

# AT R116: ADVANCED AUTOMOTIVE ELECTRICAL AND ELECTRONICS

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**Originator**

kevin\_corse1

**College**

Oxnard College

**Discipline (CB01A)**

AT - Automotive Technology

**Course Number (CB01B)**

R116

**Course Title (CB02)**

Advanced Automotive Electrical and Electronics

**Banner/Short Title**

Advanced Automotive Electrical

**Credit Type**

Credit

**Start Term**

Spring 2021

**Formerly**

AT R016 - Auto Electronics

**Catalog Course Description**

This course is designed for advanced students or technicians in the auto service industry.

This course covers various types of electronic systems, ignition systems, computer management, and fuel injection control systems. Students will learn advanced computer diagnostics including proper software updating and repairs to interactive infotainment systems.

**Taxonomy of Programs (TOP) Code (CB03)**

0948.00 - \*Automotive Technology

**Course Credit Status (CB04)**

D (Credit - Degree Applicable)

**Course Transfer Status (CB05) (select one only)**

B (Transferable to CSU only)

**Course Basic Skills Status (CB08)**

N - The Course is Not a Basic Skills Course

**SAM Priority Code (CB09)**

C - Clearly Occupational

**Course Cooperative Work Experience Education Status (CB10)**

N - Is Not Part of a Cooperative Work Experience Education Program

**Course Classification Status (CB11)**

Y - Credit Course

**Educational Assistance Class Instruction (Approved Special Class) (CB13)**

N - The Course is Not an Approved Special Class

**Course Prior to Transfer Level (CB21)**

Y - Not Applicable

**Course Noncredit Category (CB22)**

Y - Credit Course

**Funding Agency Category (CB23)**

Y - Not Applicable (Funding Not Used)

**Course Program Status (CB24)**

1 - Program Applicable

**General Education Status (CB25)**

Y - Not Applicable

**Support Course Status (CB26)**

N - Course is not a support course

**Field trips**

May be required

**Grading method**

Letter Graded

**Alternate grading methods**

Credit by exam, license, etc.

**Does this course require an instructional materials fee?**

No

**Repeatable for Credit**

No

**Is this course part of a family?**

No

**Units and Hours**

**Carnegie Unit Override**

No

**In-Class**

**Lecture**

**Minimum Contact/In-Class Lecture Hours**

52.5

**Maximum Contact/In-Class Lecture Hours**

52.5

**Activity**

**Laboratory**

**Total in-Class**

**Total in-Class**

**Total Minimum Contact/In-Class Hours**

52.5

**Total Maximum Contact/In-Class Hours**

52.5

**Outside-of-Class****Internship/Cooperative Work Experience**

Paid

Unpaid

**Total Outside-of-Class****Total Outside-of-Class****Minimum Outside-of-Class Hours**

105

**Maximum Outside-of-Class Hours**

105

**Total Student Learning****Total Student Learning****Total Minimum Student Learning Hours**

157.5

**Total Maximum Student Learning Hours**

157.5

**Minimum Units (CB07)**

3

**Maximum Units (CB06)**

3

**Prerequisites**

AT R115

**Advisories on Recommended Preparation**

AT R110

**Entrance Skills****Entrance Skills**

Must have completed AT-R115 or equivalent.

**Prerequisite Course Objectives**

AT R115-Explain and repair the lighting accessories and body electrical wiring.

AT R115-Describe magnetism, electromagnetism as it relates to automotive motors and switches.

AT R115-Explain the differences between the conventional theory and electronic theory.

AT R115-Explain the charging and starting electrical application used in today's vehicles.

AT R115-Identify electrical circuits used in automotive systems, series circuits, parallel circuits and series parallel circuits.

