

# Cave Creek Museum Basic Electronics & Computer Coding Class

## Description and Purpose

This course is a basic introduction to electronics and computer programming through hands-on exercises. The computer platform used will be Arduino Uno. Upon completion of this course, students will have a basic understanding of electronic fundamentals as well as the components and logical framework plus syntax of computer code.

The purpose of this course is to give students enough knowledge to understand the fields of electronics and computers to make informed decisions about career options and further self-learning explorations. Students' curiosity, discovery and creativity will be encouraged through a series of challenging exercises, many involving the building of functioning devices; therefore, building self-confidence.

## Prerequisites

The potential student should be able to calculate and manipulate simple algebraic formulas such as  $A=B \times C$ , fluency with digital fractions and comprehend basic graphs. You need to have demonstrated patterns of behavior that include building things, curiosity about how things work, perseverance, patience, and the ability to learn via video instruction without real-time interventions from the instructor. Additionally, you must have a pattern of self-motivation in completing homework assignments. The ideal student should have demonstrated ability and desire to create physical models in the Lego Education, KIWI kit, or equivalent environments. Good math grades will be a positive indicator. Age is flexible, but potential students with the above skills have successfully completed pre-algebra at 7 - 8 grade levels.

## Organization of the Course

This course will be based upon video classes that are the primary learning resource. Students are not limited by the pace of class instruction and can proceed at their own pace through the video series if they are able. The course will be a YouTube series from a retired scientist who now teaches high school. The online learning is accessed via the [www.toptechboy.com](http://www.toptechboy.com), under "Arduino Lessons", of which 20 are used from the 58 lessons available. Each Arduino video class runs from 15-30 minutes, including examples, and then tasks will be performed by students. The weekly in-person class will review the previous home assignment, answer questions, and then preview the concepts and vocabulary of the next online assignment. The instructor for the classroom is a retired Electrical Engineer who uses the Arduino in his art projects. He is a senior docent at the Cave Creek Museum. At-home time devoted to the course will be approximately 60-90 minutes in addition to the weekly one-hour class. The local instructor will be available for online consultations between classes.

## Learning Assessments and Outcomes

Each lesson will end with a working device and/or a piece of computer code that successfully compiles. The students' progress will be measured by their success in these exercises. Each class builds upon skills previously learned. Online classes allow the student to progress at their own pace, although occasionally requiring several reviews. After this course, the student should be able to have success in more advanced video classes, whether in Arduino or moving onto the Raspberry Pi platform via self-learning.

## Class Location and Frequency

Classes will be held at The Holland Center once per week after school on Mondays at 4:00 p.m. for 20 classes. Classes begin on October 2, 2023. See class schedule for specific dates.

## **Teacher Bios**

Paul J. McWhorter, [www.toptechboy.com](http://www.toptechboy.com), is a retired senior scientist out of Sandia National Laboratories who retired into teaching. His website has a number of free YouTube videos organized as serial classes, including those on the Arduino and Raspberry Pi platforms. He is an excellent teacher and the videos are professional quality.

The local classroom instructor is Greg Barnhart, who has a MBA degree and is a retired high technology executive. He currently is a senior docent at the Cave Creek Museum, a public speaker and an assemblage artist. Greg's work is displayed at The Finer Arts Gallery in Cave Creek, and can also be seen on his website, [www.v.gearheardt.com](http://www.v.gearheardt.com), along with his TV appearance. He has used the Arduino platform in his works.

## **Required Equipment & Supplies**

Each student should have a Windows or Chromebook PC, or a Mac, with USB ports. (An iPad won't work for in this environment while a Chromebook uses a cloud-based editor requiring a constant connection.) A kit including the Arduino microcontroller – the ELEGO UNO Project Super Starter Kit (available on Amazon for approx. \$45), and all necessary supplies are required. The cost of this kit will be reimbursed upon completion of this course.

## **Optional Resources**

### Books:

“Arduino for Dummies”, by John Nussey

“Programming Arduino -- Getting Started with Sketches”, by Simon Monk

“Programming Arduino -- Next Steps”, by Simon Monk

“Arduino Cookbook”, by Michael Margolis

### Magazine:

“Make Magazine” for makers with soldering and building skills.

### Advanced Equipment:

An inexpensive multimeter (available at Harbor Freight)

Soldering station for advanced projects beyond this course

Various videos teaching soldering (available on YouTube)