# 20CS31O1 - FUNDAMENTALS OF DATA STRUCTURES

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| Course Category: | Open Elective | Credits: | 3 |
| Course Type: | Theory | Lecture-Tutorial-Practical: | 3-0-0 |
| Pre-requisite: | Knowledge in programming languages. | Sessional Evaluation:  Univ. Exam Evaluation:  Total Marks: | 40  60  100 |

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| Course Objectives | * Master the implementation of linked data structures such as linked lists and binary trees. * Familiar with advanced data structures such as balanced search trees and priority queues. * Familiar with several sorting algorithms including quick sort, and merge sort. * Familiar with some graph traversals like DFS, BFS. | |
| Course Outcomes | Upon successful completion of the course, the students will be able to: | |
| CO1 | Understand concepts of Data Structures and Learn sorting & searching techniques. |
| CO2 | Implement stacks and queues using arrays. |
| CO3 | Gain knowledge in Linked lists and types. |
| CO4 | Understand the concepts of Binary trees, Binary search trees and Graphs. |
| CO5 | Explore the basics of balanced search trees - AVL trees, Splay trees. |
| CO6 | Acquire knowledge in B-Trees and Hash tables. |
| Course Content | UNIT-I  **Introduction to Data Structures:** Primitive, non-primitive, Linear, non-linear  **Searching:** Linear Search and Binary Search.  **Sorting Techniques:** Bubble Sort, Selection Sort, Quick sort, Merge sort, Insertion Sort, Sorting Efficiency.  UNIT-II  **Stacks:** Introduction, Stack operations, Implementation of Stacks using Arrays  **Applications:** Conversion from Infix to Postfix notation, Evaluation of Postfix Expression  **Queues**: Introduction, operations on Queues, Circular Queues, Priority Queues, Double Ended Queues (deques).  UNIT-III  **Linked Lists:** Introduction, Linked List Operations,  **Types:** Singly, Doubly and Circularly Linked Lists.  **Applications:** Stacks and Queues implementation using linked list.  UNIT-IV  **Tree**: Definition, Representation.  **Binary Tree**: Definition and Properties, Representation, Tree traversals.  **Binary Search Tree**: Definition and Properties, applications.  **Graphs:** Introduction, Basic terminologies, Representation, Graph traversals.  UNIT-V  **Balanced Search Trees:** AVL trees: Definition, operations.  **Red-Black Trees:** Definition, Representation and operations.  UNIT-VI  **B-Trees**: Indexed Sequential Access Method (ISAM), m-way search trees, B-trees of order m, Height of B-Tree, Insertion and Deletion from B-Tree.  **Hash Tables**: Dictionaries, Hash Table Structure, Hash Functions. | |
| Text Books &  References  Books | **TEXT BOOKS:**   1. Computer Programming and Data Structures by E. Balagurusamy, 4/e, McGraw Hill. 2. Data Structures and Algorithms – concepts, Techniques and Applications by G A V Pai, McGraw Hill.   **REFERENCE BOOKS:**   1. C Programming & Data Structures, B. A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning. 2. An Introduction to Data structures with applications: Tremblay J P and Sorenson P G. | |
| E-Resources | 1. <https://nptel.ac.in/courses> 2. <https://freevideolectures.com/university/iitm> | |