

## ADVANCED DATA STRUCTURES

(Note: C++ and Java implementation is not included in the syllabus)

**Objectives:** Exposed to hashing approaches, variants of trees , heaps, queues, implementation of graph algorithms, analysis of sorting algorithms with respect to bounds and file organizations and operations

### UNIT I :

**Objectives:** Comprehensive understanding of dictionaries, hashing mechanism which supports faster retrieval and skip lists

**Dictionaries :** Sets, Dictionaries, Hash Tables, Open Hashing, Closed Hashing (Rehashing Methods), Hashing Functions( Division Method, Multiplication Method, Universal Hashing), Skip Lists, Analysis of Skip Lists. (Reference 1)

### UNIT II :

**Objectives:** Illustration of Balanced trees and their operations

AVL Trees: Maximum Height of AVL Tree, Insertions and Deletions. 2-3 Trees : Insertion, Deletion.

### UNIT III :

**Objectives:** Comprehension of heaps, queues and their operations

**Priority Queues :**

Binary Heaps : Implementation of Insert and Delete min, Creating Heap.

Binomial Queues : Binomial Queue Operations, Binomial Amortized Analysis, Lazy Binomial Queues

### UNIT IV :

**Objectives:** Detailed knowledge of nonlinear data structures and various algorithms using them

**Graph algorithms :** Minimum-Cost Spanning Trees- Prim's Algorithm, Kruskal's Algorithm Shortest Path Algorithms: Dijkstra's Algorithm, All Pairs Shortest Paths Problem: Floyd's Algorithm, Warshall's Algorithm,

### UNIT V :

**Objectives:** Analysis of complexities in various sorting techniques along with their lower bounds

**Sorting Methods :** Order Statistics: Lower Bound on Complexity for Sorting Methods: Lower Bound on Worst Case Complexity, Lower Bound on Average Case Complexity, Heap Sort, Quick Sort, Radix Sorting, Merge Sort.

### UNIT VI :

**Objectives:** Illustration of tries which share some properties of table look up, various issues related to the design of file structures

**Pattern matching and Tries :** Pattern matching algorithms- the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm

Tries: Definitions and concepts of digital search tree, Binary trie, Patricia , Multi-way trie

**File Structures:** Fundamental File Processing Operations-opening files, closing files, Reading and Writing file contents, Special characters in files.

Fundamental File Structure Concepts- Field and record organization, Managing fixed-length, fixed-field buffers.

( Reference 5)

### Text Books :

1. Data Structures, A Pseudocode Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage.
2. Fundamentals of DATA STRUCTURES in C: 2<sup>nd</sup> ed, , Horowitz , Sahani, Anderson-freed, Universities Press
3. Data structures and Algorithm Analysis in C, 2<sup>nd</sup> edition, Mark Allen Weiss, Pearson

### Reference Books:

1. Web : <http://lcm.csa.iisc.ernet.in/dsa/dsa.html>
2. [http://utubersity.com/?page\\_id=878](http://utubersity.com/?page_id=878)
3. <http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures>
4. <http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms>
5. File Structures :An Object oriented approach with C++, 3<sup>rd</sup> ed, Michel J Folk, Greg Riccardi, Bill Zoellick