



## SYLLABUS

### Your Course Learning Plan

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# Electrical Fundamentals

## A. General Course Information

**Course description:** The Electrical Fundamentals students of UAW-LETC will successfully complete a series of activities that will meet the needs of Automotive Dealerships and the aftermarket while following guide lines of the National Automotive Training and Education Foundation (NATEF). These activities will consist of, but not limited to; properly using a voltmeter, ammeter, ohmmeter, and test light to obtain readings from electrical circuits built on electrical simulator boards. Fundamental diagnostics strategies in locating electrical circuit faults will be presented. These activities will take place in the classroom, consisting of written and hands-on exercises. Each phase will have its guidelines and time period. We will cover some areas with more detail than other's depending on the demand for that area.

**Prerequisites:** Technical Introduction to Dealerships: Module 12, Electrical Systems. (*Refer to TID Curriculum for more information*)

**Organization:** This is a lecture / classroom course in which topics are presented by the instructor, classroom assignments are explained and assigned projects are completed by students during class time. Objective quizzes are given daily and there is a comprehensive final exam. This course is a prerequisite for the Electrical System Diagnosis, Air Conditioning, Engine Technician, Suspension & Steering, Toyota Transmission, Brake Technician, and Transmission Rebuild courses. Electrical Fundamentals students generally have had no previous electrical instruction or employment. When students have completed this course they generally have the same level of expertise as those who have had previous training. Initial emphases are on the use of equipment and basic procedures.

**Course objectives:**

**Skills:**

1. Demonstrate a working understanding of electrical principles using Ohm's Law.
2. Exhibit the ability to measure available voltage and voltage drops in electrical circuits using a voltmeter.
3. Exhibit the ability to measure available voltage and voltage drops in electrical circuits using a voltmeter.
4. Exhibit the ability to measure amperage in electrical circuits using an ammeter.
5. Exhibit the ability to measure resistance and/or continuity in electrical circuits and components using an ohmmeter.
6. Explain and demonstrate the strategy for locating shorts, opens, and high resistance in electrical circuits.
7. Demonstrate harness wire repair using wire cutters, strippers, soldering iron, solder, flux, and heat shrink tubing.
8. Demonstrate and explain proper procedure for testing diodes using a diode tester.

**Cognitive:**

1. Identify components of atoms and their electrical charge.
2. Identify design, construction, and rules of series, parallel, and series-parallel circuits.
3. Describe application of Ohm's Law to rules of series, parallel, and series-parallel circuits.
4. Explain the purpose and proper procedure for measuring available voltage and voltage drops in electrical circuits.
5. Explain the purpose and proper procedure for measuring amperage in electrical circuits.
6. Explain the purpose and proper procedure for measuring continuity and resistance in electrical circuits and components.
7. Describe effects on amperage, resistance, and voltage in electrical circuits resulting from shorts, opens, and high resistance circuit problems
8. Describe construction and electrical properties of semiconductor devices.

**Textbooks / Software:**

1. Toyota Electrical Circuit Diagnosis Course 623, Technician Handbook
2. Video Library.

## B. Course Content and Outcomes

**Course content:**

1. Atomic Theory
2. Electrical Circuits and Ohm's Law
3. Electrical Measurements
4. Introduction to Circuit Problems
5. Series Circuits
6. Parallel Circuits
7. Series-Parallel Circuits
8. Diagnosing Circuit Problems
9. Inductors and Capacitors
10. Semiconductors
11. Electric Motors
12. Wire Repair

**Learning outcomes:**

Upon successful completion of this course the student will:

1. Demonstrate and practice personal responsibility skills required at the workplace.
2. Practice interpersonal communication and problem solving skills.
3. Utilize social and personal management skills.
4. Demonstrate the ability to follow proper procedures in the measurement of voltage, amperage, and resistance in electrical circuits.
5. Implement a diagnostic strategy that will aid in identification and location of faults in electrical circuits.
6. Possess the skills necessary to perform wire repair in line with the highest quality standards in the automotive industry.

**Grading (credit) criteria:**

Course will be weighted as follows. Task Worksheets 50%, Quizzes 30%, Final exam 20%.

Task worksheets are vital to the assessment of the student's performance competency. They will be assigned almost every day. Worksheets will be due at the end of each day. Grading will be based on a performance rating of "2" (Proficient) and "3" (Proficient, able to teach others) with a minimum rating of "2" being required for passing.

There will be many objective quizzes given relating to current topics. Grading will be based on percentage of correctly answered questions. A grade of 80% is required for passing.

