

## COURSE SYLLABUS

**Course Title:** AUMT 1407-271 Automotive Electrical Systems (4:2:8)  
**Semester/Year:** Fall 2024  
**Instructor:** Mr. Gary Ufford

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### I. GENERAL COURSE INFORMATION

- A. Course Description: ( 4:2:8)** - This course is an overview of automotive electrical systems, including topics in operational theory, testing, diagnosis, and repair of batteries, charging and starting systems, and electrical accessories. Emphasis will be on electrical schematic diagrams and service manuals. Safety is emphasized throughout the course. Elements of the course may be taught manufacturer specific.
- B. Course Goals/Objectives:** Utilizing appropriate safety procedures, the student will interpret wiring schematics and symbols, explain electrical principals, explain the theory and principles of battery, starting, charging systems, and automotive electrical accessories. The student will demonstrate diagnosis and repair of battery, starting, charging systems, and electrical accessories; and demonstrate proper use of electrical test equipment. A complete detailed list of objectives is printed in table form and listed before the content outline of this syllabus.
- C. Course Competencies:** A = 100-90 B = 89-80 C = 79-70 F = 69 or below  
A grade of a C or higher is required in order to successfully complete this course.
- D. Academic Integrity.** It is the aim of the faculty of South Plains College to foster a spirit of complete honesty and a high standard of integrity. The attempt of any student to present as his own, any work which he has not honestly performed, is regarded by the faculty and administration as a most serious offense and renders the offender liable to serious consequences, possibly suspension. For further information concerning Cheating and Plagiarism, read the section on Academic Integrity in the SPC General Catalog. **If you have a question as to whether you may work with other students on any assignment, ASK YOUR INSTRUCTOR. On some assignments working with others is encouraged.**
- E. SCANS and Foundation Skills.** Specific SCANS competencies and foundation skills applicable to this course are listed adjacent to each objective in the course objective table. They include:  
Foundation Skills (F): 1,2,3,4,5,6,8,9,10,11,12.  
Competencies (C): 5,6,7,15,16,18,19,20. A complete list of SCANS competencies and foundation skills is attached at the end of this syllabus.

- F. Verification of Workplace Competencies-Technical Education Division.** The learning outcomes of this course will prepare the student to meet the competencies measured in a comprehensive elective course experience (Course #s AUMT 1366 , or AUMT 2366). In addition the student will also be prepared to take the ASE Student Certification test for Electrical Systems.

## II SPECIFIC COURSE/INSTRUCTOR REQUIREMENTS

### A. Textbook & Other Required Materials:

1. Halderman, James D. Automotive Technology – Principles, Diagnosis, and Service 6th edition, Pearson Publishers, Copyright 2020 (with on-line curriculum)
2. 8 & 1/2" x 11" Notebook for note taking and assignments
3. Safety Glasses
4. A calculator with a reciprocal key

- B. Class Attendance Policy.** Students are expected to attend all classes in order to be successful in a course. The student may be administratively withdrawn from the course when absences become excessive **without notice , there are no excused absences. Excessive absences means 4 (four) or more absences for any reason. Upon the 5<sup>th</sup> absence, each student will lose 10 points off of their current GPA, the 6<sup>th</sup> absence an additional 10 points, and the 7<sup>th</sup> absence an additional 10 points. Excessive absences cause you to miss key points of a class and show you are not reliable/dependable for employment. Two (2) tardies will count as one absence. Leaving class without notifying your instructor is considered an absence, regardless of the time you left.**

When an unavoidable reason for class absence arises, such as illness, an official trip authorized by the college or an official activity, the instructor may permit the student to make up work missed. It is the student's responsibility to complete work missed within a reasonable period of time as determined by the instructor. Students are officially enrolled in all courses for which they pay tuition and fees at the time of registration. Should a student, for any reason, delay in reporting to a class after official enrollment, absences will be attributed to the student from the first class meeting.

Students who enroll in a course but have "Never Attended" by the official census date, as reported by the faculty member, will be administratively dropped by the Office of Admissions and Records. A student who does not meet the attendance requirements of a class as stated in the course syllabus and does not officially withdraw from that course by the official census date of the semester, may be administratively withdrawn from that course and receive a grade of "X" or "F" as determined by the instructor.

It is the student's responsibility to verify administrative drops for excessive absences through MySPC using his or her student online account. If it is determined that a student is awarded financial aid for a class or classes in which the student never attended or participated, the financial aid award will be adjusted in accordance with the classes in which the student did attend/participate and the student will owe any balance resulting from the adjustment.

