



## Algorithms 9-12 Syllabus

### Course Goals

#### 1 Python

Students use the Python programming language to learn the foundations of algorithmic thinking

#### 2 Basic Algorithms & Structures

Students learn what algorithms are and how implement them using Python code

#### 3 Implementation

Students learn how to apply their knowledge of algorithms and coding in order to create basic programs

### Course Topics

#### 1 Sorting

Students learn a few basic sorting algorithms and how to code them

#### 2 Searching

Students learn about linear and binary searches and implement both

#### 3 Data Structures

Students learn elementary data structures and code a few versions themselves

#### 4 Graph Theory

Students learn about Prim's algorithm and devise a way to code it

#### 5 Compare Algorithms

Students compare the different algorithms and examine the benefits and drawbacks of each

### Course Schedule

#### Day 1

##### Course Introduction

Students get to know one another and the basic rules and layout of the course

##### What is an Algorithm?

Students learn the specifics of what an algorithm is and how to make one of their own

##### Introduction to Python

Students gain the basic tools needed to program in Python

#### Day 2

##### Introduction to Python Review

Students get ready for the day and review the content from the previous class

### **Object Oriented Programming**

Students gain a basic understanding of object oriented programming and inheritance

### **Python Mini Project**

Students have the opportunity to apply what they've learned about Python and object oriented programming in a small project

## **Day 3**

### **Programming Skills Review**

Students review the programming concepts they learned over the past few days, including basic Python and object oriented programming

### **Bubble Sort Game & Lecture**

Students learn about bubble sort through games and a short lecture

### **Coding Bubble Sort**

Students create a function to perform bubble sort on a list

## **Day 4**

### **Python & Bubble Sort Review**

Students review the material they have learned so far

### **Selection Sort Game & Lecture**

Students gain a basic understanding of how selection sort works in anticipation of coding it

### **Coding Selection Sort**

Students apply the knowledge they have learned about selection sort to make a Python program

## **Day 5**

### **Sorts & Programming Review**

Students review concepts from the week in a short game before getting set up for class

### **Binary Search Game & Lecture**

Students learn about binary searching.

### **Coding Binary Search**

Students create a function that performs binary search on a sorted list

## **Day 6**

### **Last Week Review**

Students review what they learned over the previous week

### **Linear Search Lecture**

Students gain a basic understanding of linear search

### **Coding Linear Search**

Students code the functions they devised in the previous activity.

## Day 7

### Object Oriented Programming Review

Students refresh their memory of object oriented programming

### What are Data Structures?

Students gain an understanding of data structures and their importance

### Coding Lists

Students code a singly linked list

## Day 8

### Review Data Structures

Students review the data structures material taught the previous day as well as a few other concepts.

### Tree Data Structures

Students gain a basic understanding of trees and their uses

### Coding Trees

Students work in pairs to code their own version of a tree data structure.

## Day 9

### Trees & Prim's Algorithm

Students learn about Prim's Algorithm and get the opportunity to review the previous day's material

### Final Project

Students work in pairs or small groups to implement a sorting algorithm of their choice

## Day 10

### Course Review Game

Students play a game to review concepts covered during the course

### Wrap Up

Students prepare their materials to go home with them

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