



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**  
**KAKINADA – 533 003, Andhra Pradesh, India**

**DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE**

| I Year – II Semester     |  | L | T | P | C |
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| DATA STRUCTURES (CS1201) |  |   |   |   |   |

**Course Objectives:**

The objective of the course is to

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

**Course Outcomes:**

After completing this course a student will be able to:

- Summarize the properties, interfaces, and behaviors of basic abstract data types
- Discuss the computational efficiency of the principal algorithms for sorting & searching
- Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
- Demonstrate different methods for traversing trees

**UNIT I**

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.

Searching - Linear search, Binary search, Fibonacci search.

Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

**UNIT II**

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal, Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation, Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

**UNIT III**

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues-Circular Queues, Dequeues, Priority Queues, Multiple Queues.

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

**UNIT IV**

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees-AVL Trees, Insertion, Deletion and Rotations.



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**UNIT V**

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims &Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

**Text Books:**

- 1) Data Structures Using C. 2<sup>nd</sup> Edition.ReemaThareja, Oxford.
- 2) Data Structures and algorithm analysis in C, 2<sup>nd</sup>ed, Mark Allen Weiss.

**Reference Books:**

- 1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
- 2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
- 3) Data Structures with C, Seymour Lipschutz TMH

**e-Resources:**

- 1) <http://algs4.cs.princeton.edu/home/>
- 2) [https://faculty.washington.edu/jstraub/dsa/Master\\_2\\_7a.pdf](https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf)