



South Portland, Maine 04106

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Title: **Electricity & Electronics II**

Catalog Number: **AUTO-205**

Credit Hours: **4**

Lecture (or Lab): **2 hours lecture / 2 hours lab**

Instructor: **Ruth Morrison**

Total Contact Hours: **30 / 60**

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## Course Syllabus

### Course Description

This is the second class in a 2 part study of electrical/electronic systems. Tasks from the NATEF Master Automobile Service Technology list will be performed. Students will study inputs, outputs, and processors of electronic systems. Students will diagnose and determine the necessary action for the following systems: starting and charging systems, lighting systems, driver information systems, and accessories. Prerequisite: AUTO- 155.

### Course Objectives

As a result of this particular course, the student will be familiar with the tasks from the NATEF MASTER AUTOMOBILE SERVICE TECHNOLOGY task list minus the MAINTENANCE AND LIGHT REPAIR tasks that were previously studied in Electrical/Electronics 1. The MAST task list is below with the previously studied MLR tasks crossed out. The student must perform all high priority tasks to manufacturer's specifications and document the completion of each task.

### NATEF 2017 Standards TASKS FOR THIS COURSE:

**VI. ELECTRICAL/ELECTRONIC MASTER AUTOMOBILE SERVICE TECHNOLOGY tasks minus the MAINTENANCE AND LIGHT REPAIR tasks (MLR tasks are in AUTO 155)**

**For every task in Electrical/Electronic Systems, the following safety requirement must be strictly enforced:**

**Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.**

A. General: Electrical System Diagnosis

~~1. Research vehicle service information including 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 multimeter (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. Demonstrate proper use of a test light on an electrical circuit. P-1~~
- ~~6. Use fused jumper wires to check operation of electrical circuits. 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 needed action. P-1
- ~~9. Inspect and test fusible links, circuit breakers, and fuses; determine needed action. P-1~~
10. Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action. P-1
11. Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs. P-2
12. Repair data bus wiring harness. P-1

#### B. Battery Diagnosis and Service

- ~~1. Perform battery state of charge test; determine needed action. P-1~~
- ~~2. Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed 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 safety precautions for high voltage systems on electric, hybrid, hybrid electric, and diesel vehicles. P-2~~
- ~~8. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-1~~
- ~~9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-2~~

#### C. Starting System Diagnosis and Repair

- ~~1. Perform starter current draw tests; determine needed action. P-1~~
- ~~2. Perform starter circuit voltage drop tests; determine needed action. P-1~~
- ~~3. Inspect and test starter relays and solenoids; determine needed 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 needed action. P-2~~
6. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition. P-2
- ~~7. Demonstrate knowledge of an automatic idle stop/start stop system. P-2~~

#### D. Charging System Diagnosis and Repair

- ~~1. Perform charging system output test; determine needed action. P-1~~
2. Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions. P-1
- ~~3. Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1~~
- ~~4. Remove, inspect, and/or replace generator (alternator). P-1~~
- ~~5. Perform charging circuit voltage drop tests; determine needed 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 needed 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~~

## F. Instrument Cluster and Driver Information Systems Diagnosis and Repair

1. Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action. P-2
2. Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine needed action. P-2
- ~~3. Reset maintenance indicators as required. P-2~~

## G. Body Electrical Systems Diagnosis and Repair

1. Diagnose operation of comfort and convenience accessories and related circuits (such as: power window, power seats, pedal height, power locks, truck locks, remote start, moon roof, sun roof, sun shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, cruise control, and auto dimming headlamps); determine needed repairs. P-2
2. Diagnose operation of security/anti-theft systems and related circuits (such as: theft deterrent, door locks, remote keyless entry, remote start, and starter/fuel disable); determine needed repairs. P-2
3. Diagnose operation of entertainment and related circuits (such as: radio, DVD, remote CD changer, navigation, amplifiers, speakers, antennas, and voice-activated accessories); determine needed repairs. P-3
4. Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back-up camera); determine needed repairs. P-1
5. Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action. P-2
6. Describe the process for software transfer, software updates, or reprogramming of electronic modules. P-2

## **Topical Outline of Instruction**

1. Review
2. Electronics
3. Oscilloscope
4. Scan tools
5. Networking
6. Lighting systems
7. Driver information systems
8. Accessories

## **Course Requirements**

- Students will regularly check their SMCC email accounts.
- Students will develop a three-ring binder / portfolio of all hand outs, quizzes and tests.
- Students will successfully complete homework, quizzes and tests. Homework assignments and studying outside of class will take approximately twice the time spent in class.
- Students will successfully complete shop projects as assigned and approved by instructor and maintain documentation of completion.

