Fairfax Collegiate

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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.

Updated on 4/4/2022