Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	**CS-204**	**Title of the Course**	**Data Structure Using C**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**3**	**1**	**0**	**4**
Pre-Requisite	**None**	**Co-requisite**	**None**				
Course Objectives	• Explain the basics of Data Structure, their Managements and Operations such as array, string manipulations and various operation over linked list. Programming implementation • To learn stack, queue and various operations, different application based on given data structure such as, recursion, polish and reverse polish conversion parenthesis management, priority Queue. Programming implementations • Understand the deep knowledge of tree data structure and its various applications to control the operation complexity management. Programming implementation • To study the various sorting and searching strategy and different algorithms approach, know hashing and collision resolving techniques. Programming implementation • Understand the new range of hierarchical data structure such as Graph and various routing and traversal algorithms over the graph. Introduction to file and record handling						

Course Outcomes	
CO1	Describe the basics of Data structure operation and programming implementation skills
CO2	Stack and Queue and various application based on these data structures
CO3	Learning the different types of tree and learn its augmentation to control the operation complexity.
CO4	Learn different sorting and searching algorithms and analyze their performances.
CO5	Learning File and record management, implementing various searching and routing applications on graph.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Introduction to Data Structures**	Basic Terminology, Elementary Data Organization, Data Structure Operations. Algorithms, Analysis of Algorithms, Complexity of Algorithms, Time-Space Tradeoff. **Arrays:** Array Definition, Representation and Analysis, Single and Multi-Dimensional Arrays, Address Calculation, Application of Arrays, Character String Representation, Character String Operation, Sparse Matrices & Vectors. **Linked List:** Representation and Implementation of Singly Linked List, Traversing, Searching of Linked List, Insertion & Deletion to/from Linked List, Underflow & Overflow. Circular Linked List, Doubly Linked List, Two- way Header List, Polynomial Representation & Addition, Generalized Linked List, Garbage Collection and Compaction	9	1
2	**Stacks**	Array Representation and Implementation of Stack, Operations on Stacks: Push & Pop, Linked Representation of Stack, Application of Stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of Postfix Expression using Stack. Recursion: Recursive Definition and Processes, Recursion in C, Example of Recursion, Tower of Hanoi Problem. **Queues:** Array and Linked Representation and Implementation of Queues, Operations on Queue: Create, Add, Delete, Full and Empty; Circular Queues, D-queues and Priority Queues**.**	9	2
3	**Trees**	Basic Terminology, Binary Trees, Binary Tree Representation, Algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary Trees, Traversing Binary Trees, Threaded Binary Trees, Traversing Threaded Binary Trees, Huffman Algorithm, Binary Search Tree (BST), Insertion and Deletion in BST, Path Length, AVL Trees, B-trees.	8	3
4	**Searching and Hashing**	Sequential Search, Binary Search, Comparison and Analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation. **Sorting:** Insertion Sort, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort.	7	4
5	**Graphs**	Terminology & Representations, Graphs & Multi-Graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees. **File Handling:**Physical Storage Media File Organization, Organization of Records into Blocks, Sequential Files, Indexing and Hashing, Primary Indices, Secondary Indices	7	5

Reference Books:

1. M. Tannenbaum. “Data Structure Using C/C+”
2. Horowitz And Sahani “Fundamental of Data Structure”, Galgotia Publication
3. A Lipschutz “Data Structure”, Schaum series.

e-Learning Source:

https://nptel.ac.in/courses/106102064