**Data Structures**

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| **Subject Code:** |  | **Total Contact Hour** | **30** |
| **Semester:** | **3rd** | **Total Credit** | **3** |
| **Subject Name:** | **Data Structures** | | |
| **Course Objectives:** | 1. Introduce the basic idea of data structure, arrays, linked lists, stacks, queues, and algorithms.  2. Explore the linear data structures linked lists, Stacks, and Queues in more detail.  3. Elaborate on non-linear data structures such as Graphs, Trees, BST, Spanning trees, etc.  4. Discuss the Sorting and Searching algorithms and their operations.  5. Study the different hashing techniques in detail. | | |
| **SYLLABUS** | | | |
| **Module I** | **Introduction:** Introduction to Data structures and Algorithms, Analysis of Algorithms, Asymptotic notations, Time and space trade-off, Abstract Data Type. Arrays, Row/Column major representation of Arrays, Sparse matrix. | | **4** |
| **Module II** | **Linked lists:** Definition, types of linked list (Single, Double, Circular), operations on linked list, Application of linked list **Stack:** Representation, operations, and applications of Stack. **Queue:** Representation, operations, and applications. Types of Queues (Circular, Priority, Deque). | | **7** |
| **Module III** | **Tree:** Introduction to tree, Binary tree - definitions and properties; binary tree traversal algorithms with and without recursion. Binary Search Tree (BST): Operations on BST, AVL tree balancing; B-tree; B+ tree, Heap. **Graph:** Representation, Traversals (BFS and DFS). | | **8** |
| **Module IV** | **Sorting and Searching: Sorting:** Internal **vs.** External sorting, Bubble, Insertion, Selection, Merge sort, Quick sort, Heap sort, Radix, **Searching:** Linear, Binary Search. | | **6** |
| **Module V** | **Hashing:** Introduction, Hashing techniques, Hash function, Address calculation techniques- common hashing functions. Collision resolution techniques, Linear probing, quadratic probing, Double hashing and Rehashing. | | **5** |
| **Essential Reading** | 1.Introduction to Data Structures with Applications by J. Tremblay and P. G. Sorenson (TMH)  2.Classic Data Structures – Debasis Samanta (PHI) | | |
| **Supplementary Reading** | 1.Data Structures Using C – A.M. Tenenbaum (PHI)  2. Data structures with C-by Seymour Lipschutz (Schaum Outline Series)  3.Data Structures and Algorithm Analysis in C – M. A. Weiss (Pearson Education)  4. Fundamentals of Data Structures in C -- by Horowitz, Sahni, and Anderson-Freed (Silicon Press 2007).  5. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning. | | |
| **Course Outcomes:** | After completion of the course successfully, students will have:  **CO1**: Ability to understand the data structure and its application.  **CO2:** Proficiency in selecting an efficient linear data structure and apply to solve its problem.  **CO3:**Expertise in assessing efficiency trade-offs among different non-  Linear data structures and implementations.  **CO4:**Ability to apply Sorting and Searching operations in real-world problem solutions.  **CO5:**Ability to design the programs using different data structures and hashing approaches. | | |