## 2/4 B.Tech - SECOND SEMESTER

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| **IT4T1** | **ADVANCED DATA STRUCTURES** | **Credits: 3** |

**Lecture: 3 Periods/week**  **Internal assessment: 30 marks**
**Practice/Interaction: 1Period/week**  **Semester end examination: 70 marks**

**Objectives:**
- To choose the appropriate data structure algorithm for a specified application.
- To learn the systematic way of solving problems on Dictionaries, Skip lists, Hashing, Balanced Trees, Priority Queues, graphs, and Pattern matching, Tries and File Structures and writing programs for these solutions.
- To efficiently implement the different data structures and solutions for specific problems.

**Outcomes:**
Students will be able to
- Understand the usage of various data structures and Implement programs using Dictionaries and Skip Lists.
- Implement different operations on trees, heaps and Priority Queues.
- Apply Knowledge on Different graph algorithms.
- Implement different Pattern Matching algorithms & Tries.
- Understand the basic concepts of file structures.

**Prerequisites:**
C Programming, Classic Data Structures.

**Syllabus:**

**Unit -I**
Dictionaries: Sets, Dictionaries, Hash Tables, Open Hashing, Closed Hashing (Rehashing Methods), Hashing Functions (Division Method, Multiplication Method, Universal Hashing), Analysis of Closed Hashing Result (Unsuccessful Search, Insertion, Successful Search, Deletion), Hash Table Restructuring, Skip Lists, Analysis of Skip Lists.

**Unit -II**
Balanced Trees: AVL Trees: Maximum Height of an AVL Tree, Insertions and Deletions. Red-Balck Trees: Introduction, operations on Red-Black Trees. 2-3 Trees: Insertion, Deletion.
Priority Queues: Binary Heaps: Implementation of Insert and Delete min, Creating Heap.

**Unit -III**
Graphs: Operations on Graphs: Vertex insertion, vertex deletion, find vertex, edge addition, edge deletion, Graph Traversals- Depth First Search and Breadth First Search(Non recursive), Graph storage Representation- Adjacency matrix, adjacency lists.
Graph algorithms: Minimum-Cost Spanning Trees-Prim's Algorithm, Kruskal's Algorithm, Shortest Path Algorithms: Dijkstra's Algorithm, All Pairs Shortest Paths Problem: Warshall's Algorithm.

**Unit -IV**
Pattern matching and Tries: Pattern matching algorithms- the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Robin – Karp algorithm.

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

**Unit- V**

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.

**Text Books:**

1. Fundamentals of DATA STRUCTURES in C: $2^{nd}$ Edition, , Horowitz , Sahani, Anderson-freed, Universities Press
2. Data structures and Algorithm Analysis in C, $2^{nd}$ Edition, Mark Allen Weiss, Pearson

**Reference  Books:**

1. File Structures :An Object oriented approach with C++, $3^{rd}$ Edition, Michel J Folk, Greg Riccardi, Bill Zoellick
2. C and Data Structures: A Snap Shot oriented Treatise with Live examples from Science and Engineering, NB Venkateswarlu& EV Prasad, S Chand, 2010.
3. Data Structures and Algorithms, A. A. Puntambekar, Tech Publications.

**e- Learning Resources:**

1. http://www.nptel.ac.in/video.php?subjectId=106105085.
2. http://lcm.csa.iisc.ernet.in/dsa/dsa.html.
3. http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures.
4. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms.