

M.Tech(IT) : First Semester
Paper Code : MT13
Paper Name : Algorithm Analysis and Design

Syllabus

1. Basics of Algorithms and data types: - Algorithms, Abstract Data Type, The Running Times Of a Program, Use of the Big-Oh, small o, Big-omega and small omega notation, Inequalities involving such notation: data structures like linked lists, Basic algorithms like quicksort, depth and breadth first search in graphs.

2. Algorithms Analysis Techniques and Design technique: - Efficiency of algorithms, Analysis of recursive programs, Solving recurrence equation, Divide and conquer algorithms, Dynamic programming, Greedy algorithm, Prim's algorithm, Kruskal's algorithm, Dijkstra's method, Backtracking.

3. Trees and Sorting: - Basic terminology, Implementation of tree, An Array Representation of Trees, Representation of Trees by List of Children, Binary trees, Deterministic selection and sorting, Optimality of algorithms for sorting and selection, Randomized algorithms like randomized quick sort, and expected linear time randomized selection.

4. Algorithms for External Storage: - A Model of External Computation, External sorting, Characteristics of External Sorting, Criteria for Developing an External Sorting Algorithm, Important Uses of External Sorting, Merge Sort--A Digression, Top-Down Strategy, Bottom-Up Strategy, Storing Information in Files, Hashed Files, Indexed Files

5. Memory Management: - The Issues in Memory, Garbage Collection Algorithms For Equal-Sized Block, Collection in Place, Buddy system, Distribution of blocks, Allocation blocks, Returning blocks to available storage, Storage compaction and Compaction problem

6. NP Complete Problem: - Introduction to NP Problem, Polynomial-time, Abstract Problems, Encoding, NP-Completeness and Reducibility, NP-Completeness, Circuit Satisfiability, NP-Complete Problems, The Vertex-cover Problem, The Subset-sum Problem, The Hamiltonian-cycle Problem, The Traveling-salesman Problem.

7. Use of Amortization in Algorithm Analysis:- Simple examples illustrating Amortization like the Binary Counter, Amortized Analysis of Splaying, Amortized Analysis of Costs in Batched Insertions/ Deletions in 2-4 trees/ Red-Black Trees.

Reference Books:-

- 1) Thomas H. Cormen, Charles E. Leiserson and Ronald. L. Rivest, "Introduction to Algorithms", Prentice Hall of India.
- 2) Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "The Design and Analysis of Computer Algorithms", Addison-Wesley.