



## Data Structure and Algorithms with competitive programming

### **Description:**

Data Structure and Algorithms for Beginners to Advance entire course will be discussed in python language and all the implementation and project will be done by using python .

### **Start Date:**

### **Doubt Clear Time:**

### **Course Time:**

### **Features:**

- # Online Instructor-led learning: Live teaching by instructors
- # Every week doubt clearing session after the live classes
- # Lifetime Dashboard access
- # Doubt clearing one to one
- # Assignment in all the module

# Quiz in every module

# Everything will be discussed with python

### **What we learn:**

# Analysis in Algorithms

# Divide and Conquer

# Greedy Technique

# Dynamic Programming

# Arrays

# Linked List

# Skip List

# Hashing

# Tree

# Graph Traversal

# Tree Traversal

# Programming

# Stack

# Queue

# String Matching

# NP-Hard and NP-Complete Problems

### **Requirements:**

# Dedication

# PC with internet connectivity

### **Instructor:**

### **Name:**

Priya Bhatia

## **Description:**

Expertise in data structure competitive programming and solving analytical problems and implementing data structure algorithm in multiple programming language. I have done my M.Tech in Artificial Intelligence at IIT Hyderabad and have an experience of implementation in multiple projects.

## **>Analysis in Algorithms:**

- >>Introduction to Algorithms

- >>Analyzing Algorithm

- >>Asymptotic Notation

- >>Big O

- >>Omega

- >>Theta

- >>Recurrence Relation Solving

- >>Substitution Method

- >>Recursive Tree Method

- >>Master's Theorem

## **>Divide and Conquer:**

- >>Introduction to Divide and Conquer

- >>Discussion of applications of Divide and Conquer

- >>Finding of maxima and minima

- >>Finding Power of an Element
- >>Binary Search
- >>Quicksort
- >>Mergesort
- >>Strassen's Matrix Multiplication
- >>Maximum-subarray problem
- >>Finding of number of inversions

### **>Greedy Technique:**

- >>Introduction to Greedy Techniques
- >>Discussion of applications of Greedy Technique
- >>Knapsack Problem
- >>Job Sequencing with deadline
- >>Huffman Coding
- >>Optimal Merge Pattern
- >>Minimum Cost Spanning Tree
- >>Kruskal Algorithm
- >>Prim's Algorithm
- >>Single Source Shortest Path
- >>Dijkstra's Algorithm
- >>Bellmanford Algorithm

### **>Dynamic Programming:**

- >>Introduction to Dynamic Programming

>>Discussion of applications of Dynamic Programming

>>Fibonacci Series

>>Longest Common Subsequence

>>0/1 Knapsack

>>Sum of Subset

>>All Shortest Path

>>Matrix Chain Multiplication

### **>Arrays:**

>>Introduction to Arrays

>>One Dimensional Array - How to find the address of an element in an array

>>Two Dimensional Array

>>Row Major Order

>>Column Major Order

>>Searching in an array

>>Linear Search

>>Binary Search(Discussed in DAC)

>>Sorting of an array

>>Comparison Sort

>>Selection Sort

>>Bubble Sort

>>Insertion Sort

>>Quicksort(Discussed in DAC)

>>Mergersort(Discussed in DAC)

>>Non Comparison Sort

>>Radix Sort

>>Bucket Sort

>>Count Sort

**>Linked List:**

>>Introduction to Linked List

>>Searching in Linked List

>>Deleting from a Linked List

>>Doubly Linked List

>>Reversal in linked list

**>Skip List:**

>>Introduction to Skip List

>>Operations and Randomization in Skip Lists

>>Insertion and Deletion in Skip Lists

>>Complexity analysis

**>Hashing:**

>>Introduction to Hashing

>>Hash Tables

>>Hash Functions

>>Collision Resolution Techniques

>>Chaining

- >>Open Addressing
- >>Linear Probing
- >>Quadratic Probing
- >>Double Hashing
- >>Perfect Hashing
- >>Analysis of Chaining
- >>Analysis of Open Addressing
- >>Application of Hashing : Bloom Filters Discussion

### **>Tree:**

- >>Introduction to Binary Tree
- >>Binary Search Tree
- >>AVL Tree - Creation , Insertion, Deletion
- >>Red Black Tree - Creation , Insertion, Deletion
- >>BTree and B+ Tree - Creation , Insertion, Deletion

### **>Graph Traversal:**

- >>Breadth First Search
- >>Depth First Search

### **>Tree Traversal:**

- >>Preorder Traversal
- >>Postorder Traversal
- >>Inorder Traversal

## **>Programming:**

>>Static and Dynamic Scoping

>>Static Variable

>>Pointers

## **>Stack:**

>>Introduction to Stack Data Structure

>>Implementation of Stack Using Arrays

>>Implementation of Stack Using Linked List

>>Average Stack Lifetime of an element

>>Implementing multiple stacks in single array

>>Applications of Stack

>>Recursion

>>Tail Recursion

>>Non-Tail Recursion

>>Nested Recursion

>>Indirect Recursion

>>Infix to Postfix

>>Prefix to Postfix

>>Postfix Evaluation

>>Towers of Hanoi

>>Fibonacci Series

## **>Queue:**



- >>Introduction to Queue Data Structure
- >>Implementation of Queue Using Arrays
- >>Implementation of Queue Using Linked List
- >>Circular Queue
- >>Priority Queue
- >>Implementation of Stack using Queue

### **>String Matching:**

- >>Naive String Matching Algorithms
- >>Rabin-Karp Algorithm
- >>String Matching with finite automata

### **>NP-Hard and NP-Complete**

#### **Problems:**

- >>NP-Hard
- >>NP-Complete Problem