

|                               |                                       |          |          |          |          |
|-------------------------------|---------------------------------------|----------|----------|----------|----------|
| <b>CSE11104</b>               | <b>Data Structures and Algorithms</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Version 1.0</b>            | <b>Contact Hours 45 Hours</b>         | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |
| <b>Pre-requisite/Exposure</b> | <b>Programing Concepts in C</b>       |          |          |          |          |
| <b>Co-requisite</b>           | <b>Logical Ability</b>                |          |          |          |          |

### Course Objectives:

- Introduce the fundamental concept of data structures
- To emphasize the importance of data structures in developing and implementing efficient algorithms.
- 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:

| <b>Units</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Lecture Hours</b> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>Unit-I:</b> 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, | <b>5</b>             |

| Units                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Lecture Hours |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |
| <b>Unit-II: STACK AND QUEUE:</b> 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 Representationwith 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. <b>LINKED LIST:</b> Limitations of Array, Linked List, Singly Linked list, Operations on Singly linked list, Representation ofpolynomials 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 | <b>10</b>     |
| <b>Unit-III: TREE:</b> 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, <b>GRAPH:</b> Terminology of Graph, Terminology of a Directed Graph, Operations on Graph, Representation of Graph, Graph                                                                                                                                                                                                                                                                                          | <b>15</b>     |
| <b>Unit-IV: SEARCHING AND SORTING:</b> 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 <b>RECURSION:</b> 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.                                                                                                                                                                                                                                                                                                                                                     | <b>10</b>     |
| <b>Unit-V: HASHING:</b> Hash Table, Hash Function, Division Method, Mid Square method, Folding method Collision Resolution, Linear Probing, Quadratic Probing, Double Hashing, Separate Chaining, Load Factor <b>FILE STRUCTURE:</b> Elements of File System, Category of File Organisation, Sequential File OrganisationHeap File Organisation, Hash File Organisation, Index Sequential File Organisation Primary Index, Secondary Index.                                                                                                                                                                                                                                                                                                                                                                                                              | <b>5</b>      |

### Examination Scheme:

| Components    | Mid Term | Class Assessment | End Term |
|---------------|----------|------------------|----------|
| Weightage (%) | 20       | 30               | 50       |

### Relationship between Course Outcomes (COs) and Program Outcomes (POs):

1 = Weakly Mapped, 2 = Moderately Mapped, 3 = Strongly Mapped

| Course Code | Course Name | COs    | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 | PS O3 |
|-------------|-------------|--------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CSE11       | Data        | CO1100 | 3    | 3    | 3    | 3    | 2    | 1    | 2    | -    | 3    | -     | -     | 2     | 2     | 2     | 3     |
| 004         | Structu     | 4.1    |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |
|             | res and     | CO1100 | 2    | 3    | 3    | 3    | 2    | 1    | 1    | -    | 3    | -     | -     | 2     | 2     | 3     | 3     |
|             | Algorit     | 4.2    |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |
|             | hms         | CO1100 | 2    | 2    | 3    | 2    | 1    | 2    | 1    | -    | 3    | -     | -     | 1     | 2     | 3     | 2     |
|             |             | 4.3    |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |
|             |             | CO1100 | 3    | 2    | 2    | 2    | 3    | 3    | 2    | -    | 3    | -     | -     | 1     | 2     | 3     | 1     |
|             |             | 4.4    |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |
|             |             | CO1100 | 3    | 2    | 2    | 2    | 3    | 3    | 1    | -    | 2    | -     | -     | 1     | 3     | 2     | 1     |
|             |             | 4.5    |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |
|             |             | CO1100 | 2.   | 2.   | 2.   | 2.   | 2.   | 2.   | 1.   | -    | 2.   | -     | -     | 1.4   | 2.2   | 2.6   | 2.0   |
|             |             | 4      | 6    | 4    | 6    | 4    | 2    | 0    | 4    |      | 8    |       |       |       |       |       |       |