CS 122A, Winter 2013, Design and Analysis of Algorithms

The purpose of the course is to introduce fundamental techniques and viewpoints for the design and the analysis of efficient algorithms, and to study important specific algorithms. The course relies heavily on mathematics and mathematical thinking in two ways. First as a way of proving properties about particular algorithms such as termination, and correctness. Second, as a way of establishing bounds on the worst case (or average case) use of some resource, usually time, by a specific algorithm.

The text used is "Algorithms" by Dasgupta, Papadimitriou and Vazirani. You can buy a hard copy of the book at the bookstore (or elsewhere) and/or use the online version that is available for free, downloadable from

`www.cs.berkeley.edu/~vazirani/algorithms/all.pdf`

We will also supplement the book with some other materials distributed on the class webpage. Another good resource is the textbook "Introduction to Algorithms" by Cormen, Leiserson, Rivest and Stein, and/or the textbook "Algorithm Design" by Tardos and Kleinberg.

The prerequisites for the course are CS20 and CS 60 or equivalents, and these are definitely relevant and required. Skills from those courses such as the ability to do proofs by induction, to understand recursive programs, to handle recurrence relations, and knowledge of basic probability are crucial. If you are weak in these skills, please review that material ASAP. There is no programming in this course. This year, we will be checking prerequisites, and any student who has not had the proper prerequisites may be dropped (you will received email first seeking clarification, since out records are sometimes incomplete.)

We will deviate in some places from the order given below. Specific course topics and reading assignments are:

1. Introduction to Algorithm, illustrated by computation of Fibonoci numbers. The worst case model of complexity, upper bounds and orders of growth. Chapter 0 of the text.

In Section: Review of induction proofs and recurrence relations. Handouts are posted on the class website.

2. Divide and Conquer algorithms: Sections 2.1 through 2.5 of the text.
3. Graph Decompositions: All of chapter 3 of the text.
4. Path Algorithms in graphs: Chapter 4.
5. Greedy Algorithms: Chapter 5.
6. Dynamic Programming: Chapter 6.
7. NP-completeness: Chapter 8.
8. Number Theory Algorithms and RSA: Chapter 1.
9. Linear Programming: Chapter 7, if time allows.

Class: MWF 11-11:50 in 106 Olson

Course Instructor: Dan Gusfield
gusfield@cs.ucdavis.edu
Office: 2125 EUII
Office Hours: Professor Gusfield will be unavailable the first week of class. Permanent office hours will be posted next week.

Discussion section: Friday 9-9:50 in 1018 Olson
Discussion section will be held this Friday.
TA: Julia Matsieva
jmatsieva@ucdavis.edu
TA office hours for the first week of class will be: Tuesday: 2-4 pm and Friday: 12-2pm in 53 Kemper Hall.
Permanent office hours will be posted next week.

Videos There are videos of past lectures online for some of the topics covered in the class. I will point you to those when appropriate. The past videos are found at ItunesU: go to Itunes Store and then ItunesU, and then select UC Davis, and then find the videos for Algorithm Design and Analysis (not the videos for Theory of Computation). You can also link to the videos from Professor Gusfield's personal webpage, which links from the CS department webpage.

Grades etc.: There will be written homeworks that might only be partially graded due to limitations in available graders. I plan to have one midterm and a final, of course. However, depending on the outcome of the midterm, a second midterm might be scheduled.

Also, note the date of the final now - no early or late exams can be given: March 23, 3:30 - 5:30 pm.

There may be several quizzes based on the homework, depending on the grader situation. Generally, the homeworks and homework quizzes will count for 25% of the grade; the midterm(s) will count for 25% and the final for 50%. However, these might be slightly altered depending on our ability to grade homeworks. There may also be a second midterm, depending on the outcome of the first midterm.

COURSE PARTICIPATION WILL ALSO BE TAKEN INTO CONSIDERATION IN DETERMINING GRADES. That is, I take note of people who ask informed questions, answer my questions, point out errors in the lectures or homeworks or the book, have interesting things to say in my office hour, etc, and I consider that when assigning course grades.

About Homeworks

1) Homeworks must be written clearly and cleanly. Typed homework is much appreciated if possible. Or type the English part and write by hand, very clearly, any mathematical parts. View this as an opportunity to learn to use Latex to handle the mathematical symbols. Homeworks that are grossly difficult to read or just contain sentence fragments or fragments of ideas will mostly not be graded. Do NOT write code, and try to limit the amount of pseudo-code you write.

2) Each homework has a due date, and the homeworks are designed so that that due date is realistic. Homeworks should be put in the homework box (room 2131) on the day they are due. However, there is an automatic extension for everyone on every homework. A homework due on M, W, or F will be accepted until 4:30 on W, F, M (respectively). So a homework due on M will still be accepted until 4:30 on W, etc. NO homeworks will be accepted after the extension period, except due to medical or other emergency. It is not a good idea to consider the extension period as the de facto due date, since if you get into the habit of turning in each homework on the extension date, you will then not have any time cushion when you really need it.

3) **Please read your homeworks soon after getting them. I sometimes make mistakes and the sooner you ask me about anything questionable, the better for all the students (and for me).** This is part of the course participation mentioned above. Thanks.

4) Most important notices (including this one) will be posted to the class website. Sometimes someone will send me email asking about a something and I will post the question and answer on the website so everyone can see it. So if you find something odd in the homework, for example, please look on the website first for a possible answer.