Course: BTech **Semester:** 3

Prerequisite: Computer Programming and Basic Syntaxes

Course Objective: Data structure is a subject of primary importance in Information and Communication Technology. Organizing or structuring data is important for implementation of efficient algorithms and program development. Efficient problem solving needs the application of appropriate data structure during program development.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	0	0	0	3	20	20	-	60	-	100

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	Topics	W	T
1	**Introduction:** Data Structures, Classifications (Primitive & Non-Primitive), Data structure Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, dynamically allocated arrays. Performance analysis of an algorithm and space and time complexities	10	6
2	**Stacks, Recursion and Queue:** **Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. **Recursion -**Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, **Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Deque, Priority Queues and its problems	15	8
3	**Linked Lists:** Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues. Applications of Linked lists	10	5
4	**Searching and Sorting:** Interpolation Search **Sorts:** Selection Sort Insertion Sort Bubble Sort Quick Sort Merge Sort, Radix Sort	10	5
5	**Trees:** Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - In Order, Post Order, Pre Order; Additional Binary tree operations. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression	10	4
6	**Red Black Trees and AVL Trees:**Introduction-Operations on Red Black Trees AVL tree Construction Operations on AVL Trees	15	8
7	**Hashing:**Hash Table organizations, Hashing Functions, Static and Dynamic Hashing	15	3
8	**Graphs:** Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search.	15	5

Reference Books

1.	**Fundamentals of Data Structures in C, 2ND eDITION, E.Horowitz, S,.Sahni and Susan Anderson- Freed, Universities Press (TextBook)**
2.	**Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.**

Course Outcomes

At the end of this course Students Will be able to:	
1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation
2	Understand basic data structures such as arrays, linked lists, stacks and queues
3	Describe the hash function and concepts of collision and its resolution methods
4	Solve problem involving graphs, trees and heaps
5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

Course Outcome

After Learning the Course the students shall be able to:

After Learning the course the students shall be able to:
1. Use different types of data structures, operations and algorithms
2. Apply searching and sorting operations on files
3. Use stack, Queue, Lists, Trees and Graphs in problem solving
4. Implement all data structures in a high-level language for problem solving.

Miscellaneous

Exam Requirement

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc