CS 31 Fall 2014 Syllabus

Instructor

[Prasad Jayanti](#)
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Teaching Assistants

- Anup Joshi
- Lixing Lian
- Athina Panotopoulou

Office Hours

All office hours are held in Room 212 of Sudikoff Lab.

- Monday 1.15-2.15pm (Professor)
- Tuesday 4.00-6.00pm (TA: Anup Joshi)
- Wednesday 1.15-2.15pm (Professor)
- Wednesday 4.00-6.00pm (TA: Lixing Lian)
- Thursday 1.00-3.00pm (Professor)
- Thursday 3.00-7.00pm (TAs: 3.00-4.00 Lixing; 4.00-600 Athina; 6.00-7.00 Anup)

Graders

- Hongyu Chen '15

Course Description

Algorithm design is the heart and soul of computer science, and CS 31 is all about designing algorithms and analyzing their time and space complexity. The course covers divide-and-conquer, greedy, and dynamic programming strategies for algorithm design, and studies algorithms for median-finding, graphs, network flows, and implementations of clever data structures, such as balanced trees and disjoint-sets. For algorithm analysis, the course covers amortized analysis and how to solve certain recurrence relations. Weekly homework exercises and two take-home exams reinforce learning.

Course Goals

Even if a student never subsequently studies algorithms, the student will never forget that (1) humanity's ability to solve large scale computational problems that arise in the real world depends to a large degree on our ability to design efficient algorithms, and (2) the design and analysis of algorithms is a challenging enterprise.

By covering clever and efficient algorithms for some common problems (e.g., sorting, searching, shortest paths, network flows), the course helps the students

- appreciate how clever observations about a problem can lead to the design of a good algorithm
- learn some powerful strategies (e.g., Divide and Conquer, Greedy, and Dynamic Programming) that are commonly applicable in algorithm design
- learn some algorithm analysis techniques (e.g., solving recurrences and amortized analysis)

- gain some understanding of how to present a convincing argument that the algorithm produces the correct answer within a certain time bound

Lectures

In the Cook auditorium (in the Murdough building). Lectures are in the 10 hour: MWF 10.00-11.05 AM. X-hour is Thursday 12:00-12:50 PM.

X-hours

This course covers a lot of nontrivial material, so I expect to use most X-hours for lectures. It is **extremely important** that you have no other engagements during X-hours. I cannot adequately emphasize the need to attend all lectures, including X-hours.

Prerequisite

Computer Science 10 and 30. Else talk to Professor Jayanti.

Text

There is one text, and it is required: *Introduction to Algorithms, 3rd edition*, by Cormen, Leiserson, Rivest, and Stein; we will refer to it as "CLRS."

The [Day by Day](#) page will tell you what reading I expect you to do for each lecture. **You are responsible for checking the syllabus page to find out what to read.** And you are of course responsible for then actually doing the assigned reading.

Homework

There will be weekly homework assignments. They usually go out on Fridays and are due in class one week later. The first homework will be assigned on Friday, September 19.

A few points about the homework assignments:

- **Start early.** Difficult problems are not typically solved in one sitting. Start early and let the ideas come to you over the course of a few days.

- **Be rigorous.** Each problem has an unwritten requirement that you *argue* the correctness of your algorithm and *analyze* its running time. To obtain full credit for a problem, it is necessary to fulfill these requirements. Normally, I expect a convincing correctness argument and a good analysis of the running time, and not mere "hand waving" arguments.

- **Be concise.** Express your algorithms at the proper level of detail. Give enough detail to clearly present your solution, but not so much that the main ideas are obscured. English is often a good way to express an algorithm; pseudocode is good for communicating a complex control structure. Make sure you explain what your algorithm does in words even if you use pseudocode to specify parts of it.

- **You can work with others.** Some of the problems will be difficult, and it might often be helpful to discuss them with others. Feel free to form study groups. The idea, however, is for *everyone* to understand the problems and experience working through the solutions, and so you should not simply "give" a solution to another classmate. In particular, each student should write up his or her own homework solutions and should not read or copy the solutions of others. For each problem, if you worked on that problem with anyone, you should write down their names at the start of the solution to that problem. If you receive help from the professor or the TAs, be sure to acknowledge those names also.

- **Work on your own before talking to others:** Although, as I said above, you can work with others on the homework problems, you will learn the most by first trying out each problem on your own. Make as much progress as possible on your own before you meet with your study group. If you get used to working with others and often don't come up with the solutions on your own, you may do okay in the homework component of your grade, but you will suffer in the exams where you are strictly prohibited from collaborating with anyone (see below under the section titled ``Exams'').

- **Protocol during office hours:** Please use the office hours to ask questions and receive help. During office hours, the TAs and I require that you don't write anything at all. The idea is that you should understand what we discuss and be able to reconstruct it later on on your own to write up the solutions.

