

**Course Information**

Semester & Year: Fall 2023

Course ID & Section #: AT-16 E6453

Instructor's name: Anibal Florez

Day/Time: Mondays and Wednesdays 8:15am – 12:35pm

Location: Eureka campus room AT 128 for lecture and AT 129 for lab

Number of units: 4

**Instructor Contact Information**

Office location: AT-141

Office hours: By appointment or just stop by

Phone number: 707-476-4373

Email address: Anibal-Florez@redwoods.edu

**Required Materials**

Textbook title: Automotive Electricity and Electronics

Edition: 6<sup>th</sup> Edition

Author: James Halderman

ISBN: 13: 978-0-13-76442-8

Other requirement: ANSI Z87.1 approved safety glasses and closed toed shoes.

**Catalog Description**

A course covering theory and principles of automotive electrical systems. The course includes basic electrical theory, Ohm's Law, series and parallel circuits, electrical symbols and schematics, automotive batteries, charging systems, voltage regulation, starting systems, lighting systems, and various accessories. The laboratory portion of the course will place emphasis on diagnosis and testing techniques required to effectively determine the necessary action in an electrical system failure. The use of schematics, technical specifications, voltmeters, ohmmeters, ammeters, and circuit testers will be required. The course is designed in conjunction with Automotive Service Excellence (ASE) Education Foundation standards and subsequently will in part prepare the student for the ASE Electrical / Electronic Certification Examination.

**Course Student Learning Outcomes**

1. Diagnose general electrical system problems.
2. Diagnosis and service of battery and charging systems.
3. Diagnose and repair starting system.

**Educational Accessibility & Support**

College of the Redwoods is committed to providing reasonable accommodations for qualified students who could benefit from additional educational support and services. You may qualify if you have a physical, mental, sensory, or intellectual condition which causes you to struggle academically, including but not limited to:

- Mental health conditions such as depression, anxiety, PTSD, bipolar disorder, and ADHD
- Common ailments such as arthritis, asthma, diabetes, autoimmune disorders, and diseases
- Temporary impairments such as a broken bone, recovery from significant surgery, or a pregnancy-related disability
- A learning disability (e.g., dyslexia, reading comprehension), intellectual disability, autism, or acquired brain injury
- Vision, hearing, or mobility challenges

Available services include extended test time, quiet testing environments, tutoring, counseling and advising, alternate formats of materials (e.g., audio books, E-texts), assistive technology, on-campus transportation, and more. If you believe you might benefit from disability- or health-related services and accommodations, please contact Disability Services and Programs for Students (DSPS). If you are unsure whether you qualify, please contact DSPS for a consultation: [dsp@redwoods.edu](mailto:dsp@redwoods.edu).

- Eureka: 707-476-4280, Student Services Building, 1st floor
- Del Norte: 707-465-2324, Main Building, near the library
- Klamath-Trinity: 707-476-4280

## **Fall 2023 Dates**

- **August 18th: Last day to register for classes (day before the first class meeting)**
- **August 19th: Classes begin**
- **August 25th: Last day to add a class**
- **September 1st: Last day to drop without a “W” and receive a refund**
- **September 4th: Labor Day Holiday (All Campuses Closed)**
- **September 5th: Census Date (20% of class)**
- **October 26th: Last day to petition to graduate**
- **October 27th: Last day for student initiated withdrawal (62.5% of class)**
- **October 27th: Last day for faculty initiated withdrawal (62.5% of class)**
- **November 11th: Veterans Day (All Campuses Closed)**
- **November 20th-25th: Thanksgiving break (no classes)**
- **November 22nd-24th: No Classes, all campuses closed**
- **December 9th-15th: Final Examinations**
- **December 15th: Last day to file for P/NP option**
- **December 15th: Semester Ends**
- **December 22nd: Grades due**
- **January 5th: Grades available**

## Evaluation & Grading Policy

Your performance objectives, exams, and laboratory activities will be translated to points and points to grades. There are 1000 possible points and the following distribution will guarantee the following:

1000 - 900 = A-, A  
899 - 800 = B-, B, B+  
799 - 700 = C, C+  
699 - 600 = D  
599 - 500 = F

## Course Schedule

This course is scheduled to meet Monday and Wednesday evenings at 8:15am and will conclude at 12:35pm. During our allotted time we will go over assigned textbook material, work through classroom review exercises and finally discuss shop activities and conclude with hands-on application in the shop.

