

3343 Analysis of Algorithms – Fall 11

Schedule

(subject to change)

8/7/11

Date	Material
Th 8/25	Analyzing algorithms (Ch. 2.2) Best case and worst case runtimes; insertion sort, incremental algorithm No recitation
Tu 8/30	Asymptotic notation (Ch. 3, Ch. A) O , Ω , Θ , o , limit-theorem; runtime for code-snippets <i>Homework 1 assigned</i> Recitation: Homework 1
Th 9/1	Asymptotic notation (Ch. 3, Ch. A) O , Ω , Θ , o , limit-theorem; runtime for code-snippets Recitation: Homework 1
Tu 9/6	Heapsort (Ch. 6) Abstract data types (ADT), priority queue, heap, heapsort, linear-time buildheap <i>Homework 1 due; homework 2 assigned</i> Recitation: Homework 2
Th 9/8	Recursion trees and induction (+) Recursive algorithms. Guess solution of recurrence using recursion trees and prove the correctness of the solution using induction. Recitation: Homework 2
Tu 9/13	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) <i>Homework 2 due; homework 3 assigned</i> Recitation: Homework 3
Th 9/15	Master theorem (Ch. 4.5) Use of master theorem to solve recurrences. Recitation: Homework 3
Tu 9/20	More divide-and-conquer (Ch. 31.6 pages 956–957; 4.2) Repeated squaring for exponentiation, Strassen's matrix multiplication. <i>Homework 3 due; homework 4 assigned; project 1 assigned</i> Recitation: Homework 4
Th 9/22	Probability, random variables and expected values (Ch. C.2, C.3) Probability, random variables, expected values. Recitation: Homework 4
Tu 9/27	Randomized algorithms (Ch. 5.1–5.3) Hiring problem; Expected runtime analysis. <i>Homework 4 due; homework 5 assigned</i> Recitation: Homework 5
Th 9/29	Quicksort (Ch. 7.1–7.4) Quicksort, best-case and worst-case runtimes, randomized quicksort. Recitation: Homework 5
Tu 10/4	Sorting (Ch. 8.1, 8.2, 8.3) Decision trees, lower $\Omega(n \log n)$ bound for comparison sorts, counting sort, radix sort <i>Homework 5 due; homework 6 assigned; project 1 due</i> Recitation: Review Test 1
Th 10/6	Order statistics (Ch. 9) Order statistics (find i -th smallest element); Randomized selection, deterministic selection in linear time. Recitation: Review Test 1
Tu 10/11	Test 1 Material until 9/27 (inclusive) Recitation: Homework 6
Th 10/13	Red-black trees (Ch. 13.1, 13.2, 13.3) Red-black tree property, rotations, insertion; abstract data types, ADT dictionary Recitation: Homework 6
Tu 10/18	B-trees (Ch. 18.1, 18.2) k -ary search trees, B-tree def., height, insertion <i>Homework 6 due; homework 7 assigned; project 2 assigned</i> Recitation: Homework 7

Date	Material
Th 10/20	Dynamic programming (Ch. 15.4, +) Fibonacci, binomial coefficient, LCS: fill table, then construct solution from the table. Recitation: Homework 7
Tu 10/25	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. <i>Homework 7 due; homework 8 assigned</i> Recitation: Homework 8
Th 10/27	Greedy algorithms (Ch. 16.2, problem 16-1 on page 402) Greedy algorithms (greedy-choice property, optimal substructure). Making change, fractional knapsack. Recitation: Homework 8
Tu 11/1	Elementary Graph Algorithms (Ch. 22.1–22.2) Representations of graphs, breadth-first search (BFS) <i>Homework 8 due; homework 9 assigned; project 2 due</i> Recitation: Homework 9
Th 11/3	Elementary Graph Algorithms (Ch. 22.3–22.4) Depth-first search (DFS), topological sort Recitation: Homework 9
Tu 11/8	Minimum Spanning Trees (Ch. 23) Prim (grows single tree), Kruskal (grows forest; uses union/find data structure) <i>Homework 9 due; homework 10 assigned</i> Recitation: Review Test 2
Th 11/10	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. <i>Project 3 assigned</i> Recitation: Review Test 2
Tu 11/15	Test 2 Material from 9/23 until 10/26 (inclusive) Recitation: Homework 10
Th 11/17	All-Pairs Shortest Paths (Ch. 25.2) Dynamic programming: Floyd-Warshall Recitation: Homework 10
Tu 11/22	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 <i>Homework 10 due; homework 11 assigned</i> No recitation
Th 11/24	Thanksgiving No class
Tu 11/29	P and NP (Ch. 34) TSP, Clique, Independent Set, Vertex Cover, Hamilton Path, Hamilton Circuit Recitation: Homework 11, Review Final Exam
Th 12/1	Approximation Algorithms (Ch. 35.1 and 35.2) Constant factor approximation; Vertex cover; MST for Euclidean TSP. Recitation: Homework 11, Review Final Exam
Tu 12/6	Review for Final Exam Review for final exam <i>Homework 11 due; project 3 due</i> No recitation

Chapter numbers refer to the CLRS book, 3rd edition.

“+” indicates additional material.

The comprehensive final exam will be on Thursday 12/15, 10:30am – 1pm.