

# 1 Computer Programming Fundamentals (Computer Programming for Engineers)

Computer programming may seem like a daunting field for beginner programmers. It does not need to be. At its core, computer programming is providing a set of instructions to a computer. Each line of code contains one or more instructions. Sometimes instructions interfere with each other and cause errors. Imagine telling someone who has never seen a sandwich before how to make a peanut butter and jelly sandwich. The steps may be:

1. Get Bread, Peanut Butter, Jelly, Knife, and Plate.
2. Place plate.
3. Place two pieces of bread side by side on plate. Call them Slice A and Slice B.
4. Put peanut butter on knife.
5. Use knife to spread peanut butter on Slice A.
6. Clean knife.
7. Put jelly on knife.
8. Use knife to spread jelly on Slice B.
9. Combine Slice A with Slice B by placing Slice B on Slice A.
10. Eat Sandwich.
11. Clean Knife
12. Clean Plate

Provided no external changes, this set of instructions will always lead to a proper peanut butter and jelly sandwich. However, some people may argue about if you should use grape jelly or strawberry jelly, chunky or smooth peanut butter. Some people are adamant that you must put Jelly on Slice A, never peanut butter. Some argue that if one starts with a loaf of bread instead of slices then it produces a better sandwich. These options represent the different ways that people program. There are many different sets of instructions that produce peanut butter and jelly sandwiches. Programming is very smiliar. There are many different ways to code a program that will lead to the same result.

However, there are ways which are more efficient than others, and there are ways to make code easier to understand. When writing code, it is important to write with a consistent programming style that allows others to understand your code. Code must be maintained over time, and may transition between programmers.

This chapter should serve to introduce the basics of computer programming as a platform for the Cyber Truck Experience program.

## **1.1 Arduino Programming Language**

## **1.2 Python 3 Programming Language**

An important tool in any hackers toolkit is the ability to interact with collected data. In this section, we will be using a programming language called Python to help with this.

### **1.2.1 Background**

Python is a general purpose, versatile, and popular programming language. It is great as a first language because it is concise and easy to read. It is also a good language to have in any programmer's stack as it can be used for everything from web development to software development and data science applications.

This is different than what we have done to this point in Arduino. We will generally use the Arduino devices to directly interface with systems. These devices will then send data back to a computer or other device running a python script.

### **1.2.2 Codecademy**

We will begin by having you learn the basics of python. We will be using an external system to aid in this. Navigate over to [here](#) and create an account using your email and fill out any information they require. Please ensure that you do not pay for this service at this time. We will only need the services that the free version offers.

Please complete this course. Take notes throughout the course over functions that may be useful (importing and exporting files, searching through lists, data structures, etc.) Periodically, there will be additional trial material to supplement your learning.

**1.2.3 Editors and IDE**

**1.2.4 Threading**

**1.2.5 PySerial**

**1.2.6 matplotlib**

**1.2.7 Making GUIs with PyQt5**

**1.3 C++ Programming Language**

**1.3.1 Codecademy**

**1.4 Computer Programming Fundamentals Exercises**