Semester: 3

Course: B. Tech

Prerequisite: Computer Programming and Basic Syntax

Rationale: 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, **CIA**- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Course Content

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

Sr.	Topics	W	T
1	**Introduction:** Techniques of Problem Solving, Data Structures, Types of Data Structures (Primitive, Non-Primitive, Linear & Non-Linear), 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. Real time examples (e.g. Factorial, GCD, Fibonacci Sequence, Tower of Hanoi.	15	8
2	**Linked Lists:** Definition, Representation of linked lists in Memory. 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.	12	6
3	**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. **Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeue, Priority Queues and its problems.	25	12
4	**Hashing:** Hash Table organizations, Hashing Functions, Static and Dynamic Hashing. **Searching and Sorting:** Interpolation Search, Selection Sort Insertion Sort Bubble Sort Quick Sort Merge Sort, Radix Sort.	10	3
5	**Trees:** Terminology,BinaryTrees,PropertiesofBinarytrees,ArrayandlinkedRepresentationofBinaryTrees, BinaryTreeTraversals-InOrder,PostOrder,PreOrder;AdditionalBinarytreeoperations.Threadedbinarytrees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression, Red Black Trees and AVL Trees.	25	12
6	**Graphs:** Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search; Selection of Data Structures.	13	4

Reference Books	
1.	**Fundamentals of Data Structures in C, 2NDeDITION,E.Horowitz,S,.SahniandSusanAnderson-Freed,UniversitiesPress (Text Book)**
2.	**Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, Mc Graw Hill, 2014.**

Course Outcomes	
At the end of this course Students will be able to:	
1	Summarize the basic concepts of data structures.
2	Explain the linear & dynamic allocation of memory using linked list and its operations.
3	Illustrate stacks, queues, and recursion represented in memory for real-time applications.
4	Discuss static and dynamic hashing functions and sorting and searching.
5	Analyze the concepts of B-trees, AVL tree and Red-Black tree.
6	Describe the shortest path algorithm on graph data structure.