**Requisite Justification****Requisite Type**

Prerequisite

**Requisite**

AT R115

**Requisite Description**

Course in a sequence

**Level of Scrutiny/Justification**

Content review

**Student Learning Outcomes (CSLOs)****Upon satisfactory completion of the course, students will be able to:**

- |   |  |
|---|--|
| 1 | Pass an internet based industry standard and OSHA approved Automotive Safety Course to be allowed in the shop facilities.  |
| 2 | Demonstrate simple graphing concepts and common fractions and their decimal equivalents as they apply to automotive diagnosis and repair.  |
| 3 | Identify and demonstrate environmental safety rules and regulations, in the following areas. Shop safety, personal safety, hazardous material safety, air bag safety, power tools, and typical equipment safety. |
| 4 | Demonstrate their ability to identify, retrieve, and apply basic automotive technical information including but not limited to online information.   |

**Course Objectives****Upon satisfactory completion of the course, students will be able to:**

- |    |   |
|----|---|
| 1  | Identify safety hazards in an automotive shop.  |
| 2  | Describe and demonstrate proper customer relations.   |
| 3  | Explain the operation of closed-loop and open-loop operation.   |
| 4  | Perform the proper steps to calibrate shop diagnostic equipment.  |
| 5  | Explain the fuel injection systems and stoichiometric air/fuel ratio.   |
| 6  | F. Explain the difference between the conventional theory and electronic theory.                                |
| 7  | Identify electrical circuits used in automotive wiring, such as series, parallel, and series parallel circuits. |
| 8  | Describe magnetism, electromagnetism as it relates to automotive circuits.                                      |
| 9  | Identify semiconductors and solid-state electronics in electrical circuits.                                     |
| 10 | Explain distributor-less (DIS) and (DI) ignition systems.   |
| 11 | Identify computer controlled emission system components.  |
| 12 | Identify electronic engine management computer sensors and actuators.   |
| 13 | Explain data-link connector (DLC) terminal identification and location.   |

**Course Content****Lecture/Course Content**

Textbook and worksheets along with video presentations and in class testing.

1. . Basic Electricity Theory
  - a. Magnetism
  - b. Ohms law
  - c. Volts, amps, ohms
  - d. Electrical circuits
  - e. Semi-conductors
  - f. Transistors, emitter, collector, base
  - g. Introduction to automotive computers
  - h. Data link connector (DLC) terminal identification
2. Computer Control Systems
  - a. GM computer command control system
  - b. Ford electronic engine control system
  - c. Chrysler computer control system
  - d. Imported computer control systems
3. Conventional and Electronic Fuel Injection Control
  - a. Computer fuel management
  - b. Bosch fuel injection

- c. Fuel injector pulse width
  - d. SFI - Sequential fuel injection
  - e. PFI – Port fuel injection
  - f. TBI – Throttle body fuel injection
  - g. EFI - Electronic fuel injection
  - h. Sensors and actuators
4. Computer Emission Control
- a. Exhaust gas recirculation
  - b. Air injector system
  - c. Evaporative control system
  - d. Catalytic converter system

### Laboratory or Activity Content

None

### Methods of Evaluation

**Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):**

Problem solving exercises  
 Skills demonstrations  
 Written expression

**Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):**

Problem-solving exams  
 Quizzes  
 Skills demonstrations  
 Skill tests

### Instructional Methodology

**Specify the methods of instruction that may be employed in this course**

Audio-visual presentations  
 Class activities  
 Class discussions  
 Case studies  
 Distance Education  
 Instructor-guided interpretation and analysis  
 Lecture

**Describe specific examples of the methods the instructor will use:**

1. Reading assignments: Textbook reading assignments will be discussed in class to assist students in the understanding of electronics as applied to automobile operation.
2. Lecture and demonstrations on electronic systems.

### Representative Course Assignments

#### Writing Assignments

1. The student will access the textbook materials to answer questions pertaining to the basic skills required for technicians performing diagnosis and repair of electronic engine control systems.
2. Students will be required to answer questions at the end of each chapter; all tests include essay type questions. Students will also be required to input invoice information and develop estimates of repairs needed.

