

CS584  
**Algorithms: Design and Analysis**  
Fall 2009

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**TEXT:** *Introduction to Algorithms*, 2<sup>nd</sup> or 3<sup>rd</sup> edition, Cormen, Leiserson, Rivest & Stein

Other sources include:

Graham, Knuth & Patashnik, *Concrete Mathematics, A Foundation for Computer Science*, 2<sup>nd</sup> 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, available from <http://algo.inria.fr/flajolet/Publications/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.

**TOPICS:**

- Preprocessing and amortization
- Greedy algorithms
- Divide-&-Conquer
- Dynamic Programming
- Randomized Algorithms
- Network Flow

**EXPECTED BACKGROUND:** A solid undergraduate 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 motivate the material. The course material is understood better if we think it through and develop it interactively in class, not by reading ahead in the notes. The intent of the distribution of my class notes is to:

- Prevent you from having to copy programs 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.

**EVALUATION FOR GRADING:**

- Homework - 50%  
The homework will consist of written assignments and programs.  
Assignments and programs are due 4:00 p.m. of the due date.  
Since solutions will be put online, late homeworks will be graded, but it is not clear how these grades will be counted.
- Exams - 50% There will be no surprise, quickie exams. Presence in class is not graded.  
An in-class Midterm exam will take place Monday October 26, and the in-class Final exam will take place Wednesday, December 16,
- Discretion - ?%  
The class will be interactive, and material will be developed in class.  
Numerical final grades which fall on the border between letter grades will be influenced by thoughtful classroom participation.

**EXAM DOCUMENTATION:** All "self-contained" documentations will be permitted for the exams. By self-contained, I mean that you may not use a communication device to communicate with another person or with a web site, and you may not use programs such as Maple or Mathematica, as this might be an unfair advantage over others who don't have access to these tools.

**GROUP MAILING:** Mail sent to cs584-all@cs.wpi.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](http://www.cs.wpi.edu/Resources/majordomo.html)

**WEB:** Course materials will be available from

[www.cs.wpi.edu/~sms/cs584](http://www.cs.wpi.edu/~sms/cs584)

**CHEATING:** You are encouraged to work with other students. In fact, it is my experience that students who form study groups to discuss the material together generally perform better. However, your homeworks and exams are your responsibility **alone**. Once you begin writing up your homework, you should **not** discuss the homework with anybody else. WPI's academic policy can be found at

<http://www.wpi.edu/Pubs/Policies/Honesty/>

