

CS584
Algorithms: Design and Analysis
Fall 2011

PROFESSOR: Stanley Selkow, FL147, (508)831-5449, [sms at wpi dot edu](mailto:sms@wpi.edu)

TEXT: *Introduction to Algorithms*, 3rd edition, Cormen, Leiserson, Rivest & Stein

Other sources of material include:

Graham, Knuth & Patashnik, *Concrete Mathematics, A Foundation for Computer Science*, 2nd edition, Addison Wesley. This is not a cookbook in which to seek answers. Instead it should be read to appreciate how mathematics is created.

An advanced treatment of analysis is *Analysis of Algorithms* by Hofri, Oxford University Press, 1995, with errata at <http://www.cs.wpi.edu/~hofri/errata.ps>

Sedgewick and Flajolet, *An Introduction to the Analysis of Algorithms*, Addison Wesley, 1996. A long list of errata is available at <http://www.cs.princeton.edu/~rs/AAerrata.html>

A more advanced version of the previous text is *Analytic Combinatorics* by Flajolet and Sedgewick. A free online copy is available at <http://algo.inria.fr/flajolet/Publications/AnaCombi/book.pdf>

GOALS OF COURSE: This course covers the design, analysis and proofs of correctness of algorithms. Analysis techniques include asymptotic worst case and average case, as well as amortized analysis. Average case analysis includes the development of a probability model. Techniques for proving lower bounds on complexity are discussed.

EXPECTED BACKGROUND: A solid knowledge of data structures, discrete structures and algorithms.

CLASS NOTES: Notes that I prepare for myself will be made available, but they are not complete and they do not try to motivate the material. The course material is understood better if you think it through and develop it interactively in class, not reading ahead in the notes. The intent of the distribution of my class notes is to:

- Prevent you from having to copy algorithms and analyses into your notes rather than thinking them through in class.
- Offer an alternative program or analysis in case we do things a different way in class.
- Offer a (presumably) correct way to do things in case our development in class has errors.

PRACTICE PROBLEMS: There are 13 sets of practice problems available online. They may be used to help you prepare for the quizzes. Solutions to many **Exercises** and **Problems** from the book may be found at

mitpress.mit.edu/algorithms/

WARNING: All online Class Notes and Problems for future weeks are dynamic documents, which means that they are subject to change. I do not consider their content to be frozen until we start discussing their actual content.

EVALUATION FOR GRADING: There will be 12 closed book quizzes during the semester. About 15 to 20 minutes will be allowed, usually in the beginning of 12 classes, for a quiz. The quizzes may be straightforward changes of the PRACTICE PROBLEMS. Understanding material covered in class, the PRACTICE PROBLEMS, the CLASS NOTES, and the sections of the text suggested in the CLASS NOTES or in class should be good preparation for the quizzes. There will not be any makeups. If a “theorem” is stated in class or in the notes and no proof is provided, it would be appropriate to ask for a proof in a quiz.

There will be an open book final exam on December 14. The final exam will cover material from the entire course. You should expect it to include some material on NP-Completeness.

The average of your top 10 grades on the quizzes will comprise 80% of your final grade, and your grade on the Final Exam will comprise 20% of your final grade.

QUIZ SCHEDULE:

<u>Quiz #</u>	<u>Content</u>	<u>Date</u>
1	Background	Sept. 12
2	Preprocessing, Lower Bounds	Sept. 19
3	Heaps	Sept. 26
4	Greedy	Oct. 3
5	Min Spanning Tree	Oct. 10
6	UNION-FIND+Amortization	Oct. 24
7	Divide-&-Conquer	Oct. 31
8	Dynamic Programming	Nov. 7
9	More Dyn.Prog.+ Shortest Paths	Nov. 14
10	Randomized Algorithms	Nov. 21
11	Rand.ALGS. + Max Flow	Nov. 30
12	Max Flow	Dec. 7

GROUP MAILING: Mail sent to cs584-all at cs dot wpi dot edu will be distributed to the entire class, including the professor. Membership in this list is important since class cancellations and other changes will be announced through this list. Instructions for joining or leaving this list may be found at

www.cs.wpi.edu/Resources/majordomo.html

WEB: Course materials will be available from
www.cs.wpi.edu/~sms/cs584