## **ASE Student Certification Test**

The final week of this course will consist of an ASE Student Certification Test. It will be administered by the Testing Center, located in the Campus Center building. Students will be responsible for taking the test at their convenience during the normal operating hours of the Testing Center. A photo ID is required. For information about the Testing Center, please see [www.smccme.edu/tests](http://www.smccme.edu/tests)

## **Student Evaluation and Grading**

10%: Attendance and Participation

10%: Homework

20%: Quizzes

30%: Tests

30%: Practice of Safety and Shop Participation, including portfolio

## **Attendance Grade**

Out of 100 possible points, 10 points will be deducted for each class absence and 5 points will be deducted for each time tardy.

## **Attendance Policy**

**Late homework will not be accepted.**

**Tardy assignments (class assignments, quizzes, and tests) will receive a grade reduction of 10 points for each day late.**

**Missed assignments (except for homework) must be made up by 5 PM Friday of the week the work was missed, unless other arrangements are made.**

**Students missing 15 % of the total hours for the course, tardy or absent, will result in an administrative failure for the class. This equals 13.5 hours for this 4 credit course. This is a “no fault” policy, which means the reason(s) for absence are not considered in implementation of the policy.**

## **Text, Tools and/or Supplies**

- Automotive Technology with NATEF Correlated Task Sheets (5th Edition) by James D. Halderman (ISBN# 9780134209227).
- Electude Argo E Learning Software subscription
- Each student must supply and maintain his or her own set of tools as listed on the “SMCC Automotive Technology Required Student Tool List.”
- Personal protective equipment must be worn at all times in lab. Leather, steel-toe work boots; clear safety glasses with side shields; and a uniform are required for this course.
- Highlighters and a clipboard are required for lab.
- Students must use their tool tags when they remove tools from the tool room.

### **Please note: The following items are required to participate in lab:**

- 1. Leather steel-toe work boots**
- 2. Clear safety glasses with side shields**
- 3. Uniform**
- 4. Tool tags**
- 5. Tools listed on the “SMCC Automotive Technology Required Student Tool List”**
- 6. Clipboard and highlighters**

### **If a student does not bring or use the items on the above list, the following consequences will result:**

- **The student can not participate in lab.**
- **The student will be marked absent.**
- **The attendance grade will reflect the absence.**
- **The hours missed will be counted towards a student’s Administrative Failure for 15% absence.**
- **The student will earn a grade of 0 for the assignments during that lab session.**

## **Telephones and Computers**

The use of computers, cell phones, smart phones, or other mobile communication devices is prohibited during lecture, unless the instructor indicates a special circumstance. In case of emergency, phones should be silenced, and answered outside the classroom. Special requests to use a computer for note taking will be considered by the instructor on a case by case basis. Violations of this policy will result in dismissal from the class period and an absence recorded.

## **Office Hours**

Appointments can be made to accommodate student needs. They can be scheduled in person by walk-in basis, by email at [rmorrison@smccme.edu](mailto:rmorrison@smccme.edu) ,or by phone at 207-741-5856.

## **Learning Outcomes**

1. When necessary, utilize information-literacy skills, including evaluation of information from a variety of media and proper MLA and/or APA documentation.
2. Use critical thinking and listening skills in written and oral communication as a tool for learning.
3. Read and demonstrate understanding of complex ideas by identifying key concepts.
4. Apply theory to practice using problem solving techniques and data analysis.
5. Solve problems using algebraic techniques.
6. Interpret information presented in charts and graphs or illustrate a scenario using graphic techniques.
7. Utilize quantitative methods to solve and/or assess complex problems to support decision making, forecasting, and recommendations.
8. Participate in a direct experience of scientific inquiry of the natural world using the scientific method.
9. Find and evaluate credible sources of scientific information using a variety of media to support a research need.
10. Demonstrate the capacity to make informed and ethical judgments about the impact of science and technology on the self, the environment, and the practice of sustainability.

## **End-of-Course Evaluation**

In order to gain access to final course grades, students must complete evaluations for each course attended at SMCC. Evaluations are submitted online and can be accessed through the student portal site. Students can access the course evaluation report beginning two weeks before the end of classes. The deadline for submission of evaluations occurs 24 hours after the last day of classes each semester. Instructors will announce when the online course evaluation is available.

## **ADA Syllabus Statement**

Southern Maine Community College is an equal opportunity/affirmative action institution and employer. For more information, please call 207-741-5798. If you have a disabling condition and wish to request accommodations in order to have reasonable access to the programs and services offered by SMCC, you must register with the Disability Services Coordinator, Sandra Lynham, who can be reached at 741-5923. Further information about services for students with disabilities and the accommodation process is available upon request at this number. Course policies about online testing are modified to suit each individual's accommodations.

### **Add-Drop Policy**

Students who drop a course during the one-week “add/drop” period in the fall and spring semesters and the first three days of summer sessions receive a 100% refund of the tuition and associated fees for that course. Please note any course that meets for less than the traditional semester length, i.e., 15 weeks, has a pro-rated add/drop period. There is no refund for non-attendance.

