



## UAS Automotive Technology Course Syllabus

### AUTO121-J01/ DESL121-J02 – Basic Electrical Systems Fall 2013 3 credits

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Course dates: Tuesdays and Thursdays, Sep. 3, 2013 – Oct. 17, 2013  
Times: 6:00 PM – 10:00 PM  
Location: Technology Education Center, Room 216

Course Homepage: <https://www.uas.alaska.edu/online>

Course Description: Fundamental electrical theory for the automotive technician. Diagnosis, minor repair, and general service of alternators, starters, and batteries.

Grading Method: Letter

Prerequisites: Auto 102 or concurrent enrollment

Course Objectives: Upon successful completion of this course, the student will be able to demonstrate ability to perform the following tasks as specified by NATEF (National Automobile Technicians Education Foundation);

Task #	Priority	Task Description
VI.A.2	P-1	Identify and interpret electrical/electronic system concern; determine necessary action.
VI.A.3	P-1	Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins.
VI.A.4	P-1	Locate and interpret vehicle and major component identification numbers.
VI.A.5	P-1	Diagnose electrical/electronic integrity of series, parallel, and series-parallel circuits using principles of electricity (Ohm's law)

VI.A.7	P-1	Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems, including: source voltage, voltage drop, current flow, and resistance.
VI.A.8	P-2	Check electrical circuits with a test light; determine necessary action.
VI.A.12	P-1	Measure and diagnose the cause(s) of excessive parasitic draw; determine necessary action.
VI.A.13	P-1	Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
VI.B.1	P-1	Perform battery state-of-charge test; determine necessary action.
VI.B.2	P-1	Perform battery capacity test; confirm proper battery capacity for vehicle application, determine necessary action.
VI.B.3	P-1	Maintain or restore electronic memory functions
VI.B.4	P-1	Inspect, clean, fill, and/or replace battery, battery cables, connectors, clamps, and hold-downs.
VI.B.5	P-1	Perform battery charge.
VI.C.1	P-1	Perform starter current draw tests; determine necessary action.
VI.C.2	P-1	Perform starter circuit voltage drop tests; determine necessary action.
VI.C.3	P-2	Inspect and test starter relays and solenoids; determine necessary action.
VI.C.4	P-1	Remove and install starter in a vehicle.
VI.C.5	P-2	Inspect and test switches, connectors, and wires of starter control circuits, perform necessary action.
VI.C.6	P-2	Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition.
VI.D.1	P-1	Perform charging system output test; determine necessary action.
VI.D.2	P-1	Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions.
VI.D.3	P-1	Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment.
VI.D.4	P-1	Remove, inspect, and install generator (alternator).
VI.D.5	P-1	Perform charging circuit voltage drop tests; determine necessary action.

**Textbook:** *Diagnosis and Troubleshooting of Automotive Electrical, Electronic, and Computer Systems (Sixth Edition)* by James D. Halderman. This textbook is available for purchase at the college bookstore on Glacier Highway across from Auke Bay harbor.

**Materials needed for class:**

- Safety glasses (required) – **safety glasses will be worn at all times in the Automotive Lab.** You can purchase a set of approved safety glasses at a local hardware distributor. Keep in mind that those wearing eyeglasses are still required to wear suitable safety glasses over them.
- Coveralls (optional – how dirty do you want to get?)
- Personal padlock (optional) – personal lockers are available to you, but locks must come off and the locker emptied at the end of the semester.

*Note: You will NOT be required to purchase hand tools to participate in this class. All tools will be provided for you. It is important to note, however, that you are expected to treat the program's hand tools with respect, and be sure to return them as you found them. This means wiping them clean and making sure they go back in their proper place.*

**Personal Electronics Policy:** Students are required to turn their cell phones off during class lecture sessions and examinations. Laptop computers are welcome if you are using them to do course-related research. Random internet browsing is not permitted during class lecture sessions. Use of personal music devices is not permitted in the classroom or lab.

