

Lesson 1 - Fundamental Concepts of Electricity

Objectives:

- Describe the basic structure of an atom.
- Describe the movement of electrons.
- Define an electric current.
- Explain the difference between conductors and insulators.
- Identify at least five materials that are good conductors, and at least five materials that are good insulators.
- Explain what “charged bodies” are.
- Define static electricity.
- State Coulomb’s Law.
- Explain “electric fields.”
- Define electromotive force (EMF).

Lesson 2 - Fundamental Concepts of Magnetism

Objectives:

- State the basic laws of magnetism.
- Understand magnetic circuits.
- Describe an electromagnet.
- Understand the difference between “natural” and “artificial” magnets.
- Explain magnetic fields.
- State the two basic theories of magnetism.
- Explain how the earth’s magnetic field works.
- Define the following terms: magnetic shielding, lines of force, magnetic flux, self inductance, mutual induction, and counter electromotive force.
- State Lenz’s Law.

Lesson 3 - Voltage = EMF = Potential Difference

Objectives:

- List and describe each of the basic methods of producing electricity.
- Explain the difference between “cells” and “batteries.”
- Explain the difference between primary cells and secondary cells.
- List the three fundamental requirements for producing a voltage by means of magnetism.
- Define the terms current, ampere, and coulomb.
- Solve problems involving current, charge, and time.

Lesson 4 - Fundamental Concepts of Direct Current

Objectives:

- Define direct current.
- Define the terms voltage, amperage, resistance, and wattage.
- State the three basic equations of Ohm’s Law.
- Describe and recognize a simple series circuit.
- State and explain Kirchhoff’s Law pertaining to voltages in series circuit.
- Describe and recognize a simple parallel circuit.
- State the equations used to determine power consumption in a simple resistive circuit, and apply the equations to solve circuit problems.

Lesson 5 - Fundamental Concepts of Alternating Current

Objectives:

- Explain alternating current.
- Define peak-to-peak, RMS, and average voltage values.
- Explain sine waves.
- Describe the phase relationships between currents and voltages in capacitive and inductive reactive circuits.
- Determine the capacitive reactance of a circuit, given the value of the capacitor, frequency, and voltage.
- Determine the inductive reactance of a circuit, given the value of the inductor, frequency, and voltage.
- Determine the impedance of a circuit, given the values of the inductive and capacitive reactance, and the resistance.
- Calculate the "apparent" power and the "true" or "actual" power of a circuit.
- Determine the power factor of a circuit, given the true power, the voltage, and the amount of current draw.

Lesson 6 - Series and Parallel Circuits

Objectives:

- Describe what causes resistance in a wire.
- Define an ohm.
- State the three basic equations derived from Ohm's Law.
- Explain how Ohm's Law can be applied for a series circuit.
- Explain how Ohm's Law can be applied for a parallel circuit.
- Define electric power.
- State the three basic equations for calculating power.
- Define a kilowatt-hour.

Lesson 7 - Electrical Symbols and Schematic Diagrams

Objectives:

- Identify the electrical symbols used in schematic diagrams, and the components that they represent.
- Read and use basic wiring diagrams, including "label"-type diagrams and schematic of "ladder"-type diagrams.
- Identify the "line" side and the "load" side of a schematic diagram, and explain the difference.
- Construct simple schematic or "ladder"-type diagrams.

Lesson 8 - Electrical Safety

Objectives:

- Describe the different levels of electric shock, and explain their effects on the human body.
- Identify the kinds of accidents caused by electric shock.
- State the precautions against shock.
- Differentiate between hot, neutral, and ground wires.
- Explain the proper grounding of electric power tools.
- Describe what a GFCI is and how it operates.
- Explain how to lock out a system.
- List the three basic forms of fires.