

Course Name: **B.Tech. 3th Sem.**

Subject: **Data Structures**

Paper Code: **ETCS-209**

No of hours allotted to complete the syllabi: **44 Hours**

No of hours allotted per week: **3 Hours**

Topic Details	No of Hours Planned	Methodology*	Reference /text book**
<p>UNIT-I</p> <p>Programming methodologies Algorithms, how to formulate an algorithm and pseudocode generation.</p> <p>Abstract data type. Relationship between data structures and abstract data type.</p> <p>Define space and time Complexity. Examples for calculating space and Time complexity.</p>	2	L	T1 T2
<p>Data Structures- definition, Types- Linear, Non-Linear, Basic operations, Array representation</p> <p>Arrays: Introduction to linear arrays, Representation of linear arrays in memory, Traversing linear arrays, Insertion & deletion Sparse arrays</p> <p>Multidimensional Arrays: Two Dimensional array, Implementation of two dimensional arrays in memory</p> <p>Definition and Overview of Stacks, Queues, Linked List</p> <p>Stacks-Implementation using Arrays. Algorithm for PUSH & POP operations</p> <p>Evaluation of Postfix expression,</p>	3	L, T	T3

<p>Conversion for infix to postfix expression and their algorithms.</p> <p>Queues- Implementation using Array and Algorithms for insertion deletion from the queue using above implementations.</p> <p>Circular queue- implementation using arrays & Linked List.</p> <p>Priority queues, Dqueues, Multiple Stacks and Queues</p>	4	L, T	T4
<p>Linked List- Representation in memory, Dynamic allocation, Creation of a Linked List</p> <p>Algorithm – creation, traversing, Counting elements and Searching in a linked list.</p> <p>Memory allocation, Garbage Collection, Avail List.</p> <p>Algorithm for sorting elements in a linked list.</p> <p>Algorithm for inserting and deleting elements from a linked list from first last and middle position</p> <p>Implementation of stack and queue using Linked List</p>	3	L	T4
<p>Doubly Linked List- Algorithm for creation, Traversal (Forward/ Backward), Insertion and deletion</p> <p>Header List (Circular & Grounded) - Algorithm for creation, insertion, traversal and deletion.</p> <p>Polynomial arithmetic- Algorithm for Polynomial addition using circular Linked</p>	4	L	T4

list			
Generalized Lists. Sparse Matrices- Creation, Addition, Transpose and Multiplication algorithms. Equivalence Relations.			T7
UNIT-II			
Searching- Linear Search, Binary Search & their complexity			
Trees: Overview of Trees—Terminology, Definitions, Binary tree, Complete, full and strictly binary tree.	3	L, A	T4, T10
Tree Traversals (preorder, postorder and preorder), Representation of Arithmetic expression as a binary tree. Formation of Binary tree from given Inorder and preorder/ postorder traversals.	2		
Non-recursive and Recursive algorithms for preorder, Inorder, Postorder traversal.			
Expression trees and their usage.			
First Term Exam			
Threaded binary trees. Binary Search Tree —Build, Search an element, Insertion (Algorithms) Algorithm for deletion of a node in a BST having no child, one child and two children.	2		
Heap —Build a heap, insertion and deletion from a heap			
Balanced Trees —AVL trees, Build an AVL tree and Insertion (Rebalancing), AVL trees—Deletion and Rebalancing	3	L, T	T4, T5

<p>Multiway Search trees: B-Tree—Build, Insertion (splitting), Deletion (concatenation), B⁺ tree, B* tree</p> <p>Application of trees—Set representations, Game trees, Decision trees</p>	2	L, A	T5, T7
<p>UNIT-III Graphs, Digraphs and associated terminology (Path, degree, Connected, Isolated, Cycle, depth etc.)</p> <p>Representation of graphs- Sequential & Linked (Adjacency Matrix, Path matrix, Adjacency List)</p>	3	L	T4, T7
<p>Graph traversals- Breadth first search, Depth First Search</p> <p>Connected components, Transitive closure, Topological Sort</p> <p>Spanning Tree, Minimum cost spanning tree, Kruskal's and Prim's Algorithm</p> <p>Shortest path- Dijkstra's Algorithm & Implementation and Floyd Warshall algorithm</p> <p>Activity Network, Critical Path</p> <p>Sorting—Internal (Selection sort, Bubble sort, Insertion sort, Radix sort, Merge Sort, Shell sort, Heap sort, Quick sort) & their complexity</p>	4 2	L	T4, T7, T8, T9
Second Class Test	0		
<p>UNIT-IV Differences between External and Internal searching/ Sorting.</p> <p>List search, sequential search.</p>	2	L	T10, T11

External Sorting -(K-way Mergesort, Balanced and PolyPhase MergeSort)			
UNIT-IV Files, Queries and Sequential organization. Cylinder Surface Indexing, Tree Indexing, Trie Indexing Random File Organization- Direct Addressing, Directory Lookup, Hashing Hashing methods- direct, subtraction, modulo division, mid square folding, pseudorandom hashing Collision reduction- linear probing, quadratic probe, pseudorandom collision resolution, linked list collision resolution Bucket hashing Linked Organization, Inverted files, Cellular Partitions	3	L,A	T4, T7
Revision and Discuss last year Question Papers	2		

***Methodology Used:**

L-Lecture, T-Tutorial, A-Assignment

****Text Books/ Reference Books:**

- T1-→ Fundamentals of Computer Algorithms..... S. Sahni ... Galgotia Publications
- T2-→ Fundamentals of Data Structures using C++.. S. Sahni ... Galgotia Publications
- T3-→ Expert Data Structures with C..... R.B.Patel... Khanna Publications
- T4-→ Theory & Problems of Data Structures..... Seymour.....TMH
- T5-→ Data Structures & Program Design..... R.L.Kruse.....PHI
- T6-→ Data Structures using C & C++..... Tanenbaum.....PHI
- T7-→ Fundamentals of Data Structures..... S. Sahni ... Galgotia Publications
(2003 Reprint)
- T8-→ Data Structures, Algo's & applications in C++. S. Sahni..... McGraw Hill
- T9-→ Graph Theory with applications to CS..... N. Deo.....PHI
- T10-→ An Intro. to Data Structures with Applications... Tremblay.... McGraw Hill
- T11-→ File Structures- an OO approach with C++..... M. J. Folk.... Pearson Edu.