

CS 344: Design & Analysis of Computer Algorithms
Spring 2017, Sections 5-7, 4 Credits

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LECTURE: M-W 5:00-6:20 PM, LIV TIL-254

OFFICE HOURS: W 10:00-11:00 AM; W 3:00-4:00 PM

Section 5 Recitation : Monday 6:55 - 7:50 PM, LIV LSH-B117

TA: TBA **Office Hours** TBA.

Section 6 Recitation: Wednesday 6:55 - 7:50 PM, LIV LSH-B115

TA: TBA **Office Hours** TBA.

Section 7 Recitation: Wednesday 8:25 PM - 9:20 PM, LIV LSH-B267

TA: TBA **Office Hours** TBA.

Prerequisites: 198:112 Data Structures, 198:206 Introduction to Discrete Structures II

Exams (No Makeup Exams!): Midterm I: Feb 15; (Spring break: Sat March 11 - Sun March 19); Midterm II (incremental): March 27 (Last lecture: May 1); Final: TBA (cumulative).

Grading Guideline: 0.15 (HW & Quizzes) + max 0.20 MIDTERM 1 + 0.20 MIDTERM 2 + 0.45 FINAL, 0.25 MIDTERM 2 + 0.60 FINAL. (Class and recitation attendance and class participation will also be taken into account in grading.)

TOPICS: The course will cover a large subset of the following

- Methods for expressing and comparing complexity of algorithms: worst and average cases, lower bounds, and asymptotic analysis.
- Searching, sorting. Lower bounds for comparison-based sorting; binsort and radix sort.
- Divide and conquer. Fast integer multiplication; recurrences; the master theorem; mergesort; randomized median and selection algorithms; quicksort; fast matrix multiplication.
- Graph search algorithms. Graphs representations; depth first search; topological search; strongly connected components. Breadth first search and layered DAGs.
- Greedy algorithms. Spanning trees and cuts, union-find and path compression; minimum spanning tree (MST) algorithms; randomized algorithms.
- Shortest Paths (SPs) in digraphs. Single-source SPs for nonnegative edge weights; priority queues and Dijkstra's; SPs in DAGs; single-source SPs for general edge

weights.

- Dynamic programming. Paradigm of SPs in DAGs; longest increasing subsequence; (approximate) string matching; integer and (0,1) knapsack problems; chain matrix multiplication; single-pair reliable SPs, all-pairs SPs; independent sets.
- Network flows. Max flow min cut theorem; bipartite matching; Menger's theorem and disjoint dipaths. Global minimum cuts.
- Elements of NP-completeness & problem reductions.
- NP-hard problems. Approximation algorithms.

Textbook: Algorithms, Dasgupta, Papadimitriou & Vazirani, McGraw Hill, 1st Edn, 2008.

Reference: Introduction to Algorithms, Cormen, Leiserson, Rivest & Stein, McGraw Hill, 3rd Edn, 2001. (Will be placed on reserve at SERC.)