Marwadi University

Syllabus for Bachelor of Technology

Information and Communication Technology

Subject Code: 01CT0307

Subject Name: Data Structure and Algorithm

B. Tech. Year – II (Semester III)

Objectives:

1. To teach efficient storage mechanisms of data for an easy access.
2. To design and implementation of various basic and advanced data structures.
3. To introduce various techniques for representation of the data in the real world.
4. To develop application using data structures.
5. To teach the concept of protection and management of data.
6. To improve the logical ability

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Student will be able to choose appropriate data structure as applied to specified problem definition.
2. Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Students will be able to use linear and non-linear data structures like stacks, queues, linked list etc.

Pre-requisite of course: Basic knowledge of C language

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
4	0	2	5	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	**Introduction to data structure** Types of Data Structure, Arrays, Strings, Recursion, ADT (Abstract Data type), Concept of Files, Operations with files, types of files	5
2	**Linked List** Linked List as an ADT, Linked List Vs. Arrays, and Memory Allocation & De-allocation for a Linked List, Linked List operations, Types of Linked List, Implementation of Linked List, Application of Linked List polynomial, sparse matrix	10
3	**STACK** The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation	8
4	**Queues** The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Circular Queue, Priority Queue, & Dequeue, Application of Queues – Johnsons Algorithm, Simulation	8
5	**Trees** Basic trees concept, Binary tree representation, Binary tree operation, Binary tree traversal, Binary search tree implementation, Thread Binary tree, The Huffman Algorithm, Expression tree, Introduction to Multiway search tree and its creation (AVL, B-tree, B+ tree) **Graphs** Basic concepts, Graph Representation, Graph traversal (DFS & BFS)	13
6	**Sorting** Sort Concept, Shell Sort, Radix sort, Insertion Sort, Quick Sort, Merge sort, Heap Sort, **Searching** List Search, Linear Index Search, Index Sequential Search Hashed List Search, Hashing Methods, Collision Resolution (One way and Two way); AVL tree balancing; B-tree; Application of trees.	12
	Total Hours	56

Suggested Text books / Reference books:

1. Data Structures A Pseudocode Approach with C, Richard F. Gilberg & Behrouz A. Forouzan, second edition, CENGAGE Learning.
2. Data Structures using C, Reema Thareja, Oxford University press.
3. Introduction to Data Structure and its Applications Jean-Paul Tremblay, P. G. Sorenson
4. Data Structures Using C & C++, Rajesh K. Shukla, Wiley- India.

5. Data Structures Using C, ISRD Group, Second Edition, Tata McGraw-Hill
6. Data Structure Using C, Balagurusamy
7. C & Data Structures, Prof. P.S. Deshpande, Prof. O.G. Kakde, Dreamtech press.
8. Data Structures, Adapted by: GAV PAI, Schaum's Outlines

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
25%	20%	30%	5%	5%	15%

Suggested List of Experiments:

1. Implementations of Linked Lists menu driven program.
2. Implementation of different operations on linked list – copy, concatenate, split, reverse, count no. of nodes etc.
3. Representation of Sparse matrix using multilinked structure. Implementation of sparse matrix multiplication.
4. Implementation of polynomials operations (addition, subtraction) using Linked List.
5. Implementations of Linked Lists menu driven program (stack and queue)
6. Implementations of Double ended queue using Linked Lists.
7. Implementation of Priority queue program using Linked Lis
8. Implementations of stack menu driven program
9. Implementation of multitask in one array.
10. Implementations of Infix to Postfix Transformation and its evaluation program.
11. Implementations of Infix to Prefix Transformation and its evaluation program.
12. Simulation of recursion
13. Implementations of circular queue menu driven program
14. Implementations of double ended queue menu driven program
15. Implementations of queue menu driven program
16. Implementation of Priority queue program using array.
17. Implementation of Johnsons Algorithm
18. Implementation of Simulation Problem
19. Implementations of Binary Tree menu driven program
20. Implementation of Binary Tree Traversal program.
21. Implementation of construction of expression tree using postfix expression.
22. Implementations of Huffman code construction
23. Implementations of BST program

24. Implementation of various operations on tree like – copying tree, mirroring a tree,
25. counting the number of nodes in the tree, counting only leaf nodes in the tree.
26. Implementations of B-tree menu driven program
27. Implementations of B+ tree program
28. Implementation of Preorder traversal of a threaded binary tree.
29. Implementations of AVL Tree menu driven program
30. Implementations of Shell sort, Radix sort and Insertion sort menu driven program
31. Implementations of Quick Sort, Merge sort and Heap Sort menu driven program
32. Implementations of searching methods (Index Sequential, Interpolation Search) menu driven program
33. Implementation of hashing functions with different collision resolution techniques
34. Implementations of Graph menu driven program (DFS & BSF)

Supplementary Resources:

1. http://www.nptelvideos.in/2012/11/programming-and-data-structure.html
2. http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
3. http://www.geeksforgeeks.org/data-structures/
4. https://www.hackerrank.com/domains/data-structures/arrays