

DSA1 Syllabus

Curricular	
Modules	Topic
1 Introduction to Data Structures and algorithms	Introduction to Data Structures algorithms, and arrays
2. Complexity Analysis	Algorithm Efficiency & Complexity Analysis
	Calculating Complexity, Complexity Functions, Time & Space Complexity
3. Searching and Sorting	Searching Algorithms
	Sorting Algorithms
	Analysis of Sorting Algorithms
4 Stacks and Queues	Stacks
	Queues
	Pointer, DMA, Structure

5 Linked Lists	Singly Linked Lists
	Circular Linked Lists
	Doubly Linked Lists
Trees	Binary Trees
	Binary Search Trees
	Balanced Trees
7 Graphs	Graphs
	Graph Traversal

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Sub topic	Detail
Introduction to Data Structures, classification of data structure	Types and importance of data structures
Algorithm Basics	Definition, characteristics, importance
Arrays	Implementation of Array
Parameters for efficiency	Time and space complexity
Asymptotic notations	Big O, Theta, Omega notations
Common rules for Big O, Types of Big O functions, Time & Space Complexity	Loops, nested loops, recursion
	$O(1)$, $O(\log n)$, $O(n)$, $O(n \log n)$, $O(n^2)$, $O(2^n)$
	time and space complexity in terms of asymptotic notations
Linear Search	Implementation and analysis of Linear Search
Binary Search	Implementation and analysis of Binary Search
Bubble Sort	Implementation and analysis of bubble sort
Selection Sort	Implementation and analysis of Selection Sort
Insertion Sort	Implementation and analysis of Insertion Sort
Merge Sort	Implementation and analysis of Merge Sort
Quick Sort	Implementation and analysis of Quick Sort
Comparison of algorithms	Time and space complexities, best/average/ worst cases
Basic concepts	LIFO principle, operations
Applications(infix to postfix, postfix evaluation)	infix to postfix conversion, Postfix expression evaluation
Basic concepts	Linear Queue, FIFO principle, operations
Types	Circular queue
	Deque
Pointer and DMA	Declarations & Initialization of pointer, Pointer to Pointers, DMA
Structure	Declarations & Initialization of Structures, Accessing the Members of a Structure

Singly Linked Lists representations and operations	Singly Linked Lists
circular linked lists representations and operations	circular linked lists
Doubly linked lists representations and operations	doubly Linked Lists
Types	Types of trees
Concept and operations	Insertion, deletion, searching
traversals	In-order, pre-order, post-order
AVL Trees	Understand operations of self-balancing trees
Basic concepts	Directed vs undirected, representations
BFS and DFS	Problem Solving