St. Mira's College For Girls, Pune
(S.Y.B.Sc(C.S) 2021-2024)

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
    o Heap sort, implementation
    o 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	

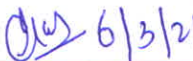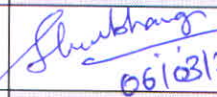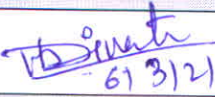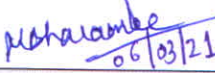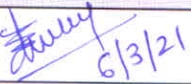| Unit 5: Hash Table	4
- Concept of hashing - Terminologies –Hash table, Hash function, Bucket, Hash address, collision, synonym, overflow etc. - Properties of good hash function - Hash functions : division function, MID square , folding methods	
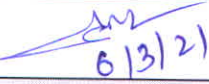
*Contact Hours:12

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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