

BODHAN

Data Structures & Algorithms in Java

“Learning to write programs stretches your mind, and helps you think better, creates a way of thinking about things that I think is helpful in all domains.”

~Bill Gates



Programme Overview

○ Course Overview

You will learn the most commonly used data structures and algorithms that are necessary to solve problems by programming which target multiple job opportunities like software developer, software engineer, product/data roles, etc..

○ Features

350⁺

Problems

60⁺

hours of video content

WHY

Data Structures & Algorithms?

- It is essential to learn the basics of the most popular programming languages (Java) to become an expert
- Data structures and algorithms is all about organizing the information and finding the most efficient approach to solve a problem.
- Learning these concepts will in turn help you to improve your problem-solving skills and solve any real-world problems using technology

Companies Hiring

amazon

Adobe

Google

Flipkart



PayPal

Microsoft

Course Outcome

- This course will enhance your basics of Java Programming, and Data Structures & Algorithm concepts.



Detailed Curriculum

Introduction to Programming

Topics	Sub-topics	Details
Basics of Programming	Flowcharts	Introduction to flowcharts, Decision making using flowcharts, Loops, Example problems
	Variables and Data types	First program, Variables and data types, Taking input, How data is stored in memory, Arithmetic Operators
	Conditional statements	Introduction to If else, Relational and logical operators, Nested conditionals
Loops and Functions	While loops	While loops, Flow of execution of statements in while loop, Example problems using while loop
	Patterns	Introduction to patterns, Basic Patterns, Square Patterns, Triangular Patterns, Character Patterns, Reverse Triangle, Inverted patterns, Isosceles triangles
	For loops	For loops, Break and Continue, increment - decrement operators
	Functions	Introduction to functions, Working of function calling, Variables and its scope, Pass by value
Arrays	Introduction to arrays	Introduction to arrays, How arrays are stored in memory, Passing arrays to functions
	Searching and Sorting	Understanding Binary Search, Selection sort, Bubble sort, Insertion sort, Merging two sorted arrays
Strings and 2D Arrays	Strings	Introduction to strings, storage of strings and their inbuilt functions
	2D Arrays	2D arrays, Storage of 2D arrays, Example problems using 2D Arrays

Data Structures

Topics	Sub-topics	Details
Problem Solving Techniques	Recursion	Introduction to recursion, Principle of mathematical induction, Fibonacci numbers, Recursion using arrays, Recursion using strings, Recursion using 2D arrays
	Time and space complexity	Order complexity analysis, Theoretical complexity analysis, Time complexity analysis of searching and recursive algorithms, Theoretical space complexity, Space
	Backtracking	Introduction to backtracking, Problems based on backtracking: Rat in the maze, Word search, and N-Queens.
Object-oriented programming	Basics of OOP	Introduction to oops, Creating objects, Getters, and setters, Constructors and related concepts, Inbuilt constructor and destructor, Example classes
	Advance concepts of OOP	Static members, Function overloading and related concepts, Abstraction, Encapsulation, Inheritance, Polymorphism, Virtual functions, Abstract classes, Exception handling
Linear Data Structures	Linked lists	Introduction to linked list, Inserting node in linked list, Deleting node from linked list, Midpoint of linked list, Merge two sorted linked lists, merge sort of a linked list, Reversing a linked list
	Stacks and Queues	Introduction to stacks, Stack using arrays, Dynamic Stack class, Stack using linked list, Inbuilt stack, Queue using arrays, Dynamic queue class, Queue using linked list, Inbuilt queue
Trees	Generic Trees	Introduction to Trees, Making a tree node class, Taking a tree as input and printing, Tree traversals, Destructor for tree node class
	Binary Trees	Introduction to Binary Trees, Taking a binary tree as input and printing, Binary Tree traversals, Diameter of binary tree
	Binary Search Trees	Introduction to Binary Search Trees, Searching a node in BST, BST class, Inserting and Deleting nodes in BST, Types of balanced BSTs

Topics

Sub-topics

Details

Advanced Data Structures

Priority Queues

Introduction to Priority Queues, Ways to implement priority queues, Introduction to heaps, Introduction to Complete Binary Trees and its implementation, Insert and Delete operations in heaps, Implementing priority queues, Heap sort, Inbuilt Priority Queue

Hashmaps

Introduction to Hashmaps, Inbuilt Hashmap, Hash functions, Collision handling, Insert and Delete operation implementation in hashmap, Load factor, Rehashing

Tries and Huffman Coding

Introduction to Tries, Making a Trie Node class, Insert, Search and Remove operation implementation in Tries, Types of Tries, Huffman Coding

Graphs

Introduction to Graphs, Graph Terminology, Graph implementation, Graph Traversals (DFS and BFS), Weighted and Directed Graphs, Minimum Spanning Trees, Cycle Detection in Graphs, Kruskal's algorithm, Prim's Algorithm, Dijkstra's algorithm

Dynamic Programming

Introduction to Dynamic Programming

Introduction to Memoization, Introduction to Dynamic Programming, Fibonacci numbers using recursion, memoization and dynamic programming


Applications of Dynamic


Longest Common Subsequence (LCS) using recursion, memoization and dynamic programming, Edit distance using recursion, memoization and dynamic programming, Knapsack problem using recursion, memoization and dynamic programming

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