# 20CS31O1 - FUNDAMENTALS OF DATA STRUCTURES

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| Course Category: | Open Elective | Credits: | 3 |
| Course Type: | Theory | Lecture-Tutorial-Practical: | 3-0-0 |
| Prerequisite: | Knowledge in programming languages. | Sessional Evaluation:Univ. Exam Evaluation:Total Marks: | 4060100 |
| 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.
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| 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 &ReferencesBooks | **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.
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| E-Resources | 1. <https://nptel.ac.in/courses>
2. <https://freevideolectures.com/university/iitm>
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