



# CENTRAL PIEDMONT COMMUNITY COLLEGE

## Course Syllabus AUT-161-10 Electrical Systems (ASEP)

### Syllabus Contents:

- Course Description
- Course Objectives
- Weekly Outline
- Student Evaluation
- Safety Regulations
- Tool List

### Time Requirements:

- 8 Weeks (1/11/2013 To 3/8/2013)
- 4 Class Hours/Week
- 3 Lab Hours/Week
- 5 Semester Hours Credit

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Office hours: By appointment

# Electrical Systems

## AUT-161-10

### General Motors ASEP

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**Prerequisites:** None

***Course Description:***

This course covers basic electrical theory, wiring diagrams, test equipment, and diagnosis, repair, and replacement of batteries, starters, and alternators. Topics include Ohm's Law, circuit construction, wiring diagrams, circuit testing, and basic troubleshooting. Upon completion, students should be able to properly use wiring diagrams, diagnose, test, and repair basic wiring, battery, starting, charging, and electrical concerns.

***Core Competency:***

Students are assigned a circuit board with electrical and electronic components. Students are required to build circuits experiments to understand and apply ohms law and complete assigned paperwork. Once the experiments are completed each student is evaluated with a hands on test building basic circuits and describes how ohms law works within the circuit.

- **General Motors ASEP Embedded Course Text**  
Battery, Charging, & Starting 16041.01W-R2

**Electrical Systems**  
**AUT-161-10 (ASEP)**  
Course Objectives

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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. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
2. Identify and interpret electrical/electronic system concern; determine necessary action. P-1
3. Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins. P-1
4. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals). P-1
5. Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law). P-1
6. Use wiring diagrams during diagnosis of electrical circuit problems. P-1
7. Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems. P-1
8. Check electrical circuits with a test light; determine necessary action. P-2
9. Measure source voltage and perform voltage drop tests in electrical/electronic circuits using a voltmeter; determine necessary action. P-1
10. Measure current flow in electrical/electronic circuits and components using an ammeter; determine necessary action. P-1
11. Check continuity and measure resistance in electrical/electronic circuits and components using an ohmmeter; determine necessary action. P-1
12. Check electrical circuits using fused jumper wires; determine necessary action. P-2
13. Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action. P-1
14. Measure and diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action. P-1
15. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. P-1

16. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; perform necessary action. P-1
17. Remove and replace terminal end from connector P-1
18. Repair connectors and terminal ends. P-1
19. Repair wiring harness (including CAN/BUS systems). P-1
20. Perform solder repair of electrical wiring. P-1
21. Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures P-3

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

1. Perform battery state-of-charge test; determine necessary action. P-1
2. Perform battery capacity test (or conductance test); confirm proper battery capacity for vehicle application; determine necessary action. P-1
3. Maintain or restore electronic memory functions. P-1
4. Inspect, clean, fill, and replace battery. P-1
5. Perform slow/fast battery charge. P-2
6. Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed. P-1
7. Start a vehicle using jumper cables and a battery or auxiliary power supply. P-1
8. Identify high voltage circuits of electric or hybrid electric vehicle and related safety precautions. P-3
9. Identify electronic modules, security systems and/or radios that require reinitialization or code entry following battery disconnect. P-2
10. 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; perform necessary action. P-2
6. Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition. P-2

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

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

**Electrical Systems**  
**AUT-161-10**  
**General Motors ASEP**  
**Weekly Outline**

**Required Text: Automotive Electricity and Electronics 3<sup>rd</sup> ed.**

**By: JAMES D HALDERMAN**

**Embedded GM Courses: GM Stage 1 Batteries, Starters, Alternators Booklet by GM**

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**WEEK 1**

**Day 1**

Orientation: Review course syllabus, grading policy, and safety regulations.

Reading Assign: Chapter 3

Electrical Fundamentals

**Day 2**

Cover Electrical Fundamentals

Chapter 3 Chapter Quiz Due

Stage 1 Lab Exercises

Reading Assign: Text: Chapter 4

**WEEK 2**

**Day 1**

Cover Electrical Circuits and Ohm's Law

Stage 1 Lab Exercises

Chapter 4 Chapter Quiz Due

TEST: CH 4 (Black Board)