**Grading:** Every student needs to know exactly how they will be graded during the course. There are four areas that make up your grade in Auto 121:

1. 20% of your grade is determined by attendance in lab and classroom sessions. I will assign two points per session. A student will receive one point if they are on time for class, and one more will be assigned if they stay until the end of class.

**IMPORTANT NOTE:** Violations of the Personal Electronics Policy will result in the forfeiture of that day's attendance credit!

2. 40% of your grade is determined by completion of lab assignments. Specific skills are taught during the lab sessions of the class and you will receive credit for these by completing the lab worksheets.

3. 20% of your grade is based on your performance on quizzes.

4. 20% of your grade is based on your performance on the final exam.

Grades will be assigned based on the following percentages:

A	93-100%
A-	90-92%
B+	86-89%
B	83-85%
B-	80-82%
C+	76-79%
C	73-75%
C-	70-72%
D+	66-69%
D	63-65%
D-	60-62%
F	60% and below

*The bottom line is, you cannot do well unless you come to class consistently. Coming late or not at all is the quickest way to put yourself in the hole.*

**Online Gradebook:** Student grades are maintained in a secure online environment. You can access your current grade and the scores of all assignments by logging in (using your University username and password) to UAS Online and going to the course home page.

**Homework:** You are assigned homework for every class meeting. For instance, if the content of meeting three was covered during one session, it is expected that you will do the homework for that meeting and have it ready for class the following meeting. Answer keys for the homework will be available at the course homepage at UAS Online.

While no credit is extended for completion of the homework, your performance on quizzes and exams will be in proportion to your effort in completing the homework assignments!

**Quizzes:** There will be a quiz given at the beginning of each class period. These quizzes will be based on the previous meeting's homework. **They CANNOT be made up if you miss a class.**

**Final exam:** There will be a comprehensive final exam given during the last class meeting.

**Lab assignments:** You will be assigned your own personal workbook for this class. This outlines all required lab assignments, and provides a means of keeping records of your lab work. You will keep this in your possession during the entire class, and submit it for a final lab grade on the day of the final exam. Keep the following guidelines in mind concerning your workbook:

- a. ALWAYS bring it with you to class. The instructor will not make copies of your lab assignments for you if you forget to bring it. Also, I will only "sign off" completed assignments in the workbook itself.
- b. Keep it clean and neat. This workbook is a record of your lab work and can be used to supplement your resume when you apply for a job.
- c. DO NOT LOSE THE WORKBOOK. I will only record your assignment grades when you hand it in at the end of the class, so losing the book is the same as starting your lab assignments all over again.
- d. The workbook must be submitted to the instructor by the day of the final exam. I will record your task completions and final lab grade at that time.

**Conduct in the lab:** The Auto lab is an industrial environment and **safety is the number one priority**. Having said that, **horseplay is strictly forbidden** in the lab. Students are expected to conduct themselves in a professional, courteous manner at all times. Many of the resources must be shared and everyone is expected to cooperate with others as best they can.

**Class evaluations:** You will be given the opportunity to write your own evaluation of this class during the last week that we meet. This is done via the internet using UAS Online. This is a big favor you are doing for me, as it helps me determine how to make the class better. If you don't like something that is being done, please say so, but also make a suggestion for how to make it better.

**Course drops/withdrawals:** Dates to be announced

*Please stay in touch and let me know if you cannot attend a particular class. I will issue an "excused absence" for those who notify me BEFORE CLASS BEGINS that they cannot make it. If I haven't heard from you for three class meetings, I will check to see if you have dropped/withdrawn from the class. If you haven't, I will file a faculty-initiated withdrawal to prevent me from having to assign you an "F" grade.*

Course Schedule:

