

CS331H: ALGORITHMS AND COMPLEXITY (Honors), Spring 2018

Professor Vijaya Ramachandran

Department of Computer Science, UT-Austin

COURSE DESCRIPTION

Time/Location/Unique number. TTh 2-3:30, GDC 1.304, unique numbers 51505 and 51510.

Discussion Sessions. #51505 F 10-11 in CBA 4.328; #51510 F 11-noon in CBA 4.328.

Prerequisites. The following coursework with a grade of at least C-: Computer Science 429 (or 310) or 429H (or 310H); Mathematics 362K or Statistics and Data Sciences 321 (or Statistics and Scientific Computation 321); and credit with a grade of at least C- or registration for: Mathematics 340L, 341, or Statistics and Data Sciences 329C (or Statistics and Scientific Computation 329C).

Professor. [Vijaya Ramachandran](#)

Teaching Assistant.

Textbook. 1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein, *Introduction to Algorithms*, Third Edition, MIT Press, 2009. (**Required**)
2. J. Kleinberg and E. Tardos, *Algorithm Design*, Pearson Education, 2006. (Additional reading, on reserve)

COURSE OUTLINE. This course will cover the basic aspects of the theory of algorithms, including divide-and-conquer, greedy, and dynamic programming, several graph algorithms, randomized algorithms, and approximation algorithms, together with an introduction to undecidability, and to NP-completeness. Here is a high-level course schedule.

COURSE SCHEDULE.

Introduction; algorithm analysis review; graphs	1 week
Greedy algorithms; minimum spanning tree; Dijkstra's SSSP	2 weeks
Divide and conquer; recurrence relations	1 week
Dynamic programming; shortest paths in graphs	2 weeks
Maximum flow, bipartite matching	1 week
NP-completeness	2 weeks
Undecidability; halting problem	1 week
Approximation algorithms	1 week
Randomized algorithms; hashing	2 weeks

This is a theory course and there is no programming content. This course carries the Quantitative Reasoning (QR) flag: establishing the correctness of algorithms and rigorous bounds on their running times, and deriving proofs of NP-completeness and undecidability are important components of this course.

Coursework. The course grade will be based on the following coursework.

- *Three in-class tests - to be held in the evenings*
- *Problem sets*
- *Class Participation*

Course Grade. The course grade will be computed as follows:

- The three tests will all be treated equally. and will be worth 60 points totally.
The top score you achieve among the three will contribute 30 points, the next highest will contribute 20 points, and the lowest score will contribute 10 points.
- The problem sets will account for a total of **30 points**. The first problem set is worth 3 points, and each of the following 5 problem sets is worth 6 points, for a total of 33 points. Any score 30 or above will achieve the full 30 points for the problem sets.
- Class participation counts for **10 points**, and will be based on class attendance, contributions to discussions, and consistent responses to any online polls and quizzes posted on Canvas and Piazza (see below for more details).
- The final grade will be assigned based on the above components, and plus and minus grades will be used.
- Grades will be curved, with the following guarantee: 85 points or above guarantees an A grade (A- or A), with A guaranteed for 90 points or above; 72 points or above guarantees a B (B+, B or B-); 60 points or above guarantees a C (C+, C, or C-). While these cut-offs are guaranteed, it is possible some of them may be lowered (and this will only benefit some students; however do not count on having these cut-offs lowered).

Key Dates. (Please make a note of these dates -- there will be no make-up test or problem set. except for a documented emergency)

- **First In-class Test: Thursday, March 1, 7-9 PM**
 - **Second In-class Test: Thursday, April 12, 7-9 PM**
 - **Third In-class Test: Thursday, May 3, 7-9 PM**
 - **Problem Sets (HW):** HW1 out **Thu, Jan 18**, due **Thu, Jan 25 10 am**; HW2 out **Thu, Jan 25**, due **Mon, Feb 5 10 am**; HW3 out **Thu, Feb 8**, due **Mon, Feb 19 10 am**; HW4 out **Tue, March 6**, due **Wed, March 21 10 am**; HW5 out **Thu, March 22**, due **Mon, Apr 2 10 am**; HW6 out **Tue, Apr 17**, due **Wed, Apr 25 10 am**.
- Late submission with a penalty is allowed only up to 24 hours after the due date and time.

Additional Information on Coursework.

- At least half of the material in the tests and final exam will build directly on material seen in class and in the problem sets.
- The second test will mainly cover the material not included in the first test. (Basic background material seen prior to the first test will be included in the second test.)
- The third test is comprehensive, and will cover material seen throughout the semester.
- You are allowed one sheet of personal notes for each of the tests, and no other material. No electronic devices are allowed for the tests and exam, including calculators and cellphones.
- **Collaboration on Problem Sets.** Students may discuss the problem sets with one another, but solutions *must be written up separately*. Please include a statement at the start of your solution to each problem that lists the individuals with whom the problem was discussed. Note that there is no penalty for discussing with other students in the class; you are, in fact, encouraged to do so. But be sure to acknowledge these discussions in your write-up.
Do not copy solutions from others -- this would be a serious case of scholastic dishonesty.
- **More on Problem Sets.** You should not consult any source outside the class. This means that you should not search the web for answers, or ask for help from people not taking this class.
- **No Electronic Devices During Class Lectures.** Please listen to the lectures, ask/answer questions in class, and write your notes by hand. Laptop usage is not allowed in class. Please turn off your electronic devices, including cellphones.

Canvas. All class-related course material will be on Canvas.

Piazza Discussion Board. We will use Piazza for discussions. Please reserve your email messages to the instructor and TA for matters that concern only you. For queries relating to class material, please post to the discussion board on Piazza so that everyone can benefit from the query and the responses. Students are encouraged to post comments and queries about class material on the Piazza discussion board.

Polls and Quizzes on Piazza and Canvas. We may post polls and short quizzes on Piazza and Canvas during the course of the semester. Please enable email notification of Piazza and Canvas posts so that you can respond to these in a timely manner. Participation in these will contribute to your class participation score.

Grading Queries. Any questions on grading should be brought to the attention of the TA or the instructor no later than a week after the graded material is returned to the class.

Students with Disabilities. Students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 471-6259, <http://www.utexas.edu/diversity/ddce/ssd>
If you need such accommodations, please notify me by January 31.

Accommodations for Religious Holidays. If you must miss a class or an examination in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time before or after the absence.
If you intend to make use of such accommodations, please notify me by January 31.

Statement on Scholastic Dishonesty. Anyone who violates the rules for the problem sets or who cheats in the tests or final exam is in danger of receiving an **F** for the course. Additional penalties may be levied by the Computer Science Department and the University.
The departmental code of conduct posted at <http://www.cs.utexas.edu/academics/conduct> will apply unless superseded by the rules stated for this course in this course description.