## Attendance

The college assumes that students will attend every session of a class for which they are registered. If, however, attendance is irregular, students may be dropped from a class. Excessive absence is defined as a total of absences which equal two weeks in a 16 week semester, for a class meeting twice per week that would equate to 4 absences. For attendance purpose, the college regards a laboratory session as the equivalent of one class meeting. If you're not present for lecture you are absent, even if you make it to lab!

Veterans and financial aid recipients should remember that should they drop below the number of units required of them by the Veterans Administration or financial aid office for any reason during the semester, including being dropped from a class for excessive absences, they will lose part of the government assistance allowances and may be required to repay funds already disbursed.

In any event if an attendance problem does develop, work with the instructor to resolve it. The purpose here is to see what we can do together to keep you in the class in order to help you master the course content.

## Course Attendance Policy

Attendance will be taken at the start of each class session. **Students who accumulate 4 absences during the first 10 weeks of class will be dropped from this class by the instructor.**

Punctuality is essential in the workplace and is considered respectful of fellow students and instructors. Excessive tardiness can affect your score as well. Less time present means you have less time to complete tasks.

Students who have experienced extenuating circumstances can complete & submit the Excused Withdrawal Petition to request an Excused Withdrawal (EW) grade instead of the current Withdrawal (W) or non-passing (D, F & NP) grades. The EW Petition is available from the Admissions and Records Forms Webpage. Supporting documentation is required.

## Academic dishonesty

In the academic community, the high value placed on truth implies a corresponding intolerance of scholastic dishonesty. In cases involving academic dishonesty, determination of the grade and of the student's status in the course is left primarily to the discretion of the faculty member. In such cases, where the instructor determines

that a student has demonstrated academic dishonesty, the student may receive a failing grade for the assignment and/or exam and may be reported to the Chief Student Services Officer or designee. The Student Code of Conduct ([AP 5500](#)) is available on the College of the Redwoods website. Additional information about the rights and responsibilities of students, Board policies, and administrative procedures is located in the [College Catalog](#) and on the [College of the Redwoods website](#).

### **Disruptive behavior**

Student behavior or speech that disrupts the instructional setting will not be tolerated. Disruptive conduct may include, but is not limited to: unwarranted interruptions; failure to adhere to instructor's directions; vulgar or obscene language; slurs or other forms of intimidation; and physically or verbally abusive behavior. In such cases where the instructor determines that a student has disrupted the educational process, a disruptive student may be temporarily removed from class. In addition, the student may be reported to the Chief Student Services Officer or designee. The Student Code of Conduct ([AP 5500](#)) is available on the College of the Redwoods website. Additional information about the rights and responsibilities of students, Board policies, and administrative procedures is located in the [College Catalog](#) and on the [College of the Redwoods website](#).

### **Inclusive Language in the Classroom**

College of the Redwoods aspires to create a learning environment in which all people feel comfortable in contributing their perspectives to classroom discussions. It therefore encourages instructors and students to use language that is inclusive and respectful.

### **Setting Your Preferred Name in Canvas**

Students have the ability to have an alternate first name and pronouns to appear in Canvas. Contact [Admissions & Records](#) to request a change to your preferred first name and pronoun. Your Preferred Name will only be listed in Canvas. It does not change your legal name in our records. See the [Student Information Update form](#).

### **Canvas Information**

If using Canvas, include navigation instructions, tech support information, what Canvas is used for, and your expectation for how regularly students should check Canvas for your class.

Log into Canvas at <https://redwoods.instructure.com>

Password is your 8 digit birth date

For tech help, email [its@redwoods.edu](mailto:its@redwoods.edu) or call 707-476-4160

Canvas Help for students: <https://www.redwoods.edu/online/Help-Student>

Canvas online orientation workshop: <https://www.redwoods.edu/online/Home/Student-Resources/Canvas-Resources>

### **Community College Student Health and Wellness**

Resources, tools, and trainings regarding health, mental health, wellness, basic needs and more designed for California community college students, faculty and staff are available on the California Community Colleges [Health & Wellness website](#).

