

# Basic Electricity

4 Days, 3.2 CEUs

A firm grasp of the fundamentals of electricity is the basis for becoming a successful electrical maintenance technician. All too often, maintenance personnel have to jump right into electrical maintenance with no training, or perhaps minimal on-the-job training that skips the fundamentals and focuses solely on a specific application. This may result in technicians performing tasks without understanding the reason why or the implications of changes they are making on the electrical circuit. All this can lead to unsafe activities and damages to electrical equipment.

This course provides basic information regarding quantifying and measuring basic elements in an electrical circuit. Participants are familiarized with multi-meter usage and basic electrical circuit components.

## Who Should Attend

This course is intended for new or cross-training technicians, electricians and supervisors responsible for maintenance of electrical equipment. The participant should bring a trigonometric calculator.

Participants must wear long pants and safety toe shoes to complete the lab portion of this course.

## Learning Objectives:

Upon completion of this course, the participant will demonstrate by attaining a minimum grade of 80% on the final exam, that he/she will be able to:

1. Explain the basic concepts of AC and DC electrical current flow.
2. Calculate voltage, wattage, resistance, current and power factor values.
3. Select appropriate test equipment for taking voltage measurements.
4. Interpret multi-meter readings.
5. Identify the circuit effects of resistors, inductors and capacitors.
6. Read and interpret single-phase circuit diagrams.

## SCOPE

### Day 1\*

#### I. Introduction

#### II. Math Review

- A. Whole Numbers
- B. Decimals and Scientific Notation
- C. Basic Operations with Numbers
- D. Fractions of Parts of Whole Numbers
- E. Fraction Operations
- F. Lab (1 Hour)  
Math Worksheets

#### III. Fundamental Concepts of Electricity

- A. Electrostatics
- B. The Atom
- C. Electrical Force
  1. Electromotive Force (EMF)
  2. Potential Difference
  3. Voltage

#### IV. Producing an Electromotive Force

- A. Producing an EMF
  1. Chemical
  2. Magnetic
  3. Friction
  4. Pressure
  5. Light
  6. Heat

### Day 2

- B. Electric Circuit
  1. Source Battery Connections
  2. Conductors
  3. Load

#### V. Resistance

- A. The OHM
- B. Resistivity
- C. Resistors
  1. Fixed Resistors
  2. Wire-Wound Resistors
  3. Carbon-Composition Resistors
  4. Deposited-Film Resistors
  5. Variable Resistors Lab (1 Hour)  
Use of Digital Meter

#### VI. VI.OHM's Law

- A. Ohm's Law
  1. Solving for Current
  2. Solving for Voltage
  3. Solving for Resistance
  4. Solving for Power
- B. Lab (1 Hour)  
Ohm's Law Worksheet

#### VII. Series Circuits

- A. Characteristics
- B. Solving Series Circuits
- C. Voltage Rises and Drops
- D. Labs (3 Hours)
  1. Series Circuit Worksheet (1 Hr)
  2. Using Radio Shack Trainer to Build Series Circuit (2 Hours)

### Day 3

#### VIII. Parallel Circuits

- A. Characteristics
- B. Resistors in Parallel
- C. Labs (3 Hours)
  1. Parallel Circuits Worksheet (1 Hr)
  2. Using Radio Shack Trainer to Build Parallel Circuit (2 Hours)

#### IX. Solving Series-Parallel/Parallel-Series Circuits

- A. Resistors in Series-Parallel Connections

### Day 4

#### X. AC Fundamentals

- A. Waveforms
- B. Basic AC Generation
- C. Sine Wave Characteristics Measured
  1. Peak Amplitudes
  2. Effective or RMS Value
  3. Average Value
- D. Sine Waves In-Phase
- E. Sine Waves Out-of-Phase

#### XI. Inductance and Capacitance

- A. Inductance
- B. Capacitance

#### XII. Three-Phase Circuits

- A. Generating Three-Phase Voltages
- B. Power Measurement

#### XIII. Basic Circuitry and Trouble-shooting

- A. Function of Circuit Components
- B. Developing Circuits
- C. Troubleshooting

#### XIV. Conclusion

- A. Review
- B. Final Exam

\*Class scheduling times may vary based on discussions and size of class