<b>Meeting</b>	<b>Lecture Topic</b>	<b>Lab/Demonstration</b>	<b>Homework</b>
Meeting 1 Sep. 3	Course overview. Electrical fundamentals; electrical theory, conductors, current, voltage, resistance, sources of electricity.	Shop safety orientation. Vehicle hoisting (#1). VIN code (#2). Vehicle safety certification label (#3).	Read textbook pages 46-55. Chapter 3 review questions 1-4. Chapter quiz questions 1-10.
Meeting 2 Sep. 5	Electrical fundamentals; capacitance, magnetism, electromagnetism, electromagnetic induction.	Vehicle and electrical service information (#4). Material safety data sheet (#5).	Read textbook pages 133-151. Chapter 10 review questions 1-4. Chapter quiz questions 1-10. Chapter 11 review questions 1-4. Chapter quiz questions 1-10.
Meeting 3 Sep. 10	Electrical circuits & Ohm's law; circuits, circuit failures, Ohm's law, Watt's law.	Electrical fundamentals (#6). Ohmmeter (#7). Resistor measurements (#8). Body resistance (#9).	Read textbook pages 56-61. Chapter 4 review questions 1-5. Chapter quiz questions 1-10.
Meeting 4 Sep. 12	Series, parallel, and series-parallel circuits; Ohm's law, Kirchhoff's voltage law, Kirchhoff's current law.	Electrical circuits (#10). Series circuit (#11). Parallel circuit (#12). Digital multimeter (#13).	Read textbook pages 63-74. Chapter 5 review questions 1-9. Chapter quiz questions 1-10.
Meeting 5 Sep. 17	Circuit testers and digital meters; test lights, DMMs, RMS vs. average. Electrical safety.	Starting and charging voltmeter test (#14). Test light use (#15).	Read textbook pages 76-93. Chapter 6 review questions 1-3. Chapter quiz questions 1-10.
Meeting 6 Sep. 19	Automotive wiring and wire repair; wire, cables, circuit protection, terminals and connectors.	Fusible link inspection (#16). Diagnosis exercises.	Read textbook pages 102-115. Chapter 8 review questions 1-5. Chapter quiz questions 1-10.

Meeting 7 Sep. 24	Wiring schematics and circuit testing; wiring schematics, switches, relays.	Circuit continuity check (#17). Diagnosis exercises.	Read textbook pages 116-131. Chapter 9 review questions 1-4. Chapter quiz questions 1-10.
Meeting 8 Sep. 26	Batteries; construction, how a battery works, battery ratings.	Battery specifications (#18). Battery hydrometer test (#19). Service and replace the battery (#20). Battery cables and connectors (#21)	Read textbook pages 194-200. Chapter 15 review questions 1-3. Chapter quiz questions 1-10.
Meeting 9 Oct. 1	Battery testing and service; battery maintenance, battery testing, battery electrical drain testing.	Battery load test (#22). Battery charging (#23). Key-off battery drain (#24). Electronic memory saver usage (#25)	Read textbook pages 202-214. Chapter 16 review questions 1-4. Chapter quiz questions 1-10.
Meeting 10 Oct. 3	Cranking system; cranking system operation, types of starters.	Remove and install starter in a vehicle (#26).	Read textbook pages 216-226. Chapter 17 review questions 1-4. Chapter quiz questions 1-10.
Meeting 11 Oct. 8	Cranking system diagnosis and service; starting system troubleshooting.	Neutral/clutch safety switch (#27). Cranking circuit voltage drop test (#28). Starter current draw test (#29).	Read textbook pages 228-240. Chapter 18 review questions 1-3. Chapter quiz questions 1-10.
Meeting 12 Oct. 10	Charging system; charging system construction and operation.	Generator identification (#30). Generator drive belt (#31). Remove and install alternator in a vehicle (#32).	Read textbook pages 242-252. Chapter 19 review questions 1-6. Chapter quiz questions 1-10.
Meeting 13 Oct. 15	Charging system diagnosis and service; charging system diagnosis.	AC voltage from the generator (#33). Charging circuit voltage drop (#34). Generator fusible link check (#35). Charging system output test (#36)	Read textbook pages 254-272. Chapter 20 review questions 1-3. Chapter quiz questions 1-10. Prepare for final exam.
Meeting 14 Oct. 17	Final exam (comprehensive).	Cleanup lab and personal belongings.	