**Day 2**

Reading Assign: Chapter 5

Stage 1 Lab Exercises

Ohm's Law & Parallel Circuit

**WEEK 3**

**Day 1**

Cover Series Circuits

Reading Assign: Chapter 6

Stage 1 Lab Exercises

**Quiz-Series Circuits**

Chapter 5 Chapter Quiz Due

TEST: CH 5

## **Day 2**

Cover Parallel Circuits  
Reading Assign: Chapter 7  
Principles of Magnetism  
Magnetism Booklet and Test  
**Quiz**-Parallel circuits  
Chapter 6 Chapter Quiz Due  
TEST: CH 6

## **WEEK 4**

### **Day 1**

Cover Series Parallel Circuits  
Mid-Term Test-Hands-On- Circuit Board –Series and Parallel Circuits  
Mid-Term Test Written –Basic Electrical Booklet  
Reading Assign: Chapter 8  
Chapter 7 Chapter Quiz Due  
TEST: CH 7

### **Day 2**

Cover Circuit testers and Digital Multimeters  
VAT 40 & VAT 45 Battery Testing  
Reading Assign: Chapter 10  
Chapter 8 Chapter Quiz Due  
TEST: CH 8

## **WEEK 5**

### **Day 1**

Cover Automotive Wiring and Wire Repair  
VAT 40 & VAT 45 Starter Testing  
Reading Assign: Chapter 17  
Chapter 10 Chapter Quiz Due  
TEST: CH 10

### **Day2**

Cover Batteries  
Testing Charging Systems  
Reading Assign: Chapter 18  
Chapter 17 Chapter Quiz Due  
TEST: CH 17

## **WEEK 6**

### **Day 1**

Cover Battery testing and service  
Reading Assign: Chapter 19  
Chapter 18 Chapter Quiz Due  
TEST: CH 18

### **Day 2**

Cover Cranking System  
Reading Assign: Chapter 20  
Chapter 19 Chapter Quiz Due  
TEST: CH 19

## **WEEK 7**

### **Day 1**

Cover Cranking System Diagnosis and Service  
Current Draw Test  
Reading Assign: Chapter 21 & 22  
Chapter 20 Chapter Quiz Due  
TEST: 20

### **Day 2**

Cover Charging System Diagnosis and Service  
Starter R&R  
Alternator R&R  
Reading Assign: Chapter 21 & 22  
Chapter 21 & 22 Chapter Quiz Due  
TEST: CH 21 & 22

## **WEEK 8**

### **Day 1**

VAT 40 and VAT 45 Starter Testing  
Make up work

### **Day 2**

**Final Exam Written**  
**Hands On Exam = VAT 40 & VAT 45**



# CENTRAL PIEDMONT COMMUNITY COLLEGE

## STUDENT GRADE POINT AVERAGE

Students will be graded according to the following grade point system.

Grade	Point Value	Description
A	4	Excellent
B	3	Very Good
C	2	Satisfactory
D	1	Poor
F	0	Failing
<b>The following grades will not be used in computing the grade point average.</b>		
I = Incomplete		W = Withdrawal
S = Satisfactory		U = Unsatisfactory
AUD = Audit		N = Never Attended
X = Credit by Examination		

- **Since this course is preparatory to entering the automotive service industry, job attitude, neatness, promptness and care of equipment will be considered part of the final grade. The final grade on these items will be determined by the instructor and based upon accepted industry standards.**

### GRADING

- FOR A GRADE OF "A":**
  - Complete all written tests with an average of 93% to 100%.
  - Attend 90% of all scheduled class/lab hours.
  - Complete all lab/shop work in a manner as would be determined EXCELLENT in an actual shop.
- FOR A GRADE OF "B":**
  - Complete all written test with an average of 85% to 92%.
  - Attend 85% of all scheduled class/lab hours.
  - Complete all lab/shop work in a manner as would be determined VERY GOOD in an actual shop.
- FOR A GRADE OF "C":**
  - Complete all written tests with an average of 77% to 84%.
  - Attend 80% of scheduled class/lab hours.
  - Complete all lab/shop work in a manner as would be determined SATISFACTORY in an actual repair shop.
- FOR A GRADE OF "D":**
  - Complete all written tests with an average of 70% to 76%.
  - Attend 80% of all scheduled class/lab hours.
  - Complete all lab/shop work in a manner as would be determined POOR in a shop.





# CENTRAL PIEDMONT COMMUNITY COLLEGE

## Transport Systems Technology - Rules and Regulations

**Year- Semester:** 2013 Spring

**Class Name:** Electrical Systems

**Class Number- Section** AUT-161-10

**Instructor:** James Viehmann

As a participant in the Transport Systems Technology division of CPCC, my classes include participation in hands-on activities in a lab setting. These labs can be in a large shop or small lab facility. In order to protect myself and others from harm, I agree to participate in those labs in a safe and professional manner.