- **Extra credit problems:** Rarely, I might assign extra credit problems. The points you get on these normally don't count towards your final grade. More specifically, at the end of the term I first assign the final grades based purely on your regular homework scores and the exam scores. I will then look at the extra credit points that you earned. If you are right on the border between two letter grades and there is evidence that you solved a substantial number of extra credit problems correctly, then (and only then) the effort you put into the extra credit problems can help you. Because of this policy, extra credit is unlikely to be helpful from the point of view of grades. I therefore encourage you to work on extra credit problems only after you have solved the regular problems as well as you possibly can, and you enjoy the challenge that the extra credit problems pose.

Homework Lateness Policy

Homework is due at the *beginning of class* on the announced due date. Late homework has an immediate 20% penalty (unless you have a valid excuse and, unless impossible, have discussed with me in advance), and 10% penalty per calendar day after that. I will not accept a homework after the next homework is due, or after the final. In this course, if you do not do homework on time, you will soon find yourself overwhelmed, so please be regular with your work.

If there are exceptional circumstances that require an extension, you should talk to Professor Jayanti much in advance, whenever possible.

Exams

There will be a midterm exam and a final exam, both of which will be take-home. Unlike the homework assignments, you may not discuss exam problems with anyone, not even with the professor.

The midterm exam will go out on Friday, October 17 and will be due at the start of class on Friday, October 24. There will be no homework during the week of the midterm.

The final exam will be a take-home exam. It will be available on the web starting November 21 (more precisely, no later than 12.01am on November 21). You will have 48 hours to work on the exam. To accommodate everyone's schedule, I let each of you decide when you want to start on the exam, but you must start on the exam no later than 11.59am on November 23. This way I am certain that I'll have all of the exams back before noon on November 25.

Homework/Exam Regrade Procedure

Your work is normally graded by the graduate TAs and the graders, according to a grading guide that I explain to the graders at a meeting each week. In case you have any grading questions on a homework or exam, please follow the procedure below.

- If the grader made an obvious mistake (e.g., totaling error), you can see me or any TA during any of the TA hours, and we'll make the correction right away.

On the other hand, if (after reading my solutions) you feel the grader did not grade your answer accurately, then you should write down which problem(s) needs regrading and why, staple this description to your homework, and submit it to the Head Teaching Assistant (whose name I'll announce soon), during his/her office hours or after class. The Head TA will make sure that the appropriate grader (the one who had graded that problem) will look at your answer once more. After you hear the outcome on your regrade request, if you still feel the matter is not resolved satisfactorily, then you should see me.

- You must submit your homework or exam for regrade in less than a week from when the homework/exam was returned in class, or November 22, whichever is earlier.

  Please note that any regrade request that comes after the deadline stated above will not be considered, regardless of its merit.

Grading

Simple formula:

- Homework: 50%
- Midterm exam: 25%
- Final exam: 25%

Although the cut offs vary from year to year, I provide the following information from the previous years as a very rough guide to the expected performance for the various top grade levels:

- A: 93 and above
- A-: 90 to 93
- B+: 87 to 90
- B: 83 to 87
- Other grades from D to B-: 60 to 83

Honor Code

All work submitted for credit must be your own. As explained below, the rules with regard to the extent of collaboration are different for homework and exams.

You may discuss the homework problems with your classmates, the TAs, and Professor Jayanti, but you must write up your own solutions. For each problem, you must indicate who else you worked with or got any help from, small or big. Even if you worked with the same people on the entire assignment, be sure to write their names at the start of the solution of each problem. Any written sources used (apart from the text, your lecture notes and any homework solutions that I distribute) must also be acknowledged; however, **you may *not* consult any solutions on the Internet or from previous years' assignments, whether they are student- or faculty-generated.**

The rules are different for the exams (because exams are where we find out what you have learned by doing the homework). Unlike the homework, any discussion of the problems is prohibited for the midterm and the final exams: you may not discuss the problems with your classmates, the TA, the professor or anyone else. You may not consult written sources other than the text book, your class notes, and any homework solutions that I distribute during this term; and you may not consult any electronic sources, including the Internet.

You should consult a copy of *Sources and Citations at Dartmouth College*, which can be found on the Internet at www.dartmouth.edu/~writing/sources.

Dartmouth's Academic Honor Principle applies to this course. Please be sure to read the principle, which you can find at www.dartmouth.edu/~reg/regulations/undergrad/acad-honor.html .

Please ask me if you have any questions about the honor code as it applies to CS 31. Better safe than sorry!

Disabilities

Students with disabilities who may need disability-related academic adjustments and services for this course are encouraged to see me privately as early in the term as possible, but no later than Friday, September 26. Students requiring disability-related academic adjustments and services must consult the Student Accessibility Services office (205 Collis Student Center, 646-9900, Student.Accessibility.Services@Dartmouth.edu). Once SAS has authorized services, students must show the originally signed SAS Services and Consent Form and/or a letter on SAS letterhead to me. As a first step, if students have questions about whether they qualify to receive academic adjustments and services, they should contact the SAS office. All inquiries and discussions will remain confidential.

Religious Observances

Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please meet with me on or before Friday, September 26 to discuss appropriate accommodations.

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Last modified: Monday, September 14, 2014