[Wellness Central](#) is a free online health and wellness resource that is available 24/7 in your space at your pace.

Students seeking to request a counseling appointment for academic advising or general counseling can email [counseling@redwoods.edu](mailto:counseling@redwoods.edu).

## **Emergency procedures / Everbridge**

College of the Redwoods has implemented an emergency alert system called Everbridge. In the event of an emergency on campus you will receive an alert through your personal email and/or phones. Registration is not necessary in order to receive emergency alerts. Check to make sure your contact information is up-to-date by logging into WebAdvisor <https://webadvisor.redwoods.edu> and selecting 'Students' then 'Academic Profile' then 'Current Information Update.'

Please contact Public Safety at 707-476-4112 or [security@redwoods.edu](mailto:security@redwoods.edu) if you have any questions. For more information see the [Redwoods Public Safety Page](#).

In an emergency that requires an evacuation of the building anywhere in the District:

- Be aware of all marked exits from your area and building
- Once outside, move to the nearest evacuation point outside your building
- Keep streets and walkways clear for emergency vehicles and personnel

Do not leave campus, unless it has been deemed safe by the campus authorities.

## **Eureka Campus Emergency Procedures**

Please review the [campus emergency map](#) for evacuation sites, including the closest site to this classroom (posted by the exit of each room). For more information on Public Safety go to the [Redwoods Public Safety Page](#). It is the responsibility of College of the Redwoods to protect life and property from the effects of emergency situations within its own jurisdiction.

In the event of an emergency:

1. Evaluate the impact the emergency has on your activity/operation and take appropriate action.
2. Dial 911, to notify local agency support such as law enforcement or fire services.
3. Notify Public Safety 707-476-4111 and inform them of the situation, with as much relevant information as possible.
4. Public Safety shall relay threat information, warnings, and alerts through the Everbridge emergency alert system, Public address system, and when possible, updates on the college website, to ensure the school community is notified.
5. Follow established procedures for the specific emergency as outlined in the College of the Redwoods Emergency Procedure Booklet, (evacuation to a safe zone, shelter in place, lockdown, assist others if possible, cooperate with First Responders, etc.).
6. If safe to do so, notify key administrators, departments, and personnel.
7. Do not leave campus, unless it is necessary to preserve life and/or has been deemed safe by the person in command.

## **Student Support Services**

The following online resources are available to support your success as a student:

- [CR-Online](#) (Comprehensive information for online students)
- [Library Articles & Databases](#)
- [Canvas help and tutorials](#)
- [Online Student Handbook](#)

[Counseling](#) offers assistance to students in need of professional counseling services such as crisis counseling.

Learning Resource Center includes the following resources for students

- [Academic Support Center](#) for instructional support, tutoring, learning resources, and proctored exams. Includes the Math Lab & Drop-in Writing Center
- [Library Services](#) to promote information literacy and provide organized information resources.
- [Multicultural & Diversity Center](#)

Special programs are also available for eligible students include

- [Extended Opportunity Programs & Services \(EOPS\)](#) provides financial assistance, support and encouragement for eligible income disadvantaged students at all CR locations.
- The TRiO Student Success Program provides eligible students with a variety of services including trips to 4-year universities, career assessments, and peer mentoring. Students can apply for the program in [Eureka](#) or in [Del Norte](#)
- The [Veteran's Resource Center](#) supports and facilitates academic success for Active Duty Military, Veterans and Dependents attending CR through relational advising, mentorship, transitional assistance, and coordination of military and Veteran-specific resources.

