M.Sc. Computer Science Syllabus First Year (2018-23)

Design and Analysis of Algorithms

Semester I	Subject Code: MS11804	Lectures: 60

Objectives:

The syllabus aims in equipping students with,

- Basic Algorithm Analysis techniques and understand the use o 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 o problems

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

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)

Prof. Alka Kalhapure (Internal Faculty)

Prof. Swati Pulate (Internal Faculty)

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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	

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Unit 6: Branch and Bound Technique	**4**
• FIFO, LIFO • LCBB • TSP problem • 0/1 knapsack problem	
Unit 7: Problem classification	**5**
• 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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