The final exam will be comprehensive relating to all topics covered in the course. Questions are written with heavy emphasis on critical thinking and diagnostic skills. A grade of 80% is required for passing.

## C. Class/Shop Policies

### Student Expectations:

1. Be on time for the start of class and return to class for final roll-call.
2. Appropriate working attire shall be worn.
3. No jewelry will be worn while utilizing electrical simulators.
4. Access to electrical simulators only as authorized by the instructor.
5. No cell phones or other electronic devices.
6. Participate in classroom discussions.
7. Observe classroom etiquette.
8. Participation in classroom clean up is required.
9. Attendance to classroom activities in assigned area.
10. Approval by instructor required prior to being absent from assigned area.
11. Ensure electrical simulators and multimeters are off prior to storing them.
12. Follow all safety rules; be concerned with your safety and the safety of others.
13. Report all injuries regardless of the nature or severity to the instructor.

## Tentative Schedule

DAY	TASK	TOPIC/ACTIVITY
1		<b>Atomic Theory</b> Identify atomic particles and states of electrical charges Quiz, Atomic Theory  Atomic Theory Text
2	Ohm's Law Exercise 1 Ohm's Law Exercise 2 Ohm's Law Exercise 3	<b>Electrical Circuits and Ohm's Law</b> Identify components of Ohm's Law and comprehend relationships Quiz, Ohm's Law  Electrical Circuits and Ohm's Law Text
3	1-1, Voltage Measurement 1-2, Current Measurement 1-3, Resistance Measurement	<b>Electrical Measurements</b> Measuring voltage with a voltmeter Measuring amperage with an ammeter Measuring resistance with an ohmmeter  Electrical Measurements Text Toyota 623, Essential Electrical Concepts, pages 1-1 through 1-30
4		<b>Introduction to Circuit Problems</b> Shorts, opens, and high resistance faults  Lecture
5	2-1, Series Circuits Series Exercise 1 Series Exercise 2 Series Exercise 3 Series Circuits 1 Series Circuits 2 Series Circuits 3	<b>Series Circuits</b> Series Circuits, Rules, Design, and Applications Quiz, Series Circuits  Series Circuits Text Toyota 623, Electrical Circuits, pages 2-1 through 2-14
6	2-2, Parallel Circuits Parallel Exercise 1	<b>Parallel Circuits</b> Parallel Circuits, Rules, Design, and Applications

	Parallel Exercise 2 Parallel Exercise 3 Parallel Circuits 1 Parallel Circuits 2 Parallel Circuits 3	Quiz, Parallel Circuits  Parallel Circuits Text Toyota 623, Electrical Circuits, pages 2-15 through 2-21
7	2-3, Series-Parallel Circuits Series-Parallel Exercise 1 Series-Parallel Exercise 2 Series-Parallel Exercise 3 Series-Parallel Circuits 1 Series-Parallel Circuits 2 Series-Parallel Circuits 3	<b>Series-Parallel Circuits</b> Series-Parallel Circuits, Rules, Design, and Applications Quiz, Series-Parallel Circuits  Series-Parallel Circuits Text Toyota 623, Electrical Circuits, pages 2-22 through 2-25
8, 9	5-1, Interior Lights Inop 5-2, Radio Inop 5-5, Headlights Inop 5-6, Gauges Inop 5-11, Interior Light Dim	<b>Diagnosing Circuit Problems</b> Strategies in locating shorts, opens, and high resistance faults Quiz, Circuit Problems  Toyota 652, Diagnosing Body Electrical Problems, pages 5-1 thru 5-6, 5-11 thru 5-17
10	2-9, Relays 2-10 Heater Control Relay 2-11, Heater Switch, Resistor Pack, Control Relay 2-12, Using a Flasher Circuit Relay 1 Relay 2 Relay 3	<b>Inductors and Capacitors</b> Quiz, Inductors  Understanding Relays Text Toyota 623, Electrical Circuits, pages 2-31 through 2-40
11	1-4, Diode Check	<b>Semiconductors</b> Quiz, Semiconductors  Diodes and Rectifiers Text Bipolar Junction Transistor Text Toyota 623, Essential Electrical Concepts, page 1-28
12	EL-1, Electric Motor Inspection	<b>Electric Motors</b> Quiz, Electric Motors  DC Motor Theory of Operation Text
13	2-14, Harness Repair	<b>Wire Repair</b>  Toyota 623, Electrical Circuits, pages 2-41 through 2-74
14		<b>Electrical Fundamentals Final</b>
15		<b>Prepare for next class, paperwork day.</b>