

# Data Structure

Duration: 1 Month

## Introduction to Data Structures

- Information and Meaning
- Algorithm concept
- Array- Row/Column major representation, sparse matrix, shifting.
- Primitive operations – As an Abstract Data Type
- Review of C Programming

## The Stack

- Push, Pop, Conversion from infix – to postfix
- Stack representation using array & linked list
- Implementation in C

## Recursion

- Recursive Definition and Processes
- Recursion in C and Recursive Implementation of Applications
- Simulation of Recursion – Efficiency of Recursion

## Linked List:

- Operations – Implementation of Singly linked list
- Operations – Implementation of Doubly linked list
- Operations – Implementation of Circular linked list
- Implementation in C

## Queue:

- Types of Queues
- Operations of Queue, Circular queue, Dequeue (insert, delete, representation)
- Implementation in C
- Insertion,
- Deletion and Concatenation Operations
- Stacks and Queues as Circular Lists
- Doubly Linked Lists
- Applications

## Trees

- Tree- definition – traversal algorithms (pre, post, in)
- Heap tree, Avl tree-balancing , B-tree

## Binary Tree Representation:

- Node Representation
- Implicit array Representation
- Choice of Representation
- Binary Tree Traversal
- Threaded Binary Trees and their Traversal
- Trees and their Applications

## Sorting

- General Background:
- Efficiency
- The big O Notation
- Efficiency of Sorting. Bubble Sort and Quick Sort and their Efficiency
- Selection Sorting
- Binary Tree Sort
- Heap Sort
- Insertion Sorts
- Shell Sort
- Merge and Radix Sorts

## Searching

- Basic Searching Techniques:
- Notation
- Search- Linear & Binary (Complexity Analysis).
- Interpolation Search

## Tree Searching

- Insertion into a Binary Search Tree
- Deleting from a Binary Search Tree
- Efficiency of Binary Search Tree operation