CSE11404	Programming &Data Structures	L	T	P	C
Version 1.0	Contact Hours – 45 Hours	3	0	0	3
Pre-requisite/Exposure	Programming Concepts in C				
Co-requisite	Logical Ability				

Course Objectives:

1. Introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms.

2. Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs.

Course Outcomes:

On the completion of this course the student will be able to

CO1: Define the concept of Dynamic memory management, data types, and algorithms.

CO2: Illustrate advantages and disadvantages of specific algorithms and data structures.

CO3: Solve bugs in program, recognize needed basic operations with data structures.

CO4: Interpret algorithms and data structures in terms of time and memory complexity of basic operations.

CO5: Compare the computational efficiency of the principal algorithms for sorting, searching, and hashing.

Course Description:

Study of advanced programming topics focused on logical structures of data as well as the design, implementation and analysis of algorithms operating on these structures. Students will gain the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms. **Course Content:**

Unit-I	5 Lecture Hours

INTRODUCTION:

Data and Information, Representation of Data, Data Type, Data Structure, Classifications of Data Structures, Application of Data Structures, Abstract Data Type, Operations Perform on Data Structure, Overview of Different Data Structures

Algorithm, Types of Algorithm, Algorithm Development Life Cycle.

ARRAY AND STRING

Array, One-dimensional array, Address calculation in One-dimensional array

Multi-dimensional array, Address calculation in two-dimensional array, Operations Perform on Array, Applications of Array, Representation of Polynomials , Sparse Matrix

Strings, Array of strings, Operations Perform on Strings.

Pointer Declaration, Address of Operator, Indirection Operator, Null Pointer, void Pointer

Generic Functions, Dangling Pointer, Arithmetic Operation with Pointer, Pointer to Pointer, Pointers and Arrays, Array of Pointers, Pointer to an Array , Pointer to Function

Passing addresses to Function, Function returning Pointer, Dynamic Memory Allocation

Creating one-dimensional array, Creating two-dimensional array, Pointers, Arrays and Strings.

Unit-II	10 Lecture Hours

STACK AND QUEUE: Stack, Operations on Stack, Stack Representation with Array, Stack Representation with Linked List, Processing of function calls, ,Evaluation of Arithmetic expressions, Queue, Operations on Queue, Queue Representation with Array, Queue Representation with Linked List, Application of Queue, Drawback of Linear Queue

Circular Queue, Circular Queue Representation with Array, Dequeue, Operation on DeQueue, Priority Queue, Representation of Priority Queue.

LINKED LIST: Limitations of Array, Linked List, Singly Linked list, Operations on Singly linked list, Representation of polynomials using linked list, Circular Linked list, Operation on Circular Link List, Josephus Problem, Doubly Linked list, Operation on Doubly Link List, Circular Doubly Linked List, Disadvantages of Linked List

Unit-III :	15Lecture Hours

TREE: Terminology of Tree, Binary Tree, Strictly Binary Tree, Extended Binary Tree,

Complete Binary Tree, Full Binary Tree, Skewed Binary Tree, Binary Expression Tree

Balanced Binary Tree, Threaded Binary Tree, Properties of Binary Tree

Representation of Binary Tree, Binary Tree Traversal, Binary Search Tree

Operations on Binary Search Tree, Heap, Operations on Heap, AVL Tree, Operations on AVL Tree,

GRAPH:Terminology of Graph, Terminology of a Directed Graph, Operations on Graph

Representation of Graph, Graph Traversal, Spanning Trees and Minimum Spanning Trees

Kruskal's Algorithm, Prim's Algorithm.

Unit-IV	**10 Lecture Hours**

SEARCHING AND SORTING

Linear Search, Binary Search, Interpolation Search, Bubble Sort, Insertion Sort

Selection Sort, Quick Sort, Merge Sort, Heap Sort, Radix Sort, Shell Sort, Time complexity of Sorting Algorithms

RECURSION:

Recursion Essentials, Infinite Regress, Depth of Recursion, Recursion Tree, Types of Recursion, Factorial, Fibonacci Sequence, GCD, Integer Power, Tower of Hanoi

Non-attacking Eight Queens, Converting Recursive function to Iterative.

Unit-V	**5 Lecture Hours**

HASHING:

Hash Table, Hash Function, Division Method, Mid Square method, Folding method

Collision Resolution, Linear Probing, Quadratic Probing, Double Hashing, Separate Chaining, Load Factor

FILE STRUCTURE

Elements of File System, Category of File Organisation, Sequential File Organisation

Heap File Organisation, Hash File Organisation, Index Sequential File Organisation

Primary Index, Secondary Index.

Text Books:

1. Fundamentals of Data Structures, Illustrated Edition by Ellis Horowitz, SartajSahni and Computer Science Press.
2. Introduction To Algorithms, Thomas H.Cormen, Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein.

Reference Books:

1. Algorithms, Data Structures, and Problem Solving with C++, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company.
2. How to Solve it by Computer, 2nd Impression by R. G. Dromey, Pearson Education.