- C. Assignment Policy:** All assignments are due at the beginning of class on the due date unless otherwise stated by your instructor. **Part of these assignments can be on-line through the on-line curriculum, you should log on to the on-line curriculum at the beginning of the semester in order to complete them on time. There may be no makeup assignments and no late assignments will be accepted.** The dates printed in this syllabus can change. Every effort

will be made to inform students of those changes, but the students are ultimately responsible for all assignments regardless of any changed dates. Please check the dates with your instructor throughout the course.

**D. Grading Policy/ Procedure and/or Methods of Evaluation:** All exams are mandatory for effective student evaluation. Exams will cover theory and practical skills pertaining to all aspects of material presented. Adequate study time should be set aside for exam reviews. **There may be no makeup exams. All fees owed to South Plains College, including projects, are required to be paid in full before you take your final exam.** The NA3SA certification test mentioned above can be used in place of your final exam. Electrical NA3SA is usually taken in the spring semester.

You will be evaluated during this course by the following method:

Unit exams, written assignments, pop quizzes, and attendance = 25%

Unit skills tests and/or Lab sheets = 50% (approximately 4)

Final Exam: = 25%

**A unit skills test is a measure of how well you follow instructions, your safety in the shop, your use of tools, your cleanliness in the work area and your attention to detail while you perform diagnostics or repairs within a required time period. If you're late for a skills test the following will happen; 0 to 5 minutes late = -10pts; more than 5 min. but less than 10 min. late = -20pts; more than 10 min. but less than 15 min. late = -30pts. If you are more than 15 minutes late you will have earned a "0" for the test.**

A task sheet is used to plan and track students while they perform required skills in the shop. This is not used to average your grade, but it is a professional evaluation of how well you work independently and your level of expertise in completing assigned tasks. Prospective employers will want to see this during an interview, so please follow the shop and repair procedures to the best of your ability.

**D. Special Requirements:** **A student's conduct is expected to follow the guidelines stated in the college catalogue and student handbook, any deviation will result in immediate disciplinary action.** Please turn off all cell phones, pagers, etc. during class. A detailed list of lab/shop guidelines will be distributed to you at the beginning of this class, you are expected to follow all guidelines when in the shop. **No smoking, chewing, or dipping is permitted in the building or outside the back doors of the shop and food and drinks are not allowed in any classroom, lab, or shop.** All these activities will be limited to break time in designated areas only. Breaks will be limited to 20 minutes. Do not park on the back lot unless preauthorized by your instructor, unauthorized vehicles can be towed at the owner's expense.

**Dress Code:** The Automotive Program requires you to dress appropriately. Flip flops or opened toed shoes are not allowed in the shop, proper foot attire should be worn to protect your feet, leather work boots are recommended. Jeans/ pants will be worn so that neither one falls to your thighs or knees, belts must hold them at your waist line. Safety glasses will be worn at all times in the shop. If a student fails to comply with the above dress code, he or she, will be sent home and given an absence for that day.

	<b>Course Objectives:</b>	
F1,2,5,6,8,12	! discuss properties of elements that cause them to be conductors, insulators, or semi-conductors.	C5,6,7,15
F1,2,5,6,8,12	! define the terms voltage, current and resistance.	C5,6,7,15
F1,2,5,6,8,12	! discuss the properties of conductors and factors that determine resistance.	C5,6,7,15
F1,2,5,6,8-12	! identify the types of circuits and discuss how they operate in an electrical system.	C5,6,7,15
F1,2,5,6,8-12	! understand the concepts of magnetism and electromagnetism and discuss how they are used in automotive electrical systems.	C5,6,7,15
F1,2,5,6,8-12	! identify diodes, transistors, and other electronic components.	C5,6,7,15
F1,2,5,6,8-12	! list and discuss the three types of circuit faults and know troubleshooting techniques associated with them.	C5,6,7,15,16, 18-20
F1,2,5,6,8,12	! discuss battery design and construction and know the various methods of rating battery performance.	C5,6,7,15
F1-6,8,12	! know how to properly service and test batteries.	C5,6,7,15
F1-6,8,12	! understand the function of starting motors and be able to identify the components of starters.	C5,6,7,15
F1-6,8,12	! know the proper procedures for testing and servicing starting motors.	C5,6,7,15
F1-6,8,12	! identify the components of the charging system and their functions.	C5,6,7,15
F1-6,8,12	! know the proper procedures for testing and servicing charging systems.	C5,6,7,15
F1-6,8-12	! know how to read electrical schematics and use them to locate potential problems.	C5,6,7,15
F1-6,8,12	! know basic troubleshooting techniques associated with all electrical accessories.	C5,6,7,15,16, 18-20