### Dress/Appearance/Hygiene

1. **Safety Glasses:** I agree to wear approved, non-tinted Safety Glasses at all times while in the lab.

“At all times” means from the moment I enter the lab until I leave. This includes any time working, not working, referencing a computer, washing hands, etc. If I am found to not be wearing my safety glasses appropriately (covering my eyes), I agree to the following consequences:

- a. First offense – Verbal warning from the instructor
- b. Second offense – I will be excluded from that lab for the remainder of the lab
- c. Third offense – I will be excluded from that lab for the remainder of the lab and my grade will be reduced
- d. Any offenses while underneath a vehicle – skip automatically to the next highest penalty. There are no verbal warnings; exclusion for the day is automatic and a second occurrence will affect my grade

I understand that there are no exceptions from the above penalties. *In addition, warnings and exclusions can and will be made by any member of the CPCC faculty, staff, lab facilitators, Division Director, etc., and carry the same weight.*

2. **Dress:** All students are required to wear their dealer sponsored uniform to school each day. All shirts must be clean and tucked in. Dark colored work-style pants are recommended or proper fitting jeans that meet the following requirements (length above the shoes, jeans above the hip with belt). No oversized jeans will be permitted. Shorts are not allowed. No keys, chains or

wallets hanging out of pockets. Rips and tears must be mended in a timely manner. All belts must be of the type that does not have an exposed buckle, or buckle turned to side of body.

3. **Shoes:** Students must wear leather work boots/shoes. We highly recommend steel toes and oil resistant soles. No sneakers, tennis shoes, open toed shoes, or dress shoes are permitted.
4. **Jewelry:** Facial jewelry of any type is NOT permitted. This includes ear, nose, lip, eyebrow, cheek rings, studs, etc. Also prohibited are necklaces, rings (only one wedding ring permitted), or bracelets of any kind as these items may pose a safety hazard. It is strongly recommended that you not wear a wristwatch.
5. **Hats:** Hats are permitted in the shop area only! If a hat has a bill, it must be worn with it facing forward. (skullies or beanies are not permitted)
6. **Hair:** Hair that is below the collar must be pulled back appropriately. Facial hair must be well groomed and not constitute a safety hazard.
7. **Hygiene:** Good personal hygiene must be maintained at all times.

*Other appearance issues not directly covered by these rules will be considered on a case-by-case basis. CPCC staff will decide what is professional in appearance and what is not.*

### **Attendance**

8. **Attendance:** All Students are required to be on time. Students are expected to discuss tardiness with the instructor after class. Students that do not attend 80% of the classes will automatically receive a failing grade.
9. **Illness-Emergency Reporting Procedures:** All students must notify the Instructor whenever he/she will be absent and state the reason for the absence. If the Instructor cannot be reached, leave a voice mail or e-mail. If no message is received from the student, this will constitute an absence. A MESSAGE MUST BE RECEIVED.
10. **Tardiness:** Tardiness in any manner will not be tolerated. Students are expected to be in class on time both in the morning and after lunch. Class begins at exactly the scheduled time. Three unexcused tardies will result in lowering of one grade level. Six or more excused tardies will result in lowering by one grade level and /or penalty to be determined by the instructor.

### **Participation/Behavior**

11. **Participation:** Students are to participate in all areas of instruction to the fullest extent of their ability.
12. **Disrespectful Behavior:** Talking, whispering, sleeping, laying your head on the desk, passing notes, etc. while the instructor is teaching is disrespectful behavior and will not be tolerated. One warning will be given; a second violation will result in immediate dismissal from the class; third violation will result in dismissal from the program.
13. **Instructors/Staff/Guests:** All persons must be treated with full courtesy and respect. Students, during any association with the instructional staff and/or guests, shall refer to them as “Sir” or “Ma’am” as the case may be. Students are expected to sit straight in their seats and give instructors their undivided attention while in class.
14. **Language:** Profanity of any kind will not be tolerated.

15. **Cheating:** Cheating in any manner WILL NOT be tolerated. Any student caught cheating or allowing or assisting in cheating, will be immediately dismissed from the program by the Instructor.

16. **Cell Phones:** Pagers, cell phones, or other electronic devices are not to be used in class. NO EXCEPTIONS!!

