

Computer Science 373 – Analysis of Algorithms

Spring 2008

Instructor: Steven Skiena

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Office Hours: 9:45AM-11:15AM Tuesday-Thursday, and by appointment.

Course Time: Tuesday-Thursday 11:20AM - 12:40PM **Place:** Earth and Space Science 079.

Textbook: Skiena, *The Algorithm Design Manual*, manuscript for second edition.

- **Grading:** Grades will be assigned based on the following formula, with cut-offs determined by my opinion of students on the boundary.

Daily Problems - 5%

Homework Assignments - 15%

Midterm 1 - 25%

Midterm 2 - 25%

Final - 30%

- **Graduate Student Grading:** Grades will be assigned based on the following formula, with cut-offs determined by my opinion of students on the boundary.

Homeworks - 20%

Midterm 1 - 15%

Midterm 2 - 15%

Project - 25%

Final - 25%

- **Homeworks:** There will be five homeworks over the course of the semester. Most will contain some programming component. As discussed below, all homeworks except HW3 should be done in pairs. On each homework assignment, only a subset of the problems will be graded.
- **Exams:** My exam strategy is as follows. All homework, daily and *midterm/exam* problems will be drawn from the textbook. Thus the correct way to study for this course is to review

these problems and figure out how to solve them. The more you work, the better your grade will be. The midterms and exams will be closed book, but there is no need to memorize solutions. Once you have solved them once you should be able to reconstruct them on demand.

- **Graduate Student Project:** Projects will be algorithm implementations from my "most wanted" list of problems, in particular (1) linear-time greedy set cover, and (2) near-linear time greedy shortest common superstring.

Rules of the Game:

1. We shall be using a manuscript of the second edition of my book *The Algorithm Design Manual* as the primary text for the course.
2. Copies of the manuscript will be sold for \$11.00 each to students through a somewhat cumbersome mechanism. Rest assured I will be making no profit on these copies.
3. I am *very* interested in any feedback/corrections you can provide me about the book. I will be give extra credit (up to 10% of the grade) to students who give me substantial feedback as to the manuscript. This includes careful reading to identify errors and bugs as well as higher order comments of passages that are unclear.

There are two dates by which I will need corrections. Typos and similar problems will be most useful to receive by February 15. Content errors and technical ambiguities will be helpful up until about April 1. Maintain a list of what problems you find, and email me the lists before the target dates for credit.

4. The WWW page for the course is <http://www.cs.sunysb.edu/~skiena/373/>. All course hand-outs and notes are available there, along with the latest announcements. Please check it out.
5. We may attempt to film some of the lectures this semester, with the goal of putting the video on the web. We will see how well this works.
6. The full lecture audio from my Spring 1996 CSE373/548 lectures are available via CD-ROM and the WWW, keyed to the lecture notes. Note, however, that the course has changed somewhat since then, so it would be a mistake to avoid coming to class.
7. I will lecture from slides, which are also available on the course page. They are available on-line to be read on-line. *Any student caught printing the slides on the CS department machines will get in trouble.*
8. The best way to learn the material is by solving problems. You are encouraged to work in pairs, for the best way to understand the subtleties of the homework problems is to argue about the answers. Each of you should look at all the problems independently, and not just divide the list in two parts each time. Don't be a leech and let your partner do all the work. Unless you learn how to solve problems, I *promise* that you will get burned on the exams and thus for your final grade.

9. The partner system relies upon a certain maturity among the students. If you don't have a partner, tell me and I will hook you up with one. If you are having trouble with your partner and want a divorce, tell me and I will set you up with a new one. I will act as a broker *but not* as a counselor. I do not want to hear what a louse your old partner is, and you will get a dirty look from me when you demand a divorce regardless of who was at fault.
10. At the start of each class, I will work out one previously identified homework problem, emphasizing the thought process leading to the solution. To get the most benefit from this, you should try to work out the problem before lecture, The daily problems should be worked on individually. I will collect your solutions for these daily problems at the beginning of each class.
11. Only one solution to the assignment per pair should be turned in, with the partners alternating who writes up the final solution. The scribe for each assignment will have to label themselves as such. Unless announced otherwise in class, any solution to a part of a homework problem which takes more than one side of a sheet of paper will not be graded. This is to save you the ordeal of trying to impress with volume instead of quality.
12. Because a primary goal of the course is to teach professionalism, any academic dishonesty will be viewed as evidence that this goal has not been achieved, and will be grounded for receiving a grade of F. (See CEAS Procedures and Guideline Governing Academic Dishonesty, 1/81.)
13. If you have a physical, psychological, medical or learning disability that may impact on your ability to carry out assigned course work, I would urge that you contact the staff in the Disabled Student Services office (DSS), ECC Building, 632-6748/TDD. DSS will review your concerns and determine, with you, what accommodations are necessary and appropriate. All information and documentation of disability is confidential.
14. I understand that everyone gets into a time bind now and then, and that accidents and troubles befall even the most dedicated student. Thus every student will get one free extension on a homework for up to a week without a late penalty. You do not have to ask for this – just write that you are using your free extension when you turn it in. Don't waste this extension or feel obligated to use it, since you will get a very dirty look if try to get another one even with a good excuse.
15. Homework assignments will be due at the *beginning of class*. The penalty will be 20% per day.
16. I hope to establish as much personal contact with each of you as is possible in a class this size. Don't be afraid to stop by during office hours to ask questions or say hello. To facilitate interaction, every few weeks I hope to have a 'Pizza with the Prof'. Outside my office will be a sheet for you to sign-up to join 5-10 other students from the class for a pizza lunch (on me). I look forward to getting to know you.

DATE	SUBJECT	LECTURE TOPIC	READING	IN/OUT
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1/29	Preliminaries	Introduction to algorithms	1-27	
1/31	"	Asymptotic notation	31-40	
2/5	"	Logarithms and more	41-56	HW1 out
2/7*	Data Structures	Elementary data structures	64-82	
2/12	"	Dictionary data structures	82-97	
2/14	Sorting	Applications of Sorting	102-107	
2/19	"	Heapsort/Priority Queues	107-117	HW1in/HW2out
2/21	"	Mergesort/Quicksort	117-124	
2/26	"	Linear sorting	125-130	
2/28	MIDTERM 1			
3/4	Graph Algorithms	Data structures for graphs	138-153	
3/6	"	Breadth-first search	153-163	HW2in/HW3out
3/11	"	Topological sort/connectivity	163-177	
3/13	"	Minimum spanning trees	184-198	
3/17-3/22 Spring Break				
3/25	"	Shortest paths	198-210	
3/27	"	Exploiting graph algorithms	210-217	
4/1	Search	Combinatorial search	222-230	HW3in/HW4out
4/3	"	Program optimization	230-239	
4/8	Decomposition	Elements of dynamic programming	263-280	
4/10	"	Examples of dynamic programming	280-292	
4/15	"	Limitations of dynamic prog	292-300	
4/17	"	Dynamic programming review		
4/22*	MIDTERM 2			
4/24*	Intractability	Reductions	307-314	HW4in/HW5out
4/29	"	Easy reductions	314-321	
5/1	"	Harder reductions	321-328	
5/6	"	The NP-completeness challenge	328-335	
5/8	"	Approximation Algorithms	335-340	HW5 in
5/20	CSE 373 Final Exam, 11AM-1:30PM			

(*) implies there will likely be a substitute instructor that class.