### **Withdrawal Policy**

A student may withdraw from a course only during the semester in which s/he is registered for that course. The withdrawal period is the second through twelfth week of the fall and spring semesters and the second through ninth week of twelve-week summer courses. This period is pro-rated for shorter-length courses. To withdraw from a course, a student must complete and submit the appropriate course withdrawal form, available at the Enrollment Service Center (no phone calls, please). The designation “W” will appear on the transcript after a student has officially withdrawn. A course withdrawal is an uncompleted course and may adversely affect financial aid eligibility. Failure to attend or ceasing to attend class does not constitute withdrawal from the course. There is no refund associated with a withdrawal.

### **Plagiarism Statement**

Adherence to ethical academic standards is obligatory. Cheating is a serious offense, whether it consists of taking credit for work done by another person or doing work for which another person will receive credit. Taking and using the ideas or writings of another person without clearly and fully crediting the source is plagiarism and violates the academic code as well as the Student Code of Conduct. If it is suspected that a student in any course in which s/he is enrolled has knowingly committed such a violation, the faculty member should refer the matter to the College’s Disciplinary Officer and appropriate action will be taken under the Student Code of Conduct. Sanctions may include suspension from the course and a failing grade in the course. Students have the right to appeal these actions to the Disciplinary Committee under the terms outlined in the Student Code of Conduct.

### **Cancellations**

When weather conditions require the College to close, we will:

- Notify you through your SMCC email account and send a text alert
- Post a storm message on the SMCC Storm Line (741-5900)
- Post the closure on a banner at the top of the SMCC website
- Post a message on the SMCC Facebook page
- Notify local media outlets
- Post a message on Twitter

When weather forces the College to close altogether, open late or close early, the following guidelines are in place:

- When the College closes altogether for the day, all classes are canceled and all offices are closed.
- When the College closes early at a specific time, all classes beginning at that time and later are canceled. All classes beginning before the closure time will be held as scheduled. All offices will close at the closing time.
- When the College opens late, all classes beginning before the specified scheduled opening time are canceled. Classes beginning at the opening time and later will be held as scheduled.

## **Student Printing Policy**

This policy identifies the cost per page for black and white as well as color printing in varying page sizes. Specifics of the policy are outlined below:

### **Per Page Costs**

Each semester students receive a \$20 printing credit. The balance resets at the end of the semester and any remaining credits are removed. The cost varies depending upon page size and whether printing is done in black and white or color.

- a. There is a \$0.10 per page fee for standard 8.5" by 11" black and white documents.
- b. The reverse sides of duplex (double-sided) documents are free.
- c. There is a \$.50 per page fee for standard 8.5" by 11" color documents.
- d. There is a \$.20 per page fee for 8.5" by 14" (legal) or 11" by 17" (tabloid) black and white documents.
- e. There is a \$1.00 per page fee for 8.5" by 14" (legal) or 11" by 17" (tabloid) color documents.

**Duplex charges** (printing on both sides of a page) work in the following fashion: One page is \$0.10, two pages are \$0.10, three pages are \$0.20, and four pages are \$0.20, *etc.* The flipsides are free, but another sheet of paper is \$0.10. Please be aware that a document with any color at all (when printed to a color printer) will by default be printed in color. You are responsible for setting the print job to print black and white if you do not need color. For directions, please go to the IT Help tab in My SMCC.

### **How does it work?**

The College's pay-for-print system monitors printing on all printers (including those in general access labs, library printers, the Academic Achievement Center, Noisy Lounge and technology labs). Students can check the number of pages they have printed by using the Printing Balance tool available on SMCC computers (located in the lower right corner of the screen, near the clock). Departments with work study students who need to print documents for the department should contact the HelpDesk at 741-5696 to have a special account set up.

### **Refunds**

Print jobs are eligible for a refund in the event of mechanical or electronic error on the part of the printer, print server, or software used to submit the job. Jobs are not eligible for a refund in cases where the job was not set up correctly, was submitted multiple times, or the student is not satisfied with the result. To request a refund, please bring the offending print to the IT Department in the basement of the Ross Technology Center. Refunds will be granted in the form of a credit to the student's account.

### **Why is SMCC charging for printing?**

The pay-for-print system is an effort to control escalating printing costs. Charging for printing helps offset the increasing cost of supplies and encourages students to conserve resources. To find ways to reduce your printing charges, please go to the IT Help tab on My SMCC. If you have questions about the pay-for-printing policy or your printing charges, please contact the HelpDesk at 741-5696 or send an email to [helpdesk@smccme.edu](mailto:helpdesk@smccme.edu).

*Be sure to log OUT of the system when you've finished your printing, to prevent unauthorized access to your account.*