#### Reading Assignments

1. In addition to textbook assignments, students will be required to read and analyze information in professional journals such as Motor Age Magazine and Motor Service Journal. Reading internet websites such as the State of California Department of Consumer Affairs and Bureau of Automotive Repair will be required assignments.

### **Skills Demonstrations**

1. The student will use an automotive shop environment to inspect, identify and assist in performing electronic ignition system inspection.

### **Outside Assignments**

#### **Representative Outside Assignments**

1. In addition to textbook assignments, students will be required to read and analyze information in professional journals such as Motor Age Magazine and Motor Service Journal. Reading internet websites such as the State of California Department of Consumer Affairs and Bureau of Automotive Repair will be required assignments.
2. Students will be required to answer questions at the end of each chapter; all tests include essay type questions. Students will also be required to input invoice information and develop estimates of repairs needed.

### **District General Education**

#### **A. Natural Sciences**

#### **B. Social and Behavioral Sciences**

#### **C. Humanities**

#### **D. Language and Rationality**

#### **E. Health and Physical Education/Kinesiology**

#### **F. Ethnic Studies/Gender Studies**

### **CSU GE-Breadth**

#### **Area A: English Language Communication and Critical Thinking**

#### **Area B: Scientific Inquiry and Quantitative Reasoning**

#### **Area C: Arts and Humanities**

#### **Area D: Social Sciences**

#### **Area E: Lifelong Learning and Self-Development**

### **CSU Graduation Requirement in U.S. History, Constitution and American Ideals:**

### **IGETC**

#### **Area 1: English Communication**

#### **Area 2A: Mathematical Concepts & Quantitative Reasoning**

#### **Area 3: Arts and Humanities**

#### **Area 4: Social and Behavioral Sciences**

#### **Area 5: Physical and Biological Sciences**

#### **Area 6: Languages Other than English (LOTE)**

### **Textbooks and Lab Manuals**

#### **Resource Type**

Textbook

#### **Classic Textbook**

No

**Description**

J. Halderman (2019). Automotive Electricity & Electronics (5th/e). prentice hall.

**Library Resources**

**Sufficient Library Resources exist**

Yes

**Distance Education Addendum**

**Definitions**

**Distance Education Modalities**

- Hybrid (51%–99% online)
- Hybrid (1%–50% online)
- 100% online

**Faculty Certifications**

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.

Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

Yes

**Regular Effective/Substantive Contact**

**Hybrid (1%–50% online) Modality:**

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Regular use of asynchronous discussion boards encourages various types of interaction and critical thinking skills among all course participants. Questions and topics posed will allow students to discuss, compare and contrast, identify, and analyze elements of the course outcomes. Other discussion boards may be used for Q&A and general class discussion by students and instructor to facilitate student success and strengthen student learning outcomes.
E-mail	E-mail, class announcements and various learning management system tools such as “Message Students Who” and “Assignment Comments”, will be used to regularly communicate with all students on matters such as clarification of class content, reminders of upcoming assignments and/or course responsibilities, to provide prompt feedback to students on coursework to facilitate student learning outcomes, or to increase the role of an individual educator in the academic lives of a student. Students will be given multiple ways to email instructor through both the learning management system inbox and faculty provided email accounts.

