Computer Science 373 – Analysis of Algorithms
Fall 2016

Instructor: Steven Skiena
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Webpage: `http://www.cs.stonybrook.edu/~skiena/373/`
Office Hours: 2:30AM-4PM Tuesday-Thursday, and by appointment.

Course Time: Tuesday-Thursday 1PM - 2:20PM **Place:** 137 Harriman Hall.

Textbook: Skiena, *The Algorithm Design Manual*, second edition, Springer-Verlag, 2008.

- **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%

  HW grading – 5%

  Midterm 1 - 25%

  Midterm 2 - 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 HW4 should be done in pairs. Homeworks will be submitted electronically, and so must be typeset or scanned. On each homework assignment, only a subset of the problems will be graded.

  This semester I intend to use peer grading for the homework assignments. Each student will be assigned to grade approximately three other student's assignments, and each student will receive the score reflecting the combination of grades they have received.

- **Exams:** My exam strategy is as follows. Many, but **not necessarily 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.

I intend to experiment this year with exams that are a mix of freeform solutions and multiple choice, with the goal of seeing whether these types of grades correlate will with each other.

My midterms/exams are designed to be hard. The average on my midterms is usually in the 60's. That is OK, because I curve the final semester grades, giving a median grade of B-.

Rules of the Game:

1. We shall be using the second edition of my book *The Algorithm Design Manual* as the primary text for the course. **Read the book! Page numbers are available on the lecture schedule.** Errata and other resources are available at `http://www.algorist.com`.

2. This semester's lectures (I hope) will be video recorded by Echo 360 and made available on Blackboard. Video lectures from past times I have taught the course are available from my YouTube channel and `http://www.algorist.com`. Of course, you are paying for a live performance, so I encourage you to come to class.

3. The WWW page for the course is `http://www.cs.sunysb.edu/~skiena/373/`. All course handouts and notes are available there, along with the latest announcements. Please check it out.

4. I will be experimenting with Piazza as a question and answer platform this semester. That said, I will be doing as little as possible with it, so students will have to fill the void. The Piazza link will be available from the course webpage.

5. 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.

6. 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 regradless of who was at fault.

7. This semester CSE 373 will have almost 50% more students than any of the previous twenty times I have taught the course! Experiments like peer grading and partially multiple choice exams are part of my attempts to deal with this. Please be understanding and patient.

8. 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.

9. 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.

10. I encourage you to make use of and (even better) contribute to the *Algorithm Design Manual Problem Solution Wiki*, available from `http://www.algorist.com`. **Try HARD to solve the problems before peaking, because learning comes from beating your head against the problems.** I never look at the Wiki and have no idea whether the Wiki solution are correct. *Cavet Emptor!*

11. There should not be any CS graduate students taking this course, and likely none from any department. But if you are a graduate student trying to take this class, come talk to me.

12. If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disablility Support Services office, 128 ECC Building (631) 632-6748. They will review your concerns and determine, with you, what accommodations are necessary and appropriate. All information and documentation of disability is confidential.

    Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following web site: http://www.ehs.sunysb.edu and search Fire Safety and Evacuation and Disabilities.

13. Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Any suspected instance of academic dishonesty will be reported to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at:

    `http://www.stonybrook.edu/uaa/academicjudiciary/`

    Adopted by the Undergraduate Council September 12, 2006

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, I hope to have two 'Pizza with the Prof's at some point in the semester. 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
8/30	Preliminaries	Introduction to algorithms	1-27	
9/1	"	Asymptotic notation	31-40	
9/6	Labor day observed (no class)			
9/8	"	Logarithms and more	41-56	HW1 out
9/13*	Data Structures	Elementary data structures	65-83	
9/15*	"	Dictionary data structures	83-89	
9/20	"	Hashing	89-98	
9/22	Sorting	Applications of Sorting	103-108	
9/27	"	Heapsort/Priority Queues	108-119	HW1in/HW2out
9/29	"	Mergesort/Quicksort/Binsort	120-138	
10/4*	MIDTERM 1			
10/6	Graph Algorithms	Data structures for graphs	145-160	
10/11	"	Breadth-first search	161-168	HW2in/HW3out
10/13	"	Topological sort/connectivity	169-183	
10/18	"	Minimum spanning trees	191-204	
10/20	"	Shortest paths	205-216	
10/25	"	Exploiting graph algorithms	217-224	
10/27	Search	Combinatorial search	230-238	HW3in/HW4out
11/1	"	Program optimization	239-247	
11/3	Decomposition	Elements of dynamic programming	273-290	
11/8	"	Examples of dynamic programming	291-300	
11/10	"	Limitations of dynamic prog	301-310	HW4in/Hw5out
11/15	"	Dynamic programming review		
11/17	SLACK CLASS			
11/22	MIDTERM 2			
11/24	no class (Thanksgiving)			
11/29	Intractability	Reductions	316-322	
12/1	"	Easy reductions	323-329	
12/6	"	Harder reductions	330-333	
12/8	"	The NP-completeness challenge	334-340	HW5 in
12/19	CSE 373 Final Exam, 5:30-8PM			

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