### Tips for Students

ASE-Certified Master Technicians were surveyed for their advice to students who want to become automotive service professional. Although the survey was especially for students, the tips that were suggested are applicable to all automotive technicians, from the newest to the most experienced. The following is a compilation of the responses:

- 1 Education, Education, Education – Continue your education and develop strong math, reading, study skills and computer skills. **A strong background in electronics is essential.**
- 2 Take advantage of on-the-job training, apprenticeship opportunities – Get all the training you can and start in a work environment that caters to service and excellence.
- 3 Keep abreast of new technology – Make a commitment to life-long learning. There is a constant change in technology so take advantage of additional training whenever it is available.
- 4 Learn a systems approach – Vehicles today are complex, so it is necessary to understand the interaction of electrical and mechanical components within the total system. Learn how to understand the whole system and you can apply this knowledge across the spectrum of vehicles.
- 5 Develop good communication skills – learn not only the professional and technical skills but also communication and people skills. Your credibility is linked to your perceived competence.
- 6 Keep a positive attitude – Develop a positive outlook so that you perform proper repairs. Apply yourself – you get exactly as much out of your job as you put into it.
- 7 Take pride in your work – Work on every car as if it were your own. Whatever you do – do it well, it's your signature.
- 8 Be honest and ethical – Stay focused on what is most important, practice good work ethics, be dependable and honest, and try to fix it right the first time.
- 9 Cultivate professionalism in yourself and others – Act professionally, take pride in your appearance as well as in the shop area. Be a positive role model for others. **Show up for work every day and always be on time. 15 minutes early is on time.**
- 10 Become ASE certified – Certification gives you an edge when you are seeking employment. Your confidence, sense of self-worth, and ability to get a job almost anywhere are improved once you become certified. ASE certification shows your employer that you have proven your technical expertise and that you are among the group of the very best technicians.

## Learning Outcomes

The college strives for continual improvement in instruction through assessment of learning outcomes. These outcomes are assessed in various ways throughout the course and upon completion of the program. Please participate to the fullest of your ability in this effort to make this course and this program successful.

## Program Learning Outcomes

1. Perform common service and repair tasks identified by the National Automotive Technicians Education Foundation (NATEF)/ Automotive Service Excellence (ASE).
2. Locate industry-standard diagnostic information to localize complex automotive problems.
3. Successfully perform the entry level skills and tasks required for service and repair of automotive systems.

## Course Objectives

Upon successful completion of this course the student should be familiar with the following tasks:

### A. General: Electrical System Diagnosis

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1
3. Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance. P-1
4. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1
5. Check operation of electrical circuits with a test light. P-1
6. Check operation of electrical circuits with fused jumper wires. P-1
7. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems. P-1
8. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action. P-1
9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. P-1
10. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action. P-1
11. Replace electrical connectors and terminal ends. P-1
12. Repair wiring harness & Perform solder repair of electrical wiring. P-1

## **B. Battery Diagnosis and Service**

1. Perform battery state-of-charge test; determine necessary action. P-1
2. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action. P-1
3. Maintain or restore electronic memory functions. P-1
4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. P-1
5. Perform slow/fast battery charge according to manufacturer's recommendations. P-1
6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply. P-1
7. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions. P-3
8. Identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery. P-1
9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-3

## **C. Starting System Diagnosis and Repair**

1. Perform starter current draw tests; determine necessary action. P-1
2. Perform starter circuit voltage drop tests; determine necessary action. P-1
3. Inspect and test starter relays and solenoids; determine necessary action. P-2
4. Remove and install starter in a vehicle. P-1
5. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action. P-2
6. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition. P-2

## **D. Charging System Diagnosis and Repair**

1. Perform charging system output test; determine necessary action. P-1
2. Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions. P-1



3. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1
4. Remove, inspect, and re-install generator (alternator). P-1
5. Perform charging circuit voltage drop tests; determine necessary action. P-1

#### **E. Lighting Systems Diagnosis and Repair**

1. Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim or no light operation; determine necessary action. P-1
2. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1
3. Aim headlights. P-2
4. Identify system voltage and safety precautions associated with high-intensity discharge headlights. P-2

#### **G. Horn and Wiper/Washer Diagnosis and Repair**

1. Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action. P-1
2. Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action. P-2
3. Diagnose (troubleshoot) windshield washer problems; perform necessary action. P-2