Face to Face (by student request; cannot be required)	Students will have direct face-to-face contact with instructor during weekly class meetings. This time will provide the opportunity for students to discuss and ask questions about the material to facilitate student learning objectives and course outcomes. The instructor will also hold weekly, scheduled office hours for students to be able to meet and discuss course materials or individual progress. Students can request additional in-person or web conferencing meetings with faculty member as needed. Faculty may encourage online students to form “study groups” in person or online. Note: For hybrid classes, face-to-face class time will provide opportunities for students to discuss amongst themselves (in groups or pairs) and ask questions about the material to facilitate SLOs and course outcomes.
Other DE (e.g., recorded lectures)	Faculty may use a variety of ADA compliant tools and media integrated within the learning management system to help students reach SLO competency. Tools may include: <ul style="list-style-type: none"> <li>o Recorded Lectures, Narrated Slides, Screencasts</li> <li>o Instructor created content</li> <li>o OC Online Library Resources</li> <li>o Canvas Peer Review Tool</li> <li>o Canvas Student Groups (Assignments, Discussions)</li> <li>o 3rd Party (Publisher) Tools (MyOpenMath)</li> <li>o Websites and Blogs</li> <li>o Multimedia (YouTube, Films on Demand, 3CMedia, Khan Academy, etc.)</li> </ul>
Synchronous Dialog (e.g., online chat)	Instructor may provide a set time each week where they will be available for synchronous chat and be available in the discussion board and can answer questions in live time.
Video Conferencing	Video tools such as ConferZoom can be used to provide live synchronous or asynchronous sessions with students. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session. Video Conferences will be used to facilitate SLOs and student-to-student group meetings will also be encouraged.
<b>Hybrid (51%–99% online) Modality:</b>	
<b>Method of Instruction</b>	<b>Document typical activities or assignments for each method of instruction</b>
Asynchronous Dialog (e.g., discussion board)	Regular use of asynchronous discussion boards encourages various types of interaction and critical thinking skills among all course participants. Questions and topics posed will allow students to discuss, compare and contrast, identify, and analyze elements of the course outcomes. Other discussion boards may be used for Q&A and general class discussion by students and instructor to facilitate student success and strengthen student learning outcomes.
E-mail	E-mail, class announcements and various learning management system tools such as “Message Students Who” and “Assignment Comments”, will be used to regularly communicate with all students on matters such as clarification of class content, reminders of upcoming assignments and/or course responsibilities, to provide prompt feedback to students on coursework to facilitate student learning outcomes, or to increase the role of an individual educator in the academic lives of a student. Students will be given multiple ways to email instructor through both the learning management system inbox and faculty provided email accounts.
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**100% online Modality:**

Method of Instruction	Document typical activities or assignments for each method of instruction
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Face to Face (by student request; cannot be required)	Students can request for instructor to call or vice versa in order to answer one-on-one questions about course material or student progress.
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Telephone	Students can request for instructor to call or vice versa in order to answer one-on-one questions about course material or student progress.
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Video Conferencing	Video tools such as ConferZoom can be used to provide live synchronous or asynchronous sessions with students. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session. Video Conferences will be used to facilitate SLOs and student-to-student group meetings will also be encouraged.
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Synchronous Dialog (e.g., online chat)	Instructor will provide a set time each week where they will be available for synchronous chat and be available in the discussion board and can answer questions in live time.
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Other DE (e.g., recorded lectures)	Faculty will use a variety of ADA compliant tools and media integrated within the learning management system to help students reach SLO competency. Tools may include: o Recorded Lectures, Narrated Slides, Screencasts o Instructor created content o OC Online Library Resources o Canvas Peer Review Tool o Canvas Student Groups (Assignments, Discussions) o 3rd Party (Publisher) Tools (MyOpenMath) o Websites and Blogs o Multimedia (YouTube, Films on Demand, 3CMedia, Khan Academy, etc.)
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Asynchronous Dialog (e.g., discussion board)	Regular use of asynchronous discussion boards encourages various types of interaction and critical thinking skills among all course participants. Questions and topics posed will allow students to discuss, compare and contrast, identify, and analyze elements of the course outcomes. Other discussion boards may be used for Q&A and general class discussion by students and instructor to facilitate student success and strengthen student learning outcomes.
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**Examinations**

**Hybrid (1%–50% online) Modality**

Online  
On campus

**Hybrid (51%–99% online) Modality**

Online  
On campus

**Primary Minimum Qualification**

AUTOMOTIVE TECHNOLOGY

**Review and Approval Dates**

**Department Chair**

12/02/2020

**Dean**

12/02/2020

**Technical Review**

12/09/2020

**Curriculum Committee**

12/09/2020

**CCCCO**

MM/DD/YYYY

**Control Number**

CCC000611491

**DOE/accreditation approval date**

MM/DD/YYYY