmission, suspension, braking system, fuel system, ignition system, electrical system and steering system.

AUTO 010-Perform a detailed vehicle inspection.

AUTO 010-Properly connect a digital multimeter and read volts, amps and ohms on a basic electrical circuit.

Course Content

1. SP2 safety training.
2. Overview of automotive electrical systems.
3. Basic electrical theory.
4. Electrical components.
5. Wiring and circuit diagrams.
6. Batteries.
7. Starting systems.
8. Charging systems.
9. Electrical accessories.
10. Automotive industry web-based training modules.

Lab Content

1. Required tasks to meet the Automotive Service Excellence (ASE) 2017 Master Automotive Service Technician (MAST) standards.
2. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
3. Identify and interpret electrical/electronic system concern; determine necessary action.
4. Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins.
5. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).
6. Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law).
7. Use wiring diagrams during diagnosis of electrical circuit problems.
8. Demonstrate the proper use of a digital multi-meter (DMM) during diagnosis of electrical circuit problems.
9. Check electrical circuits with a test light; determine necessary action.
10. Measure source voltage and perform voltage drop tests in electrical/electronic circuits using a voltmeter; determine necessary action.
11. Measure current flow in electrical/electronic circuits and components using an ammeter; determine necessary action.
12. Check continuity and measure resistance in electrical/electronic circuits and components using an ohmmeter; determine necessary action.
13. Check electrical circuits using fused jumper wires; determine necessary action.
14. Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.
15. Measure and diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action.
16. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
17. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; perform necessary action.
18. Perform battery state-of-charge test; determine necessary action.
19. Perform battery capacity test (or conductance test); confirm proper battery capacity for vehicle application; determine necessary action.
20. Maintain or restore electronic memory functions.
21. Inspect, clean, fill, and replace battery.
22. Perform slow/fast battery charge.
23. Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.
24. Start a vehicle using jumper cables and a battery or auxiliary power supply.
25. Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures.
26. Perform starter current draw tests; determine necessary action.
27. Perform starter circuit voltage drop tests; determine necessary action.
28. Inspect and test starter relays and solenoids; determine necessary action.
29. Remove and install starter in a vehicle.
30. Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action.

31. Perform charging system output test; determine necessary action.
32. Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions.
33. Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment.
34. Remove, inspect, and install generator (alternator).
35. Perform charging circuit voltage drop tests; determine necessary action.

Course Objectives

	Objectives
Objective 1	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
Objective 2	Identify and interpret electrical/electronic system concern; determine necessary action.
Objective 3	Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins.
Objective 4	Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).
Objective 5	Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law).
Objective 6	Use wiring diagrams during diagnosis of electrical circuit problems.
Objective 7	Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems.
Objective 8	Check electrical circuits with a test light; determine necessary action.
Objective 9	Measure source voltage and perform voltage drop tests in electrical/electronic circuits using a voltmeter; determine necessary action.
Objective 10	Measure current flow in electrical/electronic circuits and components using an ammeter; determine necessary action.
Objective 11	Check continuity and measure resistance in electrical/electronic circuits and components using an ohmmeter; determine necessary action.
Objective 12	Check electrical circuits using fused jumper wires; determine necessary action.
Objective 13	Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.
Objective 14	Measure and diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action.
Objective 15	Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
Objective 16	Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; perform necessary action.
Objective 17	Perform battery state-of-charge test; determine necessary action.
Objective 18	Perform battery capacity test (or conductance test); confirm proper battery capacity for vehicle application; determine necessary action.
Objective 19	Maintain or restore electronic memory functions.
Objective 20	Inspect, clean, fill, and replace battery.
Objective 21	Perform slow/fast battery charge.
Objective 22	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.
Objective 23	Start a vehicle using jumper cables and a battery or auxiliary power supply.
Objective 24	Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures.
Objective 25	Perform starter current draw tests; determine necessary action.
Objective 26	Perform starter circuit voltage drop tests; determine necessary action.
Objective 27	Inspect and test starter relays and solenoids; determine necessary action.
Objective 28	Remove and install starter in a vehicle.
Objective 29	Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action.
Objective 30	Perform charging system output test; determine necessary action.
Objective 31	Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions.
Objective 32	Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment.
Objective 33	Remove, inspect, and install generator (alternator).
Objective 34	Perform charging circuit voltage drop tests; determine necessary action.

