Sweskills Course Outline

Introduction to Algorithms & Data Structures

Course Description:

This course will focus on fundamental data structures and algorithms. Algorithm analysis in terms of Big-O running time is introduced and applied throughout. Python is used to facilitate students in using and mastering data structures and algorithms.

Elements of this course will also be based on the MIT Introduction to Algorithms 6.006 course.

Main Course Textbook :

The main text for this course is 'Problem Solving with Algorithms and Data Structures using Python ' by Bradley W. Miller and David L. Ranum. An interactive online version of the text is available here, and a PDF version is available in your module folder.

Essential Reading

The following chapters of the main text are essential reading:

1. Chapter 1 - Introduction
2. Chapter 2 - Analysis
3. Chapter 3 - Basic Data Structures
4. Chapter 4 - Recursion
5. Chapter 5 - Sorting and Searching
6. Chapter 6 - Trees and Tree Algorithms
7. Chapter 7 - Graphs and Graph Algorithms

Course Lecture Videos:

The following videos from the MIT 6.006 course are **recommended**, but not **essential**. However, focus on reading the chapters in the course text first, and if you have extra time then watch the videos.

1. Lecture 1 - Algorithmic Thinking, Peak Finding
2. Lecture 2 - Models of Computation, Document Distance
3. Lecture 3 - Insertion Sort, Merge Sort

4. Lecture 4 - Heaps and Heap Sort
5. Lecture 5 - Binary Search Trees, BST Sort
6. Lecture 8 - Hashing with Chaining
7. Lecture 13 - Breadth First Search
8. Lecture 14 - Depth First Search, Topological Sort

Further Reading:

1. Cormen, Thomas, Charles Leiserson, Ronald Rivest, and Clifford Stein. "**Introduction to Algorithms**". 3rd ed. MIT Press, 2009. This is a classic textbook in Algorithms and Datastructures. The preparation you have received in the 'Maths for Computer Science' course will prepare you with the tools to follow the material in this text.