Computer Science Paper-I
Data Structures and Algorithms-II
[CORE COURSE]

Semester – IV	Credits: 2	Subject Code: BS42101	Lectures: 48

Course Outcomes:

At the end of this course, the learner will be able to:

- Illustrate different methods of organizing the large amount of data
- Summarize well-organized data structures in solving various problems
- Compare and contrast the usage of various data structures in problem solving
- Demonstrate algorithms to solve problems using appropriate data structures

Unit 1: Algorithm Design Techniques	**6**
• Brute-force or exhaustive search • Divide and Conquer • Greedy Algorithms • Dynamic Programming • Backtracking	

Unit 2: Tree	**10**

• Concept and Terminologies
• Types of Binary trees -Binary tree, skewed tree, strictly binary tree, complete binary tree, expression tree, binary search tree, Heap
• Representation –Static and Dynamic
• Implementation and Operations on Binary Search Tree -Create, Insert, Delete, Search, Tree traversals–preorder, inorder,postorder(recursive implementation), Level-order traversal using queue, Counting leaf, non-leaf ,counting nodes with degree 1 ,counting nodes with degree 2 and total nodes, Copy, Mirror.
• Applications of trees
  ○ Heap sort, implementation
  ○ Huffman encoding(implementation using priority queue)	

Unit 3: Efficient Search Trees	**6**
• Terminology: Balanced trees -AVL Trees, Red Black tree, splay tree, • Lexical search tree -Trie • AVL Tree-concept and rotations • Red Black trees-concept, insertion and deletion. • Multi-way search tree-B and B+ tree -Insertion, Deletion • Binary Index Tree and Segment Tree	

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Unit 4: Graph	10

• Concept and terminologies
• Graph Representation –Adjacency matrix, Adjacency list, Inverse Adjacency list, Adjacency multilist
• Graph Traversals –Breadth First Search and Depth First Search (with implementation)
• Applications of graph
  ○ Topological sorting
  ○ Minimal Spanning Trees (Prim's and Kruskal's algorithm)
  ○ Single source shortest path -Dijkstra's algorithm
  ○ All pairs shortest path -Floyd Warshall algorithm	

Unit 5: Hash Table	4
• Concept of hashing • Terminologies –Hash table, Hash function, Bucket, Hash address, collision, synonym, overflow etc. • Properties of good hash function • Hash functions : division function, MID square , folding methods	

***Contact Hours:12**

Recommended Books:	
• Debasis S.(2009).*Classic Data Structures* . Prentice Hall India Pvt. Ltd. • Horowitz E., Sahni S.,Anderson-Freed s. (2008).*Fundamentals of Data Structures in C*. Universities Press. • Kamthane A.N.(2009). *Introduction to Data Structures in C*.Pearson Education. • Wirth N. (1976).*Algorithms and Data Structures.* Pearson Education.	

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