<b>Content Outline</b>		
<b>Unit 1: Terminology Circuit Identification and the Use of Test Devices</b>		
Unit Objectives:		
Upon completion of this unit, you will be able to:		
F1,2,5,6,8,12	! define voltage, current and resistance.	C5,6,7,15
F1,2,5,6,8,12	! list the properties of conductors.	C5,6,7,15
F1,2,5,6,8,12	! list and discuss the factors that determine resistance.	C5,6,7,15
F1-6,8-12	! restate Ohm's law and calculate problems using the formula $E=IR$ .	C5-7,15,18,19
F1,2,5,6,8,12	! name the 3 types of circuits used in automobiles and discuss how they operate.	C5,6,7,15
F1,2,5,6,8,12	! discuss what voltage drop is and its significance in the understanding of electrical system operation.	C5,6,7,15
F1-6,8-12	! perform repairs on wiring harnesses.	*
F1,2,5,6,8,12	! solder connections with a soldering iron.	*C5-7,15,16, 18-20
F1,2,5,6,8,12	◆ Discuss magnetism, magnetic fields, electromagnetism, and their relationship to vehicle applications	C5,6,7,15
<b>Unit 2: Using Schematics, Diagnosing, and Testing Electrical Circuits</b>		
Unit Objectives:		
Upon completion of this unit, you will be able to:		
F1,2,5,6,8,12	! understand how to read an electrical schematic.	C5,6,7,15
F1,2,5,6,8,12	! identify loads, protection controls, and the positive and ground sides of electrical circuits.	C5,6,7,15
F1,2,5,6,8,12	! diagnose and repair horn circuit problems.	C5,6,7,15
F1,2,5,6,8-12	! check electrical continuity with a test light and ohmmeter.	C5,6,7,15,18
F1,2,5,6,8-12	! check voltage and voltage drop with analog and digital voltmeters.	C5,6,7,15
F1,2,5,6,8-12	! check current flow with analog and digital ammeters.	C5,6,7,15
F1,2,5,6,8-12	! inspect, test, and replace circuit protection devices.	C5,6,7,15
F1,2,5,6,8-12	! locate shorts to ground in electrical circuits.	C5,6,7,15

	<p><b>Unit 3: Battery Service</b></p> <p>Unit Objectives: Upon completion of this unit, you will be able to:</p>	
F1,2,5,6,8,12	<ul style="list-style-type: none"> <li>◆ Describe how batteries are constructed, including the use of plates and separators to form elements</li> </ul>	C5,6,7,15
F1,2,5,6,8,12	<ul style="list-style-type: none"> <li>◆ Discuss battery ratings and how they are determined</li> </ul>	C5,6,7,15
F1,2,5,6,8,12	<ul style="list-style-type: none"> <li>◆ Discuss safety techniques for battery testing and service (includes Hybrid vehicle)</li> </ul>	C5,6,7,15
F1,2,5,6,8-12	<ul style="list-style-type: none"> <li>◆ Know proper handling techniques for batteries and associated tools and equipment (includes Hybrid vehicle)</li> </ul>	C5,6,7,15,18
F1,2,5,6,8,12	<ul style="list-style-type: none"> <li>◆ Discuss proper jump starting procedures</li> </ul>	C5,6,7,15
F1,2,5,6,8,12	<ul style="list-style-type: none"> <li>◆ Discuss proper battery charging techniques</li> </ul>	C5,6,7,15
F1,2,5,6,8-12	<ul style="list-style-type: none"> <li>◆ Determine causes of battery failure</li> </ul>	C5,6,7,15
F1,2,5,6,8-12	<ul style="list-style-type: none"> <li>◆ Perform an abnormal key off battery drain test</li> </ul>	C5,6,7,15
F1,2,5,6,8-12	<ul style="list-style-type: none"> <li>◆ Perform various other battery tests as indicated by the task verification list</li> </ul>	C5,6,7,15
	<p><b>Unit 4: Starting System Service</b></p> <p>Unit Objectives: Upon completion of this unit, you will be able to:</p>	
F1,2,5,6,8,12	<ul style="list-style-type: none"> <li>◆ Read an electrical schematic of a starting system and understand how the system works electrically</li> </ul>	C5,6,7,15
F1,2,5,6,8,12	<ul style="list-style-type: none"> <li>◆ Describe the purpose and operating principles of DC starting motors</li> </ul>	C5,6,7,15
F1,2,5,6,8,12	<ul style="list-style-type: none"> <li>◆ Identify and explain the different types of starter drive mechanisms</li> </ul>	C5,6,7,15
F1,2,5,6,8,12	<ul style="list-style-type: none"> <li>◆ Explain solenoid and magnetic switch operation</li> </ul>	C5,6,7,15
F1,2,5,6,8,12	<ul style="list-style-type: none"> <li>◆ Discuss the proper procedure for starter shimming</li> </ul>	C5,6,7,15,16,
F1,2,5,6,8-12	<ul style="list-style-type: none"> <li>◆ Perform starting system tests as indicated by the task verification list</li> </ul>	18-20

