Data Structure and Algorithms

1.1 Course Number: CS211

1.2 Contact Hours 3-0-2 Credits: 11

1.3 Semester-offered: 3

1.4 Prerequisite:

1.5 Syllabus Committee Member:

2. **Objective:** - The course will provide the basic and fundamental knowledge on various data structures concepts with their algorithms for solving different problems in Computer Science.

3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-topic	Lectures
1	Introduction	Basic concepts; Mathematical Background, Algorithms, Complexity Analysis; Arrays: one dimensional, multi-dimensional, Sparse Matrix, Elementary Operations	8
2	Stack and Queue	Stacks: Representation, elementary operations and applications such as infix to postfix, postfix evaluation, parenthesis matching; Queues: Simple queue, circular queue, dequeue, elementary operations and applications	8
3	Linked lists	Linear, circular and doubly linked lists, elementary operations and applications such as polynomial manipulation	8
4	Trees and Graphs	Binary tree representation, tree traversal, complete binary tree, heap, binary search tree, height balanced trees like AVL tree and 2-3 tree, tries, B-tree, other operations and applications of trees, Graphs representation, Adjacency list, graph traversal, path matrix, connected components, DAG, topological sort, Spanning tree;	10
5	Sorting and Searching	Sorting: Selection sort, bubble sort, quick sort, merge sort, heap sort, Radix sort; Searching: linear and binary search; Hashing: hash tables, hash functions, and open addressing	8
		Total	**42**

4. **Readings**

4.1 Textbook:

1. *J. P. Tremblay and P. G. Sorenson, "An Introduction to Data Structures with Application", TMH*
2. *Ellis Horowitz and SartajSahni, "Fundamentals of Data Structures"*
3. *Seymour Lipschutz, "Data Structures with C (Schaum's Outline Series)"*

4.2 Reference books:

1. *Cormen, Leiserson, Rivest and Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2010*

5 Outcome of the Course: Enhance the ability to understand different data structure and algorithm approaches for organizing data in a computer so that it can be used effectively