#### **H. Accessories Diagnosis and Repair**

1. Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action. P-2
4. Diagnose (troubleshoot) supplemental restraint system (SRS) problems; determine necessary action. P-2
5. Disable and enable an airbag system for vehicle service; verify indicator lamp operation. P-1
10. Verify windshield wiper and washer operation, replace wiper blades. P-1

# AT 16

## Course Grading System

### Theory Portion

Test I	Basic Electrical Theory	60 points
Test II	Battery Theory	60 points
Test III	Charging Theory	60 points
Test IV	Starting Theory	60 points
Test V	Accessory Theory	60 points
Quizzes & Assignments		100 points
Final Exam Comprehensive		<u>100 points</u>
Total possible Points		500 points

### Laboratory Portion

Participation and attitude	50 points
Basic electrical testing	90 points
Battery testing	90 points
Charging system testing	90 points
Starting system testing	90 points
Accessory testing	<u>90 points</u>
Total possible points	500 points

### Extra Credit

Each student may elect independently to read and report on a topic related to automotive electrical systems from a source other than the course text i.e. recognized trade publications, library reference material, magazines, newspaper articles, etc.... The report must be no less than one page typed and no longer than three pages typed. You must properly cite your references on a separate page. You may earn up to **50 points** per report and you may turn in a maximum of 1 report per semester. Please inform the instructor of your topic prior to doing this assignment.

### Additional options for extra credit through Ford's ACE online learning

Complete the following learning modules through Ford's ACE learning program and print out the certificate of completion for each section for credit. You'll need to register with the website before you can participate. For more information ask me.

Under the Electrical Systems (STST34) category, and Basic Electrical Theory & Operation (34S11W0) heading, complete any or all of the following for **2 extra credit points each**:

F401001003-01, F401001003-02, F401001003-03, F401001003-04, F401001003-05  
F401001003-06, F401001003-07, F401001003-08, F401001003-09, F401001003-10  
F401001003-11

## Course Calendar for AT-16

Date	Theory in Class	Shop Focus	Ch. To Read
8-21	Shop overview	Shop orientation	Chp. 1, 2, 3
8-23	Fund. & ohm's law	Circuit parts & faults	Chp. 4, 5
8-28	Series circuits	Building series circuits	Chp. 6
8-30	Parallel circuits	Building parallel circuits	Chp. 7
9-4	<b>Holiday</b>		
9-6	Compound circuits	Building comp. circuits	Chp. 8
9-11	Testing circuits	Using the DMM	Chp. 9
9-13	<b>Group theory test 1</b>	<b>Indi-lab evaluations</b>	
9-18	Vehicle wiring	Diagrams, Wire ID, Repair	Chp. 11, 12
9-20	Batteries	Battery ID & service	Chp. 18, 19
9-25	Batteries	Battery testing	Chp. 18, 19
9-27	Batteries	Battery testing	Chp. 18, 19
10-2	Batteries	Battery testing	Chp. 18, 19
10-4	<b>Group theory test 2</b>	<b>Indi-lab evaluations</b>	
10-9	Electromagnetism	Elec. Mag. Devices	Chp. 14
10-11	Charging system	Charging circuit	Chp. 22
10-16	Charging system	System diagnosis	Chp. 23
10-18	Charging system	System service	Chp. 23
10-23	Charging system	System service	Chp. 23
10-25	<b>Group theory test 3</b>	<b>Indi-lab evaluations</b>	
10-30	Cranking system	Cranking circuit	Chp. 20
11-1	Cranking system	Circuit diagnosis	Chp. 21
11-6	Cranking system	System service	Chp. 21
11-8	Cranking system	System service	Chp. 21
11-13	<b>Group theory test 4</b>	<b>Indi-lab evaluations</b>	
11-15	Lighting system	System service	Chp. 24
11-20	<b>Fall Break</b>		
11-22	<b>Fall Break</b>		
11-27	Horn circuits	Circuit testing	Chp. 28
11-29	Wiper circuits	Circuit testing	Chp. 28
12-4	SRS circuits	System service	Chp. 27
12-6	<b>Group theory test 5</b>	<b>Indi-lab evaluations</b>	
12-11	<b>Final Exam @ 8:30 – 10:30am</b>		