	<p><b>Unit 5: Charging System Service</b>  Unit Objectives:  Upon completion of this unit, you will be able to:</p>	
F1,2,5,6,8,12	! read an electrical schematic of a charging system and understand how the system works electrically.	C5,6,7,15
F1,2,5,6,8,12	! discuss the purpose and operation of charging systems.	C5,6,7,15
F1,2,5,6,8,12	! describe how AC current is developed in the alternator and rectified to DC.	C5,6,7,15
F1,2,5,6,8,9,12	! identify components of the charging system.	C5,6,7,15
F1,2,5,6,8,9,12	! compare different types of alternators and voltage regulators.	C5,6,7,15
F1,2,5,6,8,9,12	! discuss how to determine the serviceability of rotors, stators, diodes and rectifier assemblies.	C5,6,7,15
F1,2,5,6,8-12,14	! perform charging systems tests as indicated by the task verification list.	C5,6,7,15,16,18-20
F1,2,5,6,8-12,14	! Perform a jump assist procedure on a Hybrid vehicle following manufacturer procedures	C5,6,7,15,16,18-20
	<p><b>Unit 6: Using Schematics Diagnosing and Testing Accessory Circuits</b>  Unit Objectives:  Upon completion of this unit, you will be able to:</p>	
F1-6,8-12	! diagnose wiper operation problems.	C5,6,7,15
F1-6,8-12	! inspect, test, and replace pulse wiper controls.	C5,6,7,15
F1-6,8-12	! inspect, test, and repair wiper circuit switches and wiring.	C5,6,7,15
F1-6,8-12	! diagnose and repair power door lock circuits	C5,6,7,15
F1-6,8-12	! diagnose and repair RKE systems	C5,6,7,15
F1-6,8-12	! diagnose and repair automatic and power window systems	C5,6,7,15
F1-6,8-12	! inspect, test, and repair faults within the different electronic controlled systems on today's vehicles.	C5,6,7,15

## Automotive Electrical Systems Assignment and Exam Schedule

**Log on to this course on Blackboard using your SPC credentials, also log on to the on-line curriculum using your purchased access from the bookstore. Become familiar with the website and look for all on line assignments. It is your responsibility to keep up with all assignments and turn in by the due dates listed below and on line.**

**Unit 1:** Terminology Circuit Identification Use of test Devices August 26th – September 11th

**Unit 1 Assignment:** In your textbook Read Chapters 39, 40, 41, & 47. Please spend quality time with the material related to the objectives in unit1, under content outline of this syllabus. **Log on to the on-line curriculum.** Complete Job Sheet 4, the terminology list, and the Chapter Quiz questions for Ch's 39, 40, & 41. **All are due on Sept. 25th.**

**Unit 2:** Using Schematics, Diagnosing and Testing Electrical Circuits September 11th – Sept.25th

**Unit 2 Assignment:** Read chapters 42, 44, & 45. Complete all assigned lab projects. Complete exercises 1,2,3,6&7(handout/extra credit) and the Chapter Quiz questions for Ch's 42, 44, & 45. **This is due Sept. 25th.**

**Units 1 & 2 Written Test: Sept. 25th ( possibly on-line)**

**Units 1 & 2 Skills Test: Sept. 25<sup>th</sup>**

**Unit 3:** Battery Service September 30th – October 9th

**Unit 3 Assignment:** Read chapters 50& 51. **Complete the Chapter Quiz Questions for chapters 50 & 51 and turn in on October 9th . Complete all assigned lab projects. Parts of chapters 89 & 90 will also be covered in this unit.**

**Unit 3 Written Test: October 9th ( on-line)**

**3Unit 3 Skills Test: October 9th                      Fall Break October 18th – No Classes**

**Unit 4:** Starting System Service October 14th – October 30th

**Unit 4 Assignment:** Read chapters 52 & 53. **Complete the Chapter Quiz Questions for chapters 52 & 53 and turn in on October 30th. Complete all assigned lab projects. . Parts of chapters 89 & 90 will also be covered in this unit.**

