

ADVANCED ALGORITHMS – SYLLABUS

Text Books :

1. Introduction to Algorithms : T.H. Cormen, C.E. Leiserson and R.L. Rivest
2. Fundamentals of Algorithmics : G.Brassard and P.Bratley
3. Approximation Algorithms: Vijay V.Vazirani
4. Randomized Algorithms: R. Motwani and P.Raghavan
5. Reference book: Algorithmics :The spirit of computing: D.Harel

Design Paradigms: Overview :

Overview of Divide and Conquer, Greedy and Dynamic Programming strategies. Basic search and traversal techniques for graphs, Backtracking, Branch and Bound.

Max Flow Problem

String Matching

Introduction to string-matching problem, Naïve algorithm, Rabin Karp, Knuth Morris Pratt, Boyer-Moore algorithms and complexity analysis.

Theory of NP- Hard and NP-Complete Problems.

P, NP and NP-Complete complexity classes; A few NP-Completeness proofs; Other complexity classes.

Approximation Algorithms

Introduction, Combinatorial Optimization, approximation factor, PTAS, FPTAS, Approximation algorithms for vertex cover, set cover, TSP, knapsack, bin packing, subset-sum problem etc. Analysis of the expected time complexity of the algorithms.

Parallel Algorithms

Introduction, Models, speedup and efficiency, Some basic techniques, Examples from graph theory, sorting, Parallel sorting networks. Parallel algorithms and their parallel time and processors complexity.

Probabilistic Algorithms & Randomized Algorithms

Numerical probabilistic algorithms, Las Vegas and Monte Carlo algorithms, Game-theoretic techniques, Applications on graph problems

Evaluation:

Internal (40 Marks):

Best of Minor 1 & Minor 2 (20 Marks)

Minor 3: Assignments : (Evaluated for 20 Marks)

Major Examination : 60 Marks

Tentative Schedule for Advanced Algorithms for Jan- April 2016

Date		Topic	Remarks
January	11	Overview: Algorithmics	
	12	Max-Flow Problem	
	18 -31		No Classes held
February	2	String-matching -1	Assignment-1
	8	String-matching -2	
	9	NP-Complete Problem: Vertex cover and Clique	
	15	Approximation Algorithm for Vertex Cover	Assignment-2
	16	Set-covering problem	
	22	Minor-1	
	23	Approximation Algorithms	
	29	Approximation Algorithms	
	7	Approximation Algorithms (LP Duality)	
	8	Approximation Algorithms (LP Duality)	
March	14	Parallel Algorithms	A3- Research Paper Assignment (Due by 20 th Mar)
	15	Parallel Algorithms	
	21	Minor-2 Parallel Algorithms	<u>Rescheduled on req</u>
	22	Minor-2	
	28	Randomized Algorithms	
	29	Randomized Algorithms	
	4	Student Presentations	
	5	Student Presentations	
April	11		
	12		