Algorithms — Fall, 2006
CS G113 — Professor G. Cooperman

Course Description:

The purpose of this course is to present the mathematical techniques used for analyzing the time and space performance of computer algorithms. Mathematical techniques are an important supplement to computer benchmarks for at least three reasons:

- The mathematical analysis depends only on a general model of computers, and is independent of particular instruction sets, clock speeds, and vendors.
- Mathematical analysis can often be done more quickly than benchmarks.
- The mathematical analysis is most accurate for large inputs — the same regime for which benchmarks are slowest.

The focus of the presentation will be on the practical application of these techniques for the design of efficient algorithms.

Faculty Information:

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Office Hours: Tuesdays and Thursdays, 1:30 - 2:30 and by appointment.

Textbook:

The textbook for the course is *Introduction to Algorithms* by T. Cormen, C. Leiserson and R. Rivest, 2nd edition, McGraw-Hill, 2001.

Exams and Grades:

There will be a midterm exam and final exam contributing 35% and 45%, respectively, to your course grade. The remainder of the grade will be based on written homework assignments (20%). In addition, there will be five significantly harder problems for extra credit during the year. Students who can solve four out of the five assignments will receive an additional 5% extra credit for their course average.

Syllabus:

Week	Topics	Reading
Sept. 7	Mathematical Preliminaries	Chapters 1–5
Sept. 14	Heapsort; Quicksort	Chapters 6–7
Sept. 21	"Dictionary" Op's; Elementary Data Structures	Section III (Intro.) and Chapter 10
Sept. 28	Hash Tables	Chapter 11
Oct. 5	Binary Search Trees	Chapter 12
Oct. 12	mid-term;Union-Find	Chapter 21
Oct. 19	Union-Find (cont.); Dynamic Programming	Chapter 15.0–15.1
Oct. 26	Dynamic Programming (cont.)	Chapter 15.2–15.4
Nov 2	Fast Matrix Multiplication and Inverse	Chapter 28.1, 28.2
Nov. 9	Fast Integer/Polynomial Multiplication & FFT	Problem 30-1 (p. 844), Ch. 30
Nov. 16	Class choice (graph algos., red-black tree, B-tree, etc.)	
Nov. 30	Class choice (external sort, etc.)	
Nov. 30	Design of algorithms (topics TBD)	
Dec. 11 – 15	Final Examination	