



# SYMBIOSIS INTERNATIONAL (DEEMED UNIVERSITY)

(Established under section 3 of the UGC Act, 1956)

Re-accredited by NAAC with 'A++' Grade | Awarded Category - I by UGC

Founder: Prof. Dr. S. B. Mujumdar, M. Sc., Ph. D. (Awarded Padma Bhushan and Padma Shri by President of India)

**Course Name:** Design and Analysis of Algorithms

**Course Code:** T7909

**Faculty:** Engineering

**Course Credit:** 3

**Course Level:** 4

**Sub-Committee (Specialization):** Computer Science

**Learning Objectives:**

1. Analyze the complexity of an algorithm and explain algorithm analysis concepts like asymptotic, amortized analysis etc to provide a rough classification of an algorithm.
2. Devise, validate and analyze algorithms using Divide and Conquer and greedy strategy.
3. Develop, design and analyze algorithms using Dynamic Programming strategy.
4. Develop, design and analyze backtracking and branch and bound algorithms etc.
5. Explain solvability of algorithms and categorize NP-Hard and NP-Complete Problems.
6. Differentiate and compare various algorithmic design strategies.

**Books**

**Recommended:**

Book	Author	Publisher
SObject Oriented Data Structures using C++ , K.S. Easwarakumar, Vikas Publishing House pvt. Ltd., 2000		
1. "Introduction to Algorithms", T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, Prentice Hall of India Pvt. Ltd., Second Edition, 2003.		
1. Jadoon S. , Solehria S.F., Rehman S. and Jan H., SDesign and Analysis of Optimized Selection Sort Algorithm ,International Journal of Electric & Computer Sciences IJECS IJENS Vol: 11 No: 01 , 113201-5454IJECS-IJENS © February 2011 IJENS.		
2. "The Design and Analysis of Computer Algorithms", Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Pearson Education, Fourth Edition, 1999.		
2. Li N., Jennifer C. , and Sha L. , Design and Analysis of an MST-Based Topology Control Algorithm ,IEEE INFOCOM 2003		
3. Computer Algorithms/C++ , Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Universities Press, Second Edition, 2007.		

**Course Outline:**

Sr. No.	Topic	Actual Teaching Hours	Contact Hours Equivalence

1	<b>Introduction</b> Analysis of algorithm efficiency: - analysis framework asymptotic notations analysis of non-recursive and recursive algorithms, amortized analysis, writing characteristic polynomial equations, solving recurrence equations, proof techniques: by contradiction, by mathematical induction	10	10
2	<b>Divide and Conquer and Greedy Method</b> Characteristics, analysis methodology, merge sort, quick sort, binary search, large integer multiplication. General characteristics of greedy algorithms, Prim "s algorithm, Kruskal "s algorithm, Dijkstra "s algorithm, Heap Sort, job sequencing with deadlines/activity selection problem, optimal merge patterns, Knapsack problem	14	14
3	<b>Dynamic Programming</b> General strategy, principle of optimality Warshall "s and Floyd "s algorithm, optimal binary search trees, Knapsack problem, Travelling Salesperson problem, flow shop scheduling	13	13
4	<b>Backtracking and Branch- Bound</b> General strategy, generic recursive backtracking algorithm, iterative backtracking method, 8-queens problem, graph coloring, Hamiltonian cycle, Knapsack Problem.0/1 knapsack problem LC branch and bound and FIFO branch bound solution	5	5
5	<b>NP-Hard And NP-Complete Problems</b> Algorithms, Non-Deterministic Polynomial time (NP) decision problems, Cooks theorem, NP-complete problems-satisfiability problem.	3	3
<b>Total</b>		<b>45</b>	<b>45</b>

**Pre Requisites:**

Knowledge of programming languages like C, C++ is desirable

**Evaluation:**

Continuous Assessment 1. Essential a) Assignments b) Seminars c) Tests  
. Optional a) Quizzes b) Viva-voce c) Mini Project  
End Semester Examination a) Written Exam

**Pedagogy:**

1. Interactive classroom teaching and discussions
2. Practical "s using software tools like C++, Java etc
3. Brainstorming sessions
4. Seminars
5. Project based learning