COURSE CODE: CS-250

COURSE NAME: **Data Structures and Algorithms**

CREDIT HOURS: Theory = 03   Practical = 01   Total = 04

CONTACT HOURS: Theory = 48   Practical = 48   Total = 96

PREREQUISITE: None

MODE OF TEACHING: Instruction: 3 hours of Lecture per week (75%)
                            Lab Demonstration: 3 hours of Lab work per week (25%)

Course Description:

Introduction to abstract data structures and their implementations: lists, stacks, queues, trees, and graphs. Concept in running time complexity, function growth, and recurrences. Sorting algorithms such as insertion sort, bubble sort, selection sort, merge sort, and quick sort. Introduction to trees, binary trees, binary search tree operations. Introduction to graphs, depth first search and breadth first search, shortest paths, and topological sort.

TOPICS COVERED:

Week	Topic
1	C++ Programming Review
2	Linked lists
3	Introduction to Arrays, Stacks, and Queues
4	Applications of Stacks
5	Trees (Binary Trees)
6	AVL Trees, Hash Tables
7	Graphs
8	Run time complexity, function growth
9	**Mid Semester Exam**
10	Linear Time Sorting, Recursion
11	Merge sort

12	Quick Sort, Radix Sort
13	Priority Queues
14	Topological Sort
15	Minimum Spanning Tree
16	Shortest Path Algorithm
17	Greedy Algorithms
18	**End Semester Exam**

Lab/Practical:

Week	Practical
1	Implementation of pointers and dynamic memory allocation
2	Practice the concept of version control and test cases
3	Implementation of linked list with its operations
4	Use knowledge of linked lists to implement a small functionality
5	Implementation of stacks and queues in different problems
6	Implementation of Hash tables
7	Execution of a code to represent the social network
8	Implementation of three Sorting Algorithms and compare them
9	**Mid Semester Exam**
10	Concepts of Recursion, take a program using abstract stack and solve a popular puzzle
11	Implementation of Merge sort and Radix Sort
12	Implementation of Quick Sort
13	Applied Data Structures: ChatBots Lab Activity
14	Applied Data Structures: ChatBots Lab Activity
15	Implementation of binary heap (min heap)
16	Implementation of binary heap (min heap)
17	Applied Algorithms: Large Scale Search
18	**End Semester Exam**

Tools / Software Requirement: VC++ using MS Visual Studio

Text and Material:

1. Wisnu Anggoro. C++ Data Structures and Algorithms, 2018 (ISBN: 9781788835213)
2. T. H. Cormen, Charles E. Leiserson, R. L. Rivest,. Introduction to Algorithms, Third Edition
3. Mark A. Weiss, Data Structures and Algorithm Analysis in C++, Third Edition
4. https://www.hackerrank.com/domains/data-structures
5. https://www.hackerrank.com/domains/algorithms
6. https://www.geeksforgeeks.org/data-structures/

ASSESMENT SYSTEM:

Theoretical/Instruction	100%
Assignments	10%
Quizzes	15%
Mid Semester Exam	25%
End Semester Exam	50%

Practical Work	100%
Lab Work	70%
Lab Exam/Projects	30%