**Course: CSE207 Data Structures**

**Credits and Teaching Scheme**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Theory | Laboratory | Total |
| Credits | 3 | 1 | 4 |
| Contact Hours | 3 Hours/Week for 13 Weeks + Final Exam in the 14th Week | 2 Hours/Week for 13 Weeks | 5 Hours/Week for 13 Weeks + Final Exam in the 14th Week |

**Prerequisite**

CSE110 Object Oriented Programming

**Course Objective**

The course develops students' skills for designing and analyzing linear and non-linear data structures. It strengthens students' ability to identify and apply the suitable data structure for solving real world problems. Knowledge of this course will be needed as prerequisite knowledge for future courses such as CSE246 Algorithms, CSE366 Artificial Intelligence, CSE405 Computer Networks, and CSE 471 Compiler Design.

**Knowledge Profile**

K3: Theory-based engineering fundamentals

**Learning Domains**

Cognitive - C2: Understanding, C3: Applying, C4: Analyzing

Psychomotor - P2: Manipulation, P3: Precision

Affective - A2: Responding

**Program Outcomes (POs)**

PO1: Engineering Knowledge

PO2: Problem Analysis

**Complex Engineering Problem Solution**

EP1: Depth of knowledge required

EP2: Range of conflicting requirements

**Course Outcomes (COs) with Mappings**

After completion of this course students will be able to:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO** | **CO Description** | **PO** | **Learning Domains** | **Knowledge Profile** | **Complex Engineering Problem Solving/ Engineering Activities** |
| CO1 | **Interpret** and **Apply** the basic concepts of linear list for developing effective problem solutions. | PO1 | C2, C3 | K3 | EP1 |
| CO2 | **Interpret** and **Apply** the basic concepts of non-linear list for manipulating hierarchical and connected data. | PO1 | C2, C3 | K3 | EP1 |
| CO3 | **Choose** and **justify** appropriate data structure for solving computational problems. | PO2 | C3, C4 | K3 | EP1, EP2 |
| CO4 | **Analyze** and **Use** the appropriate data structure and **Write** report to design, build and test complex problems. | PO2 | C3, C4, A2, P2, P3 | K3 | EP1, EP2 |

**Course Topics, Teaching-Learning Method, and Assessment Scheme**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Topic** | T**eaching-Learning Method** | **CO** | **Mark of Cognitive Learning Levels** | |  | **CO**  **Mark** | **Exam**  **(Mark)** |
| **C2** | **C3** | **C4** |  |  |
| Data Types, Pointer, Structure, Dynamic Memory Allocation and Abstract Data Types (ADTs)  List ADT : Singly and doubly Linked list Implementation and Basic operations with Application | Lecture,  Class Discussion, Discussion Outside Class with Instructor/ Teaching Assistant | CO1 | 2 | 3 |  | 5 | Midterm Exam I  (20) |
| Stack and Queue ADT : Basic operations and Implementation | Do | CO1 |  | 10 |  | 10 |
| Stack and Queue ADT : Applications | CO3 |  | 3 | 2 | 5 |
| Iterative Solution and Recursive Solution design | Do | CO2 |  | 6 |  | 6 | Midterm  Exam II  (20) |
| Basic Tree Concepts, Tree Traversals, Binary Trees | CO2 | 3 | 3 |  | 6 |
| Binary Search Trees ADT and applications | CO3 |  | 4 |  | 4 |
| Balanced BST | CO3 |  |  | 4 | 4 |
| Binary Heap implementation, application, Priority queue | Do | CO2 |  | 7 |  | 7 | Final Exam  (20) |
| Graph representation, Terminology, Graph creation, traversal techniques, | CO2 |  | 6 |  | 6 |
| Spanning Tree, MST, Shortest Path Problem | C03 |  |  | 4 | 4 |
| Hashing: Hash table generation, Collision resolution | C03 |  | 3 |  | 3 |

**Laboratory Experiments and Assessment Scheme**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Experiment** | **Teaching-Learning Method** | **CO** | **Mark of Cognitive Learning Levels** | **Mark of Psycho-motor Learning Levels** | | **Mark of Affective Learning Levels** | **Mark**  **of**  **COs** |
| C4 | P2 | P3 | A2 |  |
| Implement program using pointers, structure and DMA etc. | Preparing Pre-Lab Report, Lab Experiment and Result Analysis, Preparing Post-Lab Report | CO4 |  |  |  |  |  |
| Implementation of different operations on linked list – copy, concatenate, split, reverse, count no. of nodes etc. | Do | CO4 |  |  |  |  |  |
| Implementations of stack menu driven program. | Do | CO4 |  |  |  |  |  |
| Implementations of queue menu driven program. | Do | CO4 |  |  |  |  |  |
| Implementations of recursion. |  | CO4 |  |  |  |  |  |
| Implementations of BST program. | Do | CO4 |  |  |  |  |  |
| Implementations of Binary heap program. | Do | CO4 |  |  |  |  |  |
| Implementations of graphand graph menu driven program (BFS & DFS). | Do | CO4 |  |  |  |  |  |
| Lab Experiments |  |  | 7 | 1 | 1 | 1 | 10 |
| Lab Exam | Individual Lab Exam | CO4 | 4 | 1 |  |  | 5 |
| **Total** |  |  | **11** | **2** | **1** | **1** | **15** |

**Mini Projects**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Mini Project** | Teaching-Learning Method | **CO** | **Mark of Cognitive Learning Level** | **Mark of Psychomotor Learning Levels** | | **Mark of Affective Learning Level** | **CO Mark** |
| **C4** | **P2** | **P3** | **A2** |
| Mini Project including Report and Presentation | Group-based, moderately complex electrical circuit building for practical application with report writing and presentation | CO4 | 7 | 1 | 1 | 1 | 10 |

**Assessment Scheme**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Area** | **CO** | | | | **Other** | **PO Marks** | |
| **CO1** | **CO2** | **CO3** | **CO4** | **PO1** | **PO2** |
| Class Participation |  |  |  |  | 5 |  |  |
| Class Test/Quiz |  |  |  |  | 10 |  |  |
| Midterm-I Exam | 15 | 0 | 5 | 0 |  | 15 | 5 |
| Midterm-II Exam | 0 | 12 | 8 | 0 |  | 12 | 8 |
| Final Exam | 0 | 13 | 7 | 0 |  | 13 | 7 |
| Laboratory Performance and Lab Exam | 0 | 0 | 0 | 15 |  |  | 15 |
| Mini Project | 0 | 0 | 0 | 10 |  |  | 10 |
| **Total** | **15** | **25** | **20** | **25** | **15** | **40** | **45** |