**Advanced Data Structure**

**Syllabus**

**Unit 1: Review of Basic Concepts**

Abstract data type, Data Structure, Algorithm, Asymptotic notations: time and space complexity, time analysis of recursive algorithms, amortized analysis, Recurrence relation: Master theorem, recursion tree, substitution method.[4HRS]

**Unit 2: Search trees**

Binary search tree, Balanced Binary search trees-(AVL trees, red-black tree, splay trees), Multi-way search trees-(B-trees, 2-3 trees), specialized search trees-(treaps, skip list), Multidimensional search trees-(K-D trees, segment trees). [8HRS]

**Unit 3: Heaps**

Overview, Leftist heap, skew Heap, Binomial Heap, Fibonacci Heap, Applications-(Priority Queue, Graph algorithms, Huffman coding) [7 HRS]

**Unit 4: Data structures for strings**

Introduction to string data structures, Tries, Compressed Tries, Suffix Trees, Suffix Arrays, Applications-(Search Engines, Bioinformatics, Pattern Matching: KMP algorithm) [7 HRS]

**Unit 5: Hash Table**

Introduction, Internal working of Hashing, Collision resolution techniques, Hash functions, Load factor and resizing, Applications [7 HRS]

**Unit 6: Advanced Graph and problems**

Disjoint set union problem, Maximal flow problem: Ford Fulkerson Algorithm, Shortest path problem- (Dijkstra algorithm, Floyd Warshall Algorithm), Hamiltonian Path and circuit problem, Introduction to Hypergraphs, Applications-Social Network Analysis, A\* for AI path finding) [7 HRS]