Design and Analysis of Algorithms

Semester I	Subject Code: MS11902	

Learning Outcomes:

After completion of this subject, the student shall be able to:

- Understand Basic Algorithm Analysis techniques and the use asymptotic notation
- Understand the use of data structures in improving algorithm performance
- The use of different paradigms of problem solving will be used to illustrate clever and efficient ways to solve a given problem
- Apply the algorithms and design techniques to solve problems
- Analyze the complexities of various problems in different domains

Design and Analysis of Algorithms

Semester I	Subject Code: MS11902	Lectures: 60

Objectives:

The syllabus aims in equipping students with,

- Basic Algorithm Analysis techniques and understand the use of asymptotic notation
- Understand different design strategies
- Understand the use of data structures in improving algorithm performance
- Understand classical problem and solutions
- Learn a variety of useful algorithms
- Understand classification of problems

Unit 1: Analysis	**6**
• Algorithm definition, space complexity, time complexity, worst case –best case –average case complexity, asymptotic notation	6
• Sorting algorithms (insertion sort, heap sort) ,recursive algorithms (Tower of Hanoi , Permutations).	

Unit 2: Design strategies	**8**
• Divide and conquer-control abstraction, ternary search, Strassen's matrix (2X2)	4
• Transform and conquer:- Horner's Rule and Binary Exponentiation – Problem Reduction	4

BOS Members:

Prof. Seema Chowhan (Subject Expert)

Prof. M.B. Lonare (Subject Expert)

Ms. Shilpa Khadilkar (Subject Expert)

Ms Anuradha Bhamre (Industry Expert)

Ms Aishwarya Kaliyiluvila (Alumni)

Prof. Ashwini Kulkarni (Chairman)

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Unit 3: Greedy method	8
• Knapsack problem • Job sequencing with deadlines • Minimum-cost spanning trees • Kruskal and Prim's algorithm	

Unit 4: Dynamic programming	10
• Matrix chain multiplication • Single source shortest paths • Bellman- ford algorithm • All pairs shortest path • Longest common subsequence • String editing • 0/1 knapsack problem • Traveling salesperson problem. • Multistage Graphs	
Unit 5: Backtracking	4
• General method • 8 Queen's problem • Sum of subsets problem • Graph coloring problem • Hamiltonian cycle	
Unit 6: Branch and Bound Technique	4
• FIFO, LIFO • LCBB • TSP problem • 0/1 knapsack problem	
Unit 7: Problem classification	5

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• Nondeterministic algorithm • The class of P,NP, NP-hard and NP- Complete problems • Significance of Cook's theorem • NCDP,M-chromatic • Halting Problem	
Unit 8: Parallel, Concurrent and Distributed Algorithm	**3**
• Parallel Algorithm-Primes • Concurrent Algorithm • Distributed Algorithm-Floyds-Warshall	

***Contact hours – 12 hours**

Reference Books:

1. Ellis Horowitz, Sartaj Sahni & Sanguthevar Rajasekaran, *Computer Algorithms*, Galgotia.
2. T. Cormen, C. Leiserson, & R. Rivest, *Algorithms*, MIT Press, 1990 1
3. A. Aho, J. Hopcroft, & J. Ullman, *The Design and Analysis of Computer Algorithms*, Addison Wesley, 1974
4. Donald Knuth, *The Art of Computer Programming* (3 vols., various editions, 1973-81), Addison Wesley

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