5633 Analysis of Algorithms – Spring 04

4/28/04

Material covered in class from 2/23/04 until 4/21/04

Week	Material
7	**Amortized analysis (Ch. 17.1, 17.2, 17.4; dynamic table slides)** Aggregate analysis (total runtime of n operations), accounting method (prepay for later operations); binary counter, dynamic tables **Red-black trees (Ch. 13.1, 13.2, 13.3)** red-black tree property, rotations, insertion; abstract data types, ADT dictionary
8	**B-trees (Ch. 18.1, 18.2)** k-ary search trees, B-tree def., height, insertion
9	**Dynamic programming (Ch. 15.2, 15.3, 15.4; slides)** Fibonacci, binomial coefficient, LCS: fill table, then construct solution from the table; matrix chain multiplication; general outline of dynamic programming: Optimal substructure (recurrence), overlapping subproblems, fill table bottom-up or by memoization.
10	**Computational Geometry (Ch. 33.2; slides)** Range trees, preprocessing time, query time, space, line sweep, line-segment intersection
11/12	**Minimum Spanning Trees (Ch. 23; slides)** Prim, Kruskal **Union-Find (Ch. 21.1, 21.2, 21.3; slides)** Operations, list implementation, tree implementation, union-by-weight / union-by rank, path compression. Ackermann function, and inverse Ackermann function α.
13	**Single-source shortest paths (Ch. 24 without 24.4; slides)** 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 **All-Pairs Shortest Paths (Ch. 25; slides)** Dynamic programming: Floyd-Warshall
14	**P and NP (Ch. 34; slides)** 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; TSP, Clique, Independent Set, Vertex Cover, Hamilton Path, Hamilton Circuit

Relevant material for the final: Everything that we covered from the first day in class until (and including) NP-completeness. This means, everything that was relevant for the midterm **plus** everything on this page.

The final will be on **Tuesday May 4** from 8:30pm until 10:45pm in the classroom.