Objective 35 Describe autonomous vehicle operation and the various Advanced Driver Assist Systems (ADAS) that are employed during autonomous driving.

Objective 36 Successfully complete SP2 safety training.

Student Learning Outcomes

Upon satisfactory completion of this course, students will be able to:

Outcome 1	Illustrate repairs given a vehicle electrical system malfunction using wiring diagrams, service information, and digital multi-meter.
Outcome 2	Demonstrate troubleshooting capabilities given a vehicle electrical system malfunction using wiring diagrams, service information, and a digital multi-meter.
Outcome 3	Demonstrate diagnostic process given a basic vehicle electrical system malfunction using wiring diagrams, service information, and a digital multi-meter.

Methods of Instruction

Method	Please provide a description or examples of how each instructional method will be used in this course.
Collaborative/Team	Learners will work in team setting.
Technology-based instruction	Diagnostic test equipment, computer-based tools, and virtual reality scenarios.
Participation	Learners will participate in classroom activities, research activities, role-play, interactive testing.
Lecture	Each class is half lecture covering multiple aspects of course content.
Laboratory	Learners will participate in lab-based activities to complete their NATEF standards job sheets.
Discussion	Learners will participate in critical diagnostic discussion making and critical thinking.
Demonstration, Repetition/Practice	Each learner will demonstrate their ability to correctly perform a given task.

Methods of Evaluation

Method	Please provide a description or examples of how each evaluation method will be used in this course.	Type of Assignment
College level or pre-collegiate essays	A research report submitted or completed not limited to; a written presentation, however, the learners are required to research information pertaining to the assignment.	In and Out of Class
Self-paced testing	Readings from required text: 1-3 chapters per week from both classroom and shop manuals. Homework from required text: multiple-choice questions, fill in the blank and essay questions to be graded each week.	Out of Class Only
Mid-term and final evaluations	Used to evaluate learners' knowledge and understanding of the information presented. Examples of these are not limited to quizzes, exams, presentations, research, or projects.	In and Out of Class
Self-paced testing	Readings from required text: 1-3 chapters per week from both classroom and shop manuals. Homework from required text: multiple-choice questions, fill in the blank and essay questions to be graded each week.	In and Out of Class
Computational/problem-solving evaluations	Analysis-based assignments pertaining to course information diagnostic procedures used to enhance the learners' problem solving skills.	In Class Only
Laboratory projects	Learners will participate in lab-based activities to complete their NATEF standards job sheets.	In Class Only

Reading reports	Turned in by report, written, presentation; however the learners' are required to research information pertaining to the assignment.	In and Out of Class
Written homework	Readings from required text: 1-3 chapters per week from both classroom and shop manuals. Homework from required text: multiple-choice questions, fill in the blank and essay questions to be graded each week.	Out of Class Only

Assignments

Other In-class Assignments

1. Lecture notes
2. Classroom discussion/participation with problem solving scenarios
3. Hands-on activities on electrical circuit boards
4. Wiring diagram analysis
5. Quizzes

Other Out-of-class Assignments

1. Readings from required text: 1-3 chapters per week from both classroom and shop manuals. Each chapter 2 hours per week.
2. Homework from required text: multiple-choice questions, fill in the blank and essay questions to be graded each week. Each chapter 2 hours per week.
3. Completion of 2 SP2 safety tests, each subject including an average of 4 hours
 - a. Mechanical Safety
 - b. Pollution prevention
4. Assigned readings and written summaries from selected instructor handouts. 1 hour.
5. Written summaries and analysis of assigned websites.
6. Must complete a course project consisting of an essay describing, analyzing and summarizing a selected topic, including out of class research and fieldwork. 8 hours
7. Vehicle diagnosis, troubleshooting and repair of personal, shop, and other vehicles to be evaluated by the instructor during lab time.
8. Hands-on lab worksheets matching each course objective. These will be graded by the instructor throughout the semester during lab time.
9. Must develop teamwork skills through lab activities and assigned special projects.
10. Automotive industry web-based training modules, each taking roughly 3 hours
11. Exam prep. 12 hours

Grade Methods

Letter Grade Only

Distance Education Checklist

Include the percentage of online and on-campus instruction you anticipate.

Online %

50

On-campus %

50

Lab Courses

How will the lab component of your course be differentiated from the lecture component of the course?

