Foundations of Java: From Fundamentals to Advanced Techniques

Topic 1: Introduction & Review of Data Structures

- What is a data structure?
- Organizing Data
- Which Data Structure or Algorithm is better?
- Common Data Structures
- Data Types
- Data types in Java
- Data Structures with Java
- (Doubly) Linked List and ArrayList (Dynamic Array)
- Queue
- Stack

Topic 2: Algorithms, Complexity Analysis

- Algorithms
- Sequential Search
- Binary Search
- Iterative
- Recursive
- Analysis of Algorithms
- Time Complexity
- Worst-Case Time Complexity
- Best-Case Time Complexity
- Average-Case Time Complexity

Topic 3: Order, Choice of Data Structures

- Big O Notation

Topic 4: Divide-and-Conquer Algorithms

- Divide-and-Conquer Approach
- Binary Search
- Merge Sort

Topic 5: Dynamic Programming

- Thread Basics
- Java Threads
- Creating thread in Java and use
- Terminating Thread
- Interrupting thread
- Race Conditions

- Graph Theory
- Find shortest path

Topic 6: Greedy Algorithms

- Huffman Code
- Data Compression
- Encoding Data
- Prefix Codes
- Huffman's Algorithm

Topic 7: Backtracking

- Backtracking Technique
- The 0-1 knapsack problem

Topic 8: Branch-and-Bound

- Breadth-first Search
- The 0-1 Knapsack Problem using Breadth-first Search
- Best-first Search
- The 0-1 Knapsack Problem using Best-first Search

Schedule

Day 1: Monday 19th February 2024 (Foundation Level)

6:00 – 6:15	• Introduction
6:15 – 6:30	• What is a data structure? • Organizing Data
6:30 – 6:45	• Which Data Structure or Algorithm is better? • Common Data Structures
6:45 – 7:00	• Data Types • Data types in Java
7:00 – 7:15	• Data Structures with Java
7:15 – 7:30	• (Doubly) Linked List and ArrayList (Dynamic Array)
7:30 – 7:45	• Queue
7:45 – 8:00	• Stack

Day 2: Tuesday 20th February 2024 (Foundation Level)

6:00 – 6:15	• Introduction • Algorithms
6:15 – 6:30	• Sequential Search • Binary Search
6:30 – 6:45	• Iterative • Recursive
6:45 – 7:00	• Analysis of Algorithms • Time Complexity
7:00 – 7:15	• Data Structures with Java
7:15 – 7:30	• Worst-Case Time Complexity
7:30 – 7:45	• Best-Case Time Complexity
7:45 – 8:00	• Average-Case Time Complexity

Day 3: Wednesday 21st February 2024 (Intermediate Level)

6:00 – 6:15	• Introduction
6:15 – 6:35	• Big O Notation
6:35 – 7:00	• Divide-and-Conquer Approach
7:00 – 7:30	• Binary Search
7:30 – 8:00	• Merge Sort

Day 4: Thursday 22nd February 2024 (Intermediate Level)

6:00 – 6:15	• Introduction
6:15 – 6:30	• Thread Basics • Java Threads
6:30 – 6:45	• Creating thread in Java and use • Terminating Thread
6:45 – 7:00	• Interrupting thread • Race Conditions
7:00 – 7:15	• Graph Theory
7:15 – 8:00	• Find shortest path

Day 5: Friday 23rd February 2024 (Advance Level)

6:00 – 6:15	• Introduction
6:15 – 6:30	• Huffman Code
6:30 – 6:45	• Data Compression
6:45 – 7:00	• Encoding Data
7:00 – 7:15	• Prefix Codes
7:15 – 8:00	• Huffman's Algorithm

Day 6: Saturday 24th February 2024 (Advance Level)

9:00 – 9:15	• Introduction
9:15 – 10:00	• Backtracking Technique
10:00 – 10:20	• Morning Tea Break
10:20 – 11:20	• The 0-1 knapsack problem using Backtracking technique
11:20 – 12:20	• Breadth-first Search
12:20 – 1:00	• The 0-1 Knapsack Problem using Breadth-first Search
1:00 – 2:00	• Lunch Break
2:00 – 3:00	• Best-first Search
3:00 – 4:00	• The 0-1 Knapsack Problem using Best-first Search