3343 Analysis of Algorithms – Fall 2007

9/18/07

Schedule

(subject to change)

Date	Material
Tu 9/18	**Recursion trees and induction (+)** Guess solution of recursions using recursion trees and prove the solutions using induction (= "substitution method") *Homework 3 assigned*
Th 9/20	**Strassen's matrix multiplication (Ch. 4.5)** Fast matrix multiplication using divide-and-conquer
Tu 9/25	**Quicksort (Ch. 4.2)** Quicksort, best-case and worst-case runtimes, randomized quicksort. *Homework 3 due; homework 4 assigned*
Th 9/27	**Balanced search trees (Ch. 6.3)** Red-black trees or AVL trees; rotations; abstract data types, ADT dictionary
Tu 10/2	**Balanced search trees (Ch. 6.3)** (2,3)-trees *Homework 4 due*
Th 10/4	**Test 1** Material until 9/25 (inclusive)
Tu 10/9	**Heapsort (Ch. 6.4)** Heaps, heap-order property, priority queues. Heapsort. *Homework 5 assigned*
Th 10/11	**Sorting (Ch. 7.1 and 11.2)** Decision trees, lower $\Omega(n \log n)$ bound for comparison sorts, counting sort
Tu 10/16	**Dynamic programming (Ch. 8.1 +)** Fibonacci, binomial coefficient; General outline of dynamic programming: Optimal substructure (recurrence), overlapping subproblems, fill table bottom-up or by memoization; LCS (Longest common subsequence) *Homework 5 due; homework 6 assigned*
Th 10/18	**Dynamic programming (Ch. 8.4 +)** LCS; Knapsack
Tu 10/23	**Greedy algorithms (+)** Making change, fractional knapsack. *Homework 6 due; homework 7 assigned*
Th 10/25	**Elementary graph algorithms (Ch. 5.2)** Representations of graphs, breadth-first search (BFS), depth-first search (DFS)
Tu 10/30	**More elementary graph algorithms (Ch. 5.3)** Strongly connected components; Topological sort *Homework 7 due; homework 8 assigned*
Th 11/1	**Minimum Spanning Trees (Ch. 9.1)** Prim's algorithm (grows single tree)
Tu 11/6	**Single-source shortest paths (Ch. 9.3)** Optimal substructure, relaxation step; Dijkstra's algorithm (only for non-negative edge weights), predecessor tree (shortest path tree) *Homework 8 due*
Th 11/8	**Test 2** Material from 9/27 until 10/30 (inclusive)

Date	Material
Tu 11/13	**P and NP (Ch. 11.3 +)** Decision problems, definition of classes P and NP, polynomial-time reductions *Homework 9 assigned*
Th 11/15	**P and NP (Ch. 11.3 +)** NP-hardness, NP-completeness; Show that problems are NP-complete by reducing from other problems; TSP, Clique, Independent Set, Vertex Cover, Hamilton Path, Hamilton Circuit
Tu 11/20	**P and NP (+)** More examples of NP-complete problems and reductions. *Homework 9 due; homework 10 assigned*
Th 11/22	**Thanksgiving holiday**
Tu 11/27	**Approximation algorithms (Ch. 12.3)** Approximation algorithms for NP-hard problems. Tree-walk for TSP.
Th 11/29	**Review for final exam** The final exam will be comprehensive and cover all topics that have been covered in class. *Homework 10 due*

Chapter numbers refer to Levitin's book. "+" indicates additional material.

The final exam will take place on Friday December 7, 10:30am-1pm in the classroom.