

**Course Objectives/Course Outline**  
**Spokane Community College**

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**Course Title:** Electrical Theory  
**Prefix and Course Number:** ELMT 112

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**Course Learning Outcomes:**

**By the end of this course, a student should be able to:**

- be familiar with electrical words and terms.
- describe the action of free electrons.
- list six methods of producing electricity.
- describe the effects of magnets and magnetism.
- calculate using the principles of Ohm's Law.
- differentiate between series and parallel circuit requirements.
- read resistor color codes.
- use a multimeter to measure current and voltage.

**Course Outline:**

- I. Structure of Matter
  - A. Elements
  - B. Compounds
  - C. Molecules
  - D. Atoms
- II. Atomic Theory
  - A. Atom Structure
    1. nucleus
    2. proton
    3. electron
- III. Electrical Charges
  - A. The Law of Charges
  - B. Atomic Charges
    1. charges materials
    2. charges by contact
    3. charges by induction
    4. neutralizing a charge
  - C. Attraction and Repulsion
  - D. Electrostatic Fields
- IV. Electron Theory
  - A. Electron Orbits
    1. orbital shells
    2. shell capacity
  - B. The Valance Shell
  - C. Electron Energy
  - D. Producing Electricity
  - E. Conductors
  - F. Insulators
  - G. Semiconductors
  - H. The Effect of Atomic Bonds
- V. How Electricity is Produced

- A. Friction
- B. Chemicals
- C. Pressure
- D. Heat
- E. Light
- F. Magnetism
- VI. Electric Current
  - A. Free Electrons
  - B. Electron Movements
  - C. Current Flow
    - 1. voltage
    - 2. ampere
    - 3. resistance
- VII. Effects of Electricity
  - A. Chemical Activity
  - B. Pressure
  - C. Heat
  - D. Light
  - E. Magnetism
- VIII. Magnetism
  - A. Magnetism and the Electron
  - B. Magnetic Molecules
  - C. Magnetic Materials
  - D. Magnetizing
  - E. Demagnetizing
  - F. The Earth's Magnetic Field
  - G. Magnetic Polarities
  - H. Magnetic Compass
  - I. Laws of Magnetism
  - J. Magnetic Fields
  - K. Lines of Force
  - L. Interaction of Magnetic Fields
- IX. Electromagnetism
  - A. As a Conductor
  - B. Field Intensity
  - C. Field Interaction
  - D. Electromagnetism in a Coil
  - E. The Magnetic Core
  - F. The Magnetomotive Force
- X. Electricity and Magnetism at Work
  - A. Incandescent Lights
  - B. Electric Heaters
  - C. Electromagnetic Relay
  - D. Electric Motors
  - E. The Meter
  - F. Basic Generators
- XI. The Electric Circuit
  - A. Direct Current
  - B. Switches
  - C. Loads
  - D. Power Sources
  - E. Control of Current

- F. Conductance
- XII. Resistance
  - A. Rate of Resistance
  - B. Units of Resistance
  - C. Wire
    - 1. resistance
    - 2. load
  - D. Loads and Power Sources
  - E. Circuit Resistance

- F. Measuring the Resistance
  - 1. connecting the meter
  - 2. zero adjust
  - 3. reading the scale
  - 4. using the ohmmeter to troubleshoot
- XIII. Resistors
  - A. Use
  - B. Tolerance
  - C. Types
    - 1. composition
    - 2. wire-wound
    - 3. film
    - 4. fixed
    - 5. adjustable
    - 6. variable
  - D. Resistor Color Codes
- XIV. Ohm's Law
  - A. Equations
  - B. Calculating Current
  - C. Calculating Resistance
  - D. Calculating Voltage
- XV. Meters
  - A. Measuring Current
    - 1. connecting the meter into the circuit
    - 2. clamp-on ammeter
    - 3. reading the scale
    - 4. useable part of the scale
  - B. Measuring Voltage
    - 1. connecting the meter into the circuit
    - 2. multiplier resistors
    - 3. ohms per volt rating
    - 4. reading the scale
  - C. Miscellaneous Meters
    - 1. wheatstone bridge
    - 2. power meters
    - 3. multimeters
    - 4. special meters
- XVI. Power
  - A. Units of Power
  - B. Power Losses
  - C. Power Ratings
    - 1. incandescent lamps
    - 2. resistors
    - 3. typical
  - D. The Kilowatt-Hour
- XVII. Series Circuits
  - A. Basic Electrical Units
  - B. Series Loads
  - C. Series Power Sources
  - D. Series-Opposing Power Sources
  - E. Power Consumption
  - F. Voltage Drops

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- G. Polarity
- H. Potentiometer Circuit
- I. Open Circuits
- J. Short Circuits
- K. The Fuse
- L. Circuit Breakers