

# Introduction to Applied Electronics

**Length of Course:** 16 Weeks

**Instructors:** Scott Steinbeck MBA & Seth Highfill

**Website:** [www.sparkgaplearning.com](http://www.sparkgaplearning.com)

**Email:** [sparkgaplearning@gmail.com](mailto:sparkgaplearning@gmail.com)

---

## Resources:

- Simon Monk, *Electronics Cookbook: Practical Electronic Recipes with Arduino and Raspberry Pi*, ISBN-13: 978-1491953402, ISBN-10: 1491953403

## Additional Reading

- Geier, Michael, 2015, *How to Diagnose and Fix Everything Electronic, Second Edition*. McGraw-Hill Education TAB.
- Platt, Charles and Jansson, Fredrik, 2014, *Encyclopedia of Electronic Components Volume 2*. Maker Media, Inc..

## Online Resources:

- Adafruit Learning - <https://learn.adafruit.com/>
  - Instructables - <http://www.instructables.com/tag/type-id/category-technology/>
  - Jeremy Blum - <https://www.youtube.com/user/sciguy14>
  - Programming Electronics Academy - <https://www.youtube.com/user/OSHJunkies>
- 

## Course Description

In this course we will be introducing students to the world of electronics. We will explore many of the electronic sensors and controllers used in everyday consumer products. Students will be educated on the functionality and operation of each electronic component. Then students will work both individually and together in groups to discuss and build projects that demonstrates the understanding and practical application of the explained components.

---

### 1. Introduction to AC & DC voltage

Objectives:

- a. Understand what electricity is
- b. Understand how AC voltage works
- c. Understand how DC voltage works
- d. Learn how to safely work on electronics

### 2. Electronic Components

Objectives:

- a. Understand the basic building blocks of electronic components
  - i. Switches
  - ii. Resistor & Potentiometer (variable resistor)
  - iii. Capacitor
  - iv. Diodes
  - v. Transistor

### 3. Motors

Objectives:

- a. Get familiar with how a motor works
- b. Different types of motors (Stepper, Servo, DC Motor)
- c. Using the right motor for the right job.

#### 4. Relays

Objectives:

- a. Learn the many applications for relays
- b. Understand how different types of relays work

#### 5. Integrated Circuits

Objective:

- a. Understand what an Integrated Circuit is used for
- b. What ICs are under the surface
- c. Explore how we can use them to react to external changes
- d. Introduce popular ICs (Arduino, Circuit Playground, Raspberry Pi, etc)

#### 6. Exploring Sensors - Light & Temperature

Objectives:

- a. Understand how light & temperature sensors work
- b. Use a microcontroller to respond to changes in light
- c. Read ambient temperature & humidity
- d. Talk about the limitations of analog sensors

#### 7. Exploring Sensors - Pressure & Moisture

Objectives:

- a. Understand how pressure & moisture sensors work
- b. Build a circuit that changes light intensity based on pressure
- c. Use a moisture probe to determine when a plant should be watered

#### 8. Exploring Sensors - Magnetic (reed switch) & Motion

Objectives:

- a. Understand how Magnetic (reed switch) & Motion sensors work
- b. Build a circuit that set off an alarm with motion
- c. Build a box that turns on a light when the lid is raised

#### 9. Exploring Sensors - Ultrasonic & Radar

Objectives:

- a. Understand how Ultrasonic & Radar sensors work
- b. Build a circuit that can calculate distance from an ultrasonic sensor
- c. Detect motion with a radar sensor

#### 10. Exploring Sensors - Infrared & Laser

Objectives:

- a. Understand how Infrared & Laser sensors work
- b. Calculate speed from 2 line break sensors
- c. Use a universal remote to control lights and sounds on an arduino

#### 11. Wireless Communication

Objectives:

- Understand the uses and limitation of wireless communication: Infrared (tv remote), Radio (Ceiling fan, remote outlets), Bluetooth (phone) ,WiFi, Cellular
- Control an arduino via a bluetooth module from a mobile device
- Take temperature readings and log them to the internet via a wifi module