**Unit 4 Written Test: October 30th (on blackboard)**

**Unit 4 Skills Test: October 30th**

**Unit 5:** Charging System Service November 4th – November 25th

**Unit 5 Assignment:** Read Chapters 54 & 55. **Complete the Chapter Quiz Questions for chapters 54 & 55 and turn in on November 25th. Complete all assigned lab projects. Parts of chapters 89 & 90 will also be covered in this unit.**

**Unit 5 Written Test: November 25th (on-line)**

**Unit 5 Skills Test: November 25th    Thanksgiving Holiday November 27th – 30th**

**Unit 6:** Using Schematics, Diagnosing and Testing Accessory Circuits November 25th – December 4th

**Unit 6 Assignment:** Read chapter 58. Read and study any handouts given to you. Complete all assigned lab projects.

**Unit 6 Written Test: This will be included on the final exam.**



**Unit 6 Skills Test: This test will be given on a needed and time allowing basis only.**

**Final Exam: Your final exam is due by December 9th at 5:00 pm. Please allow yourself adequate study time, this will be a comprehensive test.**

## **SCANS COMPETENCIES**

- C-1 **TIME** - Selects goal - relevant activities, ranks them, allocates time, prepares and follows schedules.
- C-2 **MONEY** - Uses or prepares budgets, makes forecasts, keeps records and makes adjustments to meet objectives.
- C-3 **MATERIALS AND FACILITIES** - Acquires, stores, allocates, and uses materials or space efficiently.
- C-4 **HUMAN RESOURCES** - Assesses skills and distributes work accordingly, evaluates performances and provides feedback.

### **INFORMATION - Acquires and Uses Information**

- C-5 Acquires and evaluates information.
- C-6 Organizes and maintains information.
- C-7 Interprets and communicates information.
- C-8 Uses computers to process information.

### **INTERPERSONAL—Works With Others**

- C-9 Participates as members of a team and contributes to group effort.
- C-10 Teaches others new skills.
- C-11 Serves Clients/Customers—works to satisfy customer’s expectations.
- C-12 Exercises Leadership—communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- C-13 Negotiates—works toward agreements involving exchanges of resources; resolves divergent interests.
- C-14 Works With Diversity—works well with men and women from diverse backgrounds.

### **SYSTEMS—Understands Complex Interrelationships**

- C-15 Understands Systems—knows how social, organizational, and technological systems work and operates effectively with them.
- C-16 Monitors and Corrects Performance—distinguishes trends, predicts impacts on system operations, diagnoses systems performance and corrects malfunctions.
- C-17 Improves or Designs Systems—suggests modifications to existing systems and develops new or alternative systems to improve performance.

### **TECHNOLOGY—Works With a Variety of Technologies**

- C-18 Selects Technology—chooses procedures, tools, or equipment, including computers and related technologies.
- C-19 Applies Technology to Task—understands overall intent and proper procedures for setup and operation of equipment.
  - C-20 Maintains and Troubleshoots Equipment—prevents, identifies, or solves problems with equipment, including computers and other technologies.

## FOUNDATION SKILLS

### **BASIC SKILLS—Reads, Writes, Performs Arithmetic and Mathematical Operations, Listens and Speaks**

- F-1 Reading—locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- F-2 Writing—communicates thoughts, ideas, information and messages in writing and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- F-3 Arithmetic—performs basic computations; uses basic numerical concepts such as whole numbers, etc.
- F-4 Mathematics—approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- F-5 Listening—receives, attends to, interprets, and responds to verbal messages and other cues.
- F-6 Speaking—organizes ideas and communicates orally.

### **THINKING SKILLS—Thinks Creatively, Makes Decisions, Solves Problems, Visualizes and Knows How to Learn and Reason**

- F-7 Creative Thinking—generates new ideas.
- F-8 Decision-Making—specifies goals and constraints, generates alternatives, considers risks, evaluates and chooses best alternative.
- F-9 Problem Solving—recognizes problems, devises and implements plan of action.
- F-10 Seeing Things in the Mind’s Eye—organizes and processes symbols, pictures, graphs, objects, and other information.
- F-11 Knowing How to Learn—uses efficient learning techniques to acquire and apply new knowledge and skills.
- F-12 Reasoning—discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

### **PERSONAL QUALITIES—Displays Responsibility, Self-Esteem, Sociability, Self-Management, Integrity and Honesty**

- F-13 Responsibility—exerts a high level of effort and perseveres towards goal attainment.
- F-14 Self-Esteem—believes in own self-worth and maintains a positive view of self.
- F-15 Sociability—demonstrates understanding, friendliness, adaptability, empathy and polite-ness in group settings.
- F-16 Self-Management—assesses self accurately, sets personal goals, monitors progress and exhibits self-control.
- F-17 Integrity/Honesty—chooses ethical courses of action.