17. **Food/Tobacco/Alcohol/Drugs/Medications:**

- Smoking or use of *any tobacco* products are not permitted on campus.
- The unlawful manufacture, distribution, dispensation, possession, or use of illegal drugs presents a hazard to students, employees, and property and is not permitted at any property in use by the College or while participating in a co-op. Any student who violates this policy is subject to disciplinary action. Refer to CPCC's Policy and Procedures No.7.01 at <http://www.cpcc.edu/administration/policies-and-procedures/7-01-drug-free-college> for complete details.
- NO FOOD OR DRINK (EXCEPT BOTTELD WATER) IS ALLOWED IN THE LAB AT ANY TIME. You may eat and drink only in the break areas or outside. Food and drink in the classroom is at the instructor's discretion.
- No alcohol is permitted on campus. If this occurs it will result in immediate dismissal from the program.
- No student is to be on campus under the influence of alcohol or with the odor of alcohol on or about them.

18. **Breaks:** Students are not permitted to gather in the hallways or other areas of the building. During breaks students are allowed in the break areas, restrooms, or outside. Students are not to block walkways or doorways.

Refer to “CPCC Student Code of Conduct and Disciplinary Procedures” and/or CPCC’s Policies and Procedures at <http://www.cpcc.edu/administration/policies-and-procedures/7-students> for the College’s expectations of its students.

*Any student not following these guidelines will be dismissed from class and attendance credit for that day will not be given. After a student has been warned or dismissed from class three times he or she will be dropped from the program.*

**No excuses will be considered.**

By signing this form I am attesting to the fact that I have read or had read to me and I understand all of the Rules and Regulations of Central Piedmont Community College’s Transport Systems Technology program. By affixing my signature to this form I am also agreeing to abide by each and every rule. I understand that any and all violations of these rules will be made part of my record and that any violation could result in termination from this program.

Student Name (Print) \_\_\_\_\_ Date \_\_\_\_\_

Student ID# \_\_\_\_\_

Student Signature \_\_\_\_\_



# CENTRAL PIEDMONT COMMUNITY COLLEGE

## Automotive Technology, Tool List

### Safety Glasses or Goggles Mandatory in Labs

- Toolbox
- Common slotted screwdrivers, 4"x3/16, 6"x1/4, 8"x1/4
- Phillips screwdrivers number 1 and number 2
- Torx bit set T10 to T60
- Standard combination wrench set 5/16 to 1 1/4"
- Metric combination wrench set 6mm to 22mm
- 16 oz ball peen hammer
- 6" needle nose pliers
- Regular slip joint pliers
- 10 or 12" Channel Lock pliers
- 6 or 7" side cutting pliers
- Set of punches and chisels
- Feeler gauge set
- 3/8 "drive socket set, including ratchet, extensions, standard and metric sockets,
  - 3/8 to 7/8 and 8mm to 17mm
- 3/8" to 1/2" socket adapter, 1/2" to 3/8" socket adapter
- 1/2" drive socket set with extensions and ratchet,
- 1/2" drive flex handle at least 18" long (breaker bar)
- 1/2" drive sockets, 7/16 to 1 1/4 and 10mm to 22mm
- 1/2" inch drive torque wrench
- Spark plug sockets 5/8" and 13/16" 3/8" drive
- Gasket scraper
- Set of Allen wrenches
- 12-volt test light
- 1/4" drive socket set, standard and metric sockets, including ratchet
- Non-sparking drift punch, brass or aluminum
- Digital Volt, Ohm and Ammeter DVOM, with Leads Example Fluke model 83

**You may wish to purchase additional tools for the specific program you are enrolled in such as ASEP, BMW, T-TEN, CAP. Check with your instructor for a list.**



# CENTRAL PIEDMONT COMMUNITY COLLEGE

## Automotive Technology Safety Regulations

- An Instructor must be present any time a class or session is working in the lab

### *Use of safety glasses is required/mandatory in lab areas.*

- Any safety hazard will be reported to the instructor immediately. Floor will be kept clear of all liquids and tripping hazards.
- No equipment will be operated by students until they have received instruction on proper and safe operation of same equipment.
- Vehicle lifts must be secured with mechanical locks prior to working under vehicle
- Jack stands will be used when jacking up a vehicle for service.
- Brake asbestos "dust" will be controlled any time work is done which could lead to asbestos exposure.
- Floor exhaust system will be used anytime an engine is running in the lab.
- Use of tobacco is not permitted in any lab or classroom.
- Use of audio equipment is not permitted during class/lab hours.
- Students and faculty must follow OSHA rules concerning exposure to blood borne diseases.
- Proper disposal of automotive waste products, including hazardous wastes, is required.