DURGAPUR INSTITUTE OF ADVANCED TECHNOLOGY AND MANAGEMENT
(Affiliated to MAKAUT and recognized by AICTE, New Delhi)

Subject Code: IT-501 Subject Name:DESIGN & ANALYSIS OF ALGORITHM
Semester : V Year: 3RD Session : 2018
Branch Name: Information Technology Faculty Name: SANKAR MUKHERJEE
Assistant Professor
CSE Department

LESSION PLAN

Course Objectives:

Upon completion of this course, students will be able to do the following:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Course Outcome:

CO1:- Argue the correctness of algorithms using inductive proofs and invariants.

CO2:- Analyze worst-case running times of algorithms using asymptotic analysis.

CO3:- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.

CO4:- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.

CO5:- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.

CO6:- Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.

CO7: Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Recite algorithms that employ randomization. Explain the difference between a randomized algorithm and an algorithm with probabilistic inputs.

List of books consulted (prescribed in the syllabus book):

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, “Introduction to Algorithms”
2. A. Aho, J.Hopcroft and J.Ullman “The Design and Analysis of Algorithms”
3. D.E.Knuth “The Art of Computer Programming”, Vol. 3
4. Jon Kleiberg and Eva Tardos, "Algorithm Design"

Additional books referred (those not mentioned in syllabus book):

1. K.Mehlhorn , “Data Structures and Algorithms” - Vol. I & Vol. 2.
2. S.Baase “Computer Algorithms”
3. E.Horowitz and Shani “Fundamentals of Computer Algorithms”
4. E.M.Reingold, J.Nievergelt and N.Deo- “Combinational Algorithms- Theory and Practice”, Prentice Hall, 1997

Period	Unit	Topic
1	Complexity Analysis	Algorithm specifications, Pseudo Code conventions, recursive algorithms
2		Performance analysis, space complexity, Time complexity
3	Divide and Conquer	Binary Search, Finding of Max-Min and their complexity
4		Merge Sort, Quick Sort and their complexity
5		Heap Sort and its complexity
6	Dynamic Programming	Matrix Chain Manipulation
7		Single source shortest path
8		All pair shortest paths
9	Backtracking	8 queens problem
10		Graph coloring problem
11	Greedy Method	Knapsack problem
12		Job sequencing with deadlines
13		Minimum cost spanning tree by Prim's and Kruskal's algorithm
14	Lower Bound Theory	O(nlgn) bound for comparison sort
15	Disjoint set manipulation	Set manipulation algorithm like UNION-FIND
16		union by rank
17	Graph traversal algorithm	Breadth First Search(BFS) and Depth First Search(DFS)
18		Classification of edges - tree, forward, back and cross edges – complexity and comparison
19	String matching problem	string matching using finite automata
20		Knuth, Morris, Pratt (KMP) algorithm with their complexities.
21	Amortized Analysis	Aggregate, Accounting, and Potential Method contd.
22		Aggregate, Accounting, and Potential Method contd..
23		Aggregate, Accounting, and Potential Method
24	Network Flow	Ford Fulkerson algorithm
25		Max-Flow Min-Cut theorem
26		Exercise based on network Flow
27	Matrix Manipulation Algorithm	Strassen's matrix manipulation algorithm
28		application of matrix multiplication to solution of simultaneous linear equations using LUP decomposition
29		Inversion of matrix and Boolean matrix multiplication
30	Notion of NP-completeness	P class, NP class, NP hard class, NP complete class – their interrelationship
31		Satisfiability problem, Cook's theorem (Statement only)
32		Clique decision problem
33	Approximation Algorithms	Necessity of approximation scheme, performance guarantee
34		polynomial time approximation schemes, vertex cover problem
35		travelling salesman problem
36		Question Paper Discussion

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