



Algorithms with Python 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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