

CONTINUING EDUCATION
CAREER & TECHNOLOGY CENTER
FREDERICK COMMUNITY COLLEGE

BASIC ELECTRONICS

DESCRIPTION: 30 hours, 10 sessions

Introduction to electronic manufacturing and measurement skills for those interested in entering the labor force and others interested in the subject. Topics include a minimum technical approach to understanding how basic circuits work. Common practices and components will be examined in basic DC circuits. A minimum of basic math as related to DC circuits is introduced. Soldering and mechanical assembly are practiced, along with the proper use of multimeters and oscilloscopes.

COURSE OUTLINE:

- SESSION 1:
- Course Introduction
 - Safety
 - a. Hazards
 - b. Safe Practices
 - c. Personal protective equipment
 - Electricity and Magnetism
 - a. Nature of matter
 - b. Electron flow
 - c. Magnetism
 - d. Sources of electricity
 - Current, Voltage, and Power
 - a. Current and the ampere
 - b. Potential and the volt
 - c. Power and the watt
 - Introduction to the Multimeter
 - a. Types of Multimeters
 - b. Measurements they can make
 - Lab activity – voltage measurements of batteries
- SESSION 2:
- Basic Circuits
 - a. Properties of circuits
 - b. What ground is and isn't
 - c. Simple schematics
 - Ohm's Law

- a. Relationship between voltage, current, and resistance
- b. Power dissipation

Resistors

- a. Types and uses
- b. Color code system
- c. Numbering system

Series Connection of Resistors

- a. Calculating series connections
- b. Measuring series connections

Parallel Connection of Resistors

- a. Calculating series connections
- b. Measuring series connections

Lab activity – resistance measurements

SESSION 3:

Complex Circuits

- a. Tracing current paths in series – parallel connections
- b. Multiple computations

Reactive Components:

- a. Capacitors
- b. Inductors
- c. Series and parallel combinations

Alternating Current

- a. Waves, frequency, period, and amplitude
- b. Demonstration of oscilloscope
- c. Transformers, the national power grid.

Oscilloscopes

- a. Setup and controls
- b. Measuring frequency, voltage, and time
- c. Demonstration of TV video signal

Lab activity – RC, RL circuit construction hands – on PC demonstration of RLC circuits

SESSION 4:

Motors and Generators

- a. Basic overview of how they work
- b. Differences between DC and AC

Converting from AC to DC

- c. Introduction to the Diode

- d. Half wave and Full Wave Rectifiers

Converting from DC to AC

- e. Basic overview of the inverter

Lab activity – AC to DC conversion

SESSION 5:

Transistors

- a. Bipolar Transistors
- b. Field Effect Transistors
- c. Basic Transistor switching circuits
- d. Transistor amplifiers

Lab activity – transistor circuit

SESSION 6:

Parts Lists, Assembly Drawings, and Printed Wiring Boards

- a. Basic introduction to PWB's
- b. How to read an assembly drawing
- c. How to locate and identify components

Soldering

- a. Soldering equipment and materials
- b. Techniques
- c. Characteristics of a good solder joint

Desoldering and rework

- a. Desoldering equipment
- b. Cuts and jumpers
- c. When to scrap a PWB

Electrostatic Discharge

- a. IPC ESD video
- b. demonstration of ESD devices

Electronics project – select a project for final session

Lab activity – solder construction

SESSION 7:

Linear Integrated Circuits

- a. Operational amplifiers
- b. Voltage regulators
- c. Timers
- d. Other Linear IC's

Lab activity – Inverting and Non-inverting amplifier

SESSION 8: Digital Circuits
a. Binary numbers
b. Logic Gates
c. Flip-Flops

In-class project – design of Octal to 7 segment converter part I

SESSION 9: Introduction to Computers and Microprocessors

Digital project – build octal to 7 segment converter

Hand out electronics project kits

SESSION 10: In class build and test period for electronics project

Textbook:

Slone, G. Randy. Tab Electronics Guide to Understanding Electricity and Electronics. 2 ed., New York: McGraw-Hill,2000

ISBN: 0-07-136057-3