3343 Analysis of Algorithms – Fall 10

8/23/10

Schedule

(subject to change)

Date	Material
Th 8/26	**Analyzing algorithms (Ch. 2.2)** Best case and worst case runtimes; insertion sort, incremental algorithm
Tu 8/31	**Asymptotic notation (Ch. 3, Ch. A)** O, Ω, Θ, o, limit-theorem; runtime for code-snippets *Homework 1 assigned* **Recitation: Homework 1**
Th 9/2	**Asymptotic notation (Ch. 3, Ch. A)** O, Ω, Θ, o, limit-theorem; runtime for code-snippets
Tu 9/7	**Heapsort (Ch. 6)** Abstract data types (ADT), priority queue, heap, heapsort, linear-time buildheap *Homework 1 due; homework 2 assigned* **Recitation: Homework 2**
Th 9/9	**Recursion trees and induction (+)** Recursive algorithms. Guess solution of recurrence using recursion trees and prove the correctness of the solution using induction.
Tu 9/14	**Divide-and-conquer (Ch. 2.3) and recurrences (Ch. 4.3, 4.4)** Divide-and-conquer, merge sort, binary search; Runtime recurrences. Big-Oh induction (substitution method) *Homework 2 due; homework 3 assigned* **Recitation: Homework 3**
Th 9/16	**Master theorem (Ch. 4.5)** Use of master theorem to solve recurrences.
Tu 9/21	**More divide-and-conquer (Ch. 31.6 pages 956–957; 4.2)** Repeated squaring for exponentiation, Strassen's matrix multiplication. *Homework 3 due; homework 4 assigned; project 1 assigned* **Recitation: Homework 4**
Th 9/23	**Probability, random variables and expected values (Ch. C.2, C.3)** Probability, random variables, expected values.
Tu 9/28	**Randomized algorithms (Ch. 5.1–5.3)** Hiring problem; Expected runtime analysis. *Homework 4 due* **Recitation: Review test 1**
Th 9/30	**Test 1** Material until 9/21 (inclusive)
Tu 10/5	**Quicksort (Ch. 7.1–7.4)** Quicksort, best-case and worst-case runtimes, randomized quicksort. *Homework 5 assigned* **Recitation: Homework 5**
Th 10/7	**Sorting (Ch. 8.1, 8.2, 8.3)** Decision trees, lower $\Omega(n \log n)$ bound for comparison sorts, counting sort, radix sort
Tu 10/12	**Sorting (Ch. 8.1, 8.2, 8.3)** Decision trees, lower $\Omega(n \log n)$ bound for comparison sorts, counting sort, radix sort *Homework 5 due; homework 6 assigned* **Recitation: Homework 6**
Th 10/14	**Order statistics (Ch. 9)** Order statistics (find i-th smallest element); Randomized selection, deterministic selection in linear time
Tu 10/19	**Red-black trees (Ch. 13.1, 13.2, 13.3)** Red-black tree property, rotations, insertion; abstract data types, ADT dictionary *Homework 6 due; homework 7 assigned* **Recitation: Homework 7**

Date	Material
Th 10/21	**Dynamic programming (Ch. 15.4, +)** Fibonacci, binomial coefficient, LCS: fill table, then construct solution from the table.
Tu 10/26	**Dynamic programming (Ch. 15.3, 15.4., 16.2, +)** 0-1 Knapsack; general outline of dynamic programming: Optimal substructure (recurrence), overlapping subproblems, fill table bottom-up or by memoization. *Homework 7 due; homework 8 assigned; project 1 due* **Recitation: Homework 8**
Th 10/28	**Greedy algorithms (Ch. 16.2, problem 16-1 on page 402)** Greedy algorithms (greedy-choice property, optimal substructure). Making change, fractional knapsack.
Tu 11/2	**Elementary Graph Algorithms (Ch. 22.1–22.2)** Representations of graphs, breadth-first search (BFS) *Homework 8 due; project 2 assigned* **Recitation: Review test 2**
Th 11/4	**Test 2** Material from 9/23 until 10/26 (inclusive)
Tu 11/9	**Elementary Graph Algorithms (Ch. 22.3–22.4)** Depth-first search (DFS), topological sort *Homework 9 assigned* **Recitation: Homework 9**
Th 11/11	**Minimum Spanning Trees (Ch. 23)** Prim (grows single tree), Kruskal (grows forest; uses union/find data structure)
Tu 11/16	**Single-source shortest paths (Ch. 24 without 24.4)** Optimal substructure, triangle inequality, relaxation step; Dijkstra (only for non-negative edge weights), predecessor tree (shortest path tree); Bellman-Ford, detection of negative-weight cycles; Shortest paths in a DAG *Homework 9 due; homework 10 assigned* **Recitation: Homework 10**
Th 11/18	**All-Pairs Shortest Paths (Ch. 25.2)** Dynamic programming: Floyd-Warshall Online teaching evaluations, first day
Tu 11/23	**P and NP (Ch. 34)** Decision problems, definition of classes P and NP, polynomial-time reductions, NP-hardness, NP-completeness; Show that problems are NP-complete by reducing from other problems *Homework 10 due; homework 11 assigned* **Recitation: Homework 11**
Th 11/25	**Thanksgiving** No class
Tu 11/30	**P and NP (Ch. 34)** TSP, Clique, Independent Set, Vertex Cover, Hamilton Path, Hamilton Circuit **Recitation: Review final exam**
We 12/1	**Drop deadline to drop with a 'W'**
Th 12/2	**Review for Final Exam** Review for final exam *Homework 11 due; project 2 due*
Su 12/5	Online teaching evaluations, last day

Chapter numbers refer to the CLRS book, 3rd edition. "+" indicates additional material.

The comprehensive final exam will be on Thursday 12/9, 10:30am – 1pm.