

5. A First course in Probability, Sheldon Ross, Pearson

6. Introduction to Stochastic Processes, Paul G. Hoel, Sidney C. Port & Charles J. Stone  
University Bookstall, New Delhi (Houghton Pliffin Company, 1972)

7. Introduction to Probability Models, Sheldon Ross, Elsevier India

<b>Subject Name: Design &amp; Analysis of Algorithms</b>					
<b>Paper Code: CSEN 2201</b>					
<b>Contact Hours per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

## **Module I**

### **1. Algorithm Analysis (7 Lectures)**

Time and space complexity. Asymptotic Notations and their significance.

Asymptotic Analysis. Finding time complexity of well known algorithms like-mergesort, heapsort, quicksort. Randomized Quicksort. Average Case Analysis. Asymptotic solution to recurrences. Master Theorem.

## **2. Medians and Order Statistics. (3 Lectures)**

### **Module II**

#### **3. Dynamic Programming (6 Lectures)**

Basic method, use, Examples: Matrix-chain multiplication, All pair shortest paths, LCS Problem. Optimal Binary Search Trees: Algorithm and speedup using quadrangle inequality.

#### **4. Greedy Method (6 Lectures)**

Elements of the greedy strategy. Huffman codes. Matroids and the greedy methods. Minimum cost spanning trees: Prim's and Kruskal's algorithms and their correctness proofs.

### **Module III**

#### **5. Amortized Analysis (2 Lectures)**

Aggregate, Accounting and Potential methods.

#### **6. Disjoint Set Manipulation (2 Lectures)**

UNION-FIND with union by rank, Path compression.

#### **7. Graphs Algorithms (6 Lectures)**

Topological Sorting. Strongly Connected Components. Shortest Path Algorithms: Dijkstra's and Bellman Ford with correctness proofs.

### **Module IV**

#### **8. Lower Bound Theory (1 Lecture)**

Bounds on sorting and searching techniques.

#### **9. NP-completeness (4 Lectures)**

P class, NP-hard class, NP-complete class. Relative hardness of problems and polynomial time reductions. Satisfiability problem, Vertex Cover Problem, Independent Sets, Clique Decision Problem.

#### **10. Approximation algorithms (3 Lectures)**

Necessity of approximation scheme, performance guarantee. Approximation algorithms for 0/1 knapsack, vertex cover, TSP. Polynomial time approximation schemes: 0/1 knapsack problem.

### **TEXTBOOKS:**

1. Introduction To Algorithms by Cormen, Leiserson, Rivest and Stein. Third Edition, 2009. Prentice Hall.
2. Algorithm Design by Jon Kleinberg and Eva Tardos. Addison Wesley, 2005.

### **REFERENCE:**

3. Computer Algorithms: Introduction to Design and Analysis by Sarah Baeer and Allen van Gelder. 3rd Edition, Addison Wesley.