Data Structure and Algorithms Course Syllabus

Course Overview :

1. Various Popular Data Structures and their Algorithms.
2. Implementation of Data Structures using C and C++
3. Recursive Algorithms on Data Structures
4. Various Sorting Algorithms
5. How to develop Analytical skills in Data Structure and use them efficiently.

Section 1: Introduction

- setting up the environment
- Introduction of various data structures and abstract data types

Section 2 - Arrays:

- what is an array data structure
- arrays related interview questions

Section 3 - Linked Lists:

- linked list data structure and its implementation
- doubly linked lists
- linked lists related interview questions

Section 4 - Stacks and Queues:

- stacks and queues
- stack memory and heap memory
- How does stack memory work exactly?
- stacks and queues related interview questions

Section 5 - Binary Search Trees:

- what are binary search trees
- practical applications of binary search trees
- problems with binary trees

Section 6 - Priority Queues and Heaps:

- what are priority queues
- what are heaps
- heapsort algorithm overview

Section 7 - Hashing and Dictionaries:

- associative arrays and dictionaries
- how to achieve **O(1)** constant running time with hashing

Section 8 - Graph Traversal:

- basic graph algorithms
- breadth-first
- depth-first search
- stack memory visualization for DFS

Section 9 - Sorting Algorithms

- bubble sort, selection sort and insertion sort
- quicksort and merge sort
- non-comparison based sorting algorithms
- counting sort and radix sort

Section 10 - Shortest Path problems (Dijkstra and Bellman-Ford Algorithms):

- shortest path algorithms
- Dijkstra's algorithm
- Bellman-Ford algorithm