Lab component of the course will be completed in a laboratory environment on campus under the supervision of an appropriate facilitator.

From the COR list, what activities are specified as lab, and how will those be monitored by the instructor?

The facilitator will supervise all lab content, guiding the learner in productivity and understanding.

How will you assess the online delivery of lab activities?

Laboratory activities will not be delivered in the online setting, only in person.

Instructional Materials and Resources

If you use any other technologies in addition to the college LMS, what other technologies will you use and how are you ensuring student data security?

SP2 online safety training.

If used, explain how specific materials and resources outside the LMS will be used to enhance student learning.

SP2 - free account provided to all used to ensure the learners ability to distinguish safe working practices and conditions from unsafe practices and conditions.

Effective Student/Faculty Contact

Which of the following methods of regular, timely, and effective student/faculty contact will be used in this course?

Within Course Management System:

Chat room/instant messaging
Discussion forums with substantive instructor participation
Online quizzes and examinations
Private messages
Regular virtual office hours
Timely feedback and return of student work as specified in the syllabus
Video or audio feedback
Weekly announcements

External to Course Management System:

Direct e-mail
Synchronous audio/video

For hybrid courses:

Field trips
Orientation, study, and/or review sessions
Scheduled Face-to-Face group or individual meetings
Supplemental seminar or study sessions

Briefly discuss how the selected strategies above will be used to maintain Regular Effective Contact in the course.

Regular effective contact will be practiced through online lecture, discussion board postings, email communications, regular announcements, prompt grading and feedback of assignments, and virtual office hours. This contact between the facilitator and learner on a regular basis will enhance learner confidence and understanding and promote critical thinking and analyzation of subject matter.

If interacting with students outside the LMS, explain how additional interactions with students outside the LMS will enhance student learning.

Interaction between instructor and learner will help to enhance learning and understanding of subject material.

Other Information

Provide any other relevant information that will help the Curriculum Committee assess the viability of offering this course in an online or hybrid modality.

With the uncertainty of the teaching environment, enabling the lecture portion of this course to be delivered in an online setting, while keeping the hands on portion face-to-face, will ensure learners can access needed training to ensure knowledge and experience is achieved to gain employment in the automotive field.

MIS Course Data

CIP Code

47.0604 - Automobile/Automotive Mechanics Technology/Technician.

TOP Code

094800 - Automotive Technology

SAM Code

C - Clearly Occupational

Basic Skills Status

Not Basic Skills

Prior College Level

Not applicable

Cooperative Work Experience

Not a Coop Course

Course Classification Status

Credit Course

Approved Special Class

Not special class

Noncredit Category

Not Applicable, Credit Course

Funding Agency Category

Not Applicable

Program Status

Program Applicable

Transfer Status

Transferable to CSU only

General Education Status

Y = Not applicable

Support Course Status

N = Course is not a support course

Allow Audit

Yes

Repeatability

No

Materials Fee

No

Additional Fees?

Yes

Additional Fee Amount

\$20.00

Additional Fees Description

Automotive Service Excellent (ASE) Student Exam.

Approvals**Curriculum Committee Approval Date**

3/17/2022

Academic Senate Approval Date

3/24/2022

Board of Trustees Approval Date

4/22/2022

Chancellor's Office Approval Date

5/06/2022

Course Control Number

CCC000631389

Programs referencing this course

Automotive Air Conditioning Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=104>)
Automotive Electrical Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=105>)
Automotive Emissions Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=106>)
Automotive Engine Management Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=107>)
Automotive Transmission Axle Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=108>)
Automotive Braking Systems Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=109>)
Automotive General Service Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=110>)
Automotive Light and Medium Duty Diesel Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=111>)
Automotive Steering, Suspension, Alignment Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=112>)
Hybrid, Fuel Cell, Electric Vehicle Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=198>)
Automotive Introductions Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=201>)
Engineering Technology AS Degree (<http://catalog.collegeofthedesert.eduundefined/?key=209>)
Automotive AI Autonomous Vehicle Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=360>)
Advanced Transportation Technologies AS Degree (<http://catalog.collegeofthedesert.eduundefined/?key=44>)
Advanced Transportation Technologies AS Degree (<http://catalog.collegeofthedesert.eduundefined/?key=45>)
Automotive Technology AS Degree (<http://catalog.collegeofthedesert.eduundefined/?key=57>)
Automotive Alternative Fuels Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=82>)