Data Structures and Algorithms

Code	Credit Hours
CS- 250	3-1

Course Description

An overview of data structure concepts, arrays, stack, queues, linked lists, trees, and graphs. Discussion of various implementations of these data objects, programming styles, and run-time representations. Course also examines algorithms for sorting, searching and some graph algorithms.

Text Book:

1. Data Structures & Algorithms Using C++, Fourth or latest Edition, Nell Dale

Reference Book:

1. Adam Drozdek. Data Structures and Algorithms in C++, sixth Edition (2016)
2. T. H. Cormen, Charles E. Leiserson, R. L. Rivest, Clifford S. Introduction to Algorithms, Third Edition (2009)
3. Mark A. Weiss, Data Structures and Algorithm Analysis in C++, Fourth Edition (2013)
4. Data Structures & Algorithms Using C++, Fourth or latest Edition, John Bullinaria (2019)

Prerequisites:

CS-212 Object Oriented Programming

ASSESSMENT SYSTEM FOR THEORY

Quizzes	10%
Assignments	10%
Mid Semester Exam	30%
End Semester Exam	50%

ASSESSMENT SYSTEM FOR LAB

Quizzes	10% - 15%
Assignments	5% - 10%
Lab Work and Report	70-80%
Lab ESE/Viva	20-30%

Teaching Plan

Week No	Topic	Learning Outcomes
1	Introduction	Introduction to Data Structures and Algorithms
2	Linear Data Structures	Array, Linked List, Singly Linked List
3	Linear Data Structures	Doubly Linked List, Circular Linked List
4	Linear Data Structures	Stacks, Queue, Priority Queue
5	Binary Data Structures	Introduction to Trees, Binary Search Trees
6	Binary Data Structures	Binary Search Tree Operations and Traversal
7	Binary Data Structures	AVL Trees
8	Binary Data Structures	Binary Heaps
	MID TERM IN WEEK 9	
10	Algorithms	Sorting Algorithms I
11	Algorithms	Sorting Algorithms II
12	Algorithms	Introduction to Graphs
13	Algorithms	Search Operations
14	Algorithms	Hash Tables
15	Algorithms	Recursion
16	Algorithms	Spanning Trees, Shortest Paths
17	Algorithms	Concept in Running Time Complexity, Function Growth
	ESE in WEEK 18	

Practical:

Experiment No	Description
1	Implementation of pointers and dynamic memory allocation
2	Practice the concept of version control and test cases
3	Working with Multi-dimensional arrays
4	Implementation of linked list with its operations
5	Use knowledge of linked lists to implement a small functionality.
6	Implementation of stacks and queues in different problems
7	Execution of a code to represent the social network
8	Implementation of three Sorting Algorithms and compare them
9	Concepts of Recursion, take a program using abstract stack and solve a popular puzzle
10	Implementation of Merge sort and Radix Sort
11	Implementation of Quick Sort
12	Applied Data Structures: ChatBots Lab Activity or Bloom Filter, etc
13	Implementation of binary heap (min heap)
14	Implementation of Hash tables
15	Open Ended Lab
16	Project