

Course Information: CS 331 Algorithms and Complexity (Fall 2024)

Time and location: 2:00 to 3:30 PM, Mondays and Wednesdays (GDC 1.304).

Instructor: Kevin Tian, kjtian@cs.utexas.edu.

Office hours: 4:00 to 5:00 PM, Mondays (GDC 4.720).

TA: Trung Dang, dddtrung@utexas.edu.

Discussion section: 1:00 to 2:00 PM, Fridays (CBA 4.344).

Office hours: 4:00 to 5:00 PM, Tuesdays (GDC 1.302, Desk 1).

TA: Ryan Park, ryanjpark03@utexas.edu.

Discussion section: 12:00 to 1:00 PM, Fridays (CBA 4.330).

Office hours: 1:00 to 2:00 PM, Thursdays (GDC 1.302, Desk 1).

Description: This course is a comprehensive introduction to the design and analysis of algorithms. Our goal is to investigate strategies for answering: how efficiently can we complete a given computational task? After this course, students should be equipped to tackle this question for a wide range of fundamental tasks arising in the practice of computer science.

The first three units of this course cover common algorithmic paradigms, familiarizing students with the principles of recursion, dynamic programming, and greedy algorithms. The next three units introduce toolkits for designing graph algorithms, continuous algorithms, and randomized algorithms, emphasizing real-world applications. The last unit, complexity theory, develops techniques for reasoning about fundamental limits on computational efficiency.

Quantitative reasoning: This course carries the Quantitative Reasoning flag. Quantitative Reasoning courses are designed to equip you with skills that are necessary for understanding the types of quantitative arguments you will regularly encounter in your adult and professional life. You should therefore expect a substantial portion of your grade to come from your use of quantitative skills to analyze real-world problems.

Prerequisites: The following coursework with a grade of at least C- is required.

- Discrete Math (CS 311 or CS 311H).
- Data Structures (CS 314 or CS 314H).
- Computer Architecture (CS 429 or CS 429H).
- Probability (Math 362K or SDS 321).
- Linear Algebra (Math 340L or Math 341 or SDS 329C).

Coding component: The assignments have a coding component: typically, one problem per homework. These problems are intended to provide you with hands-on experience for writing algorithms, and evaluating their performance. We use Python, and for all coding problems, Jupyter notebooks will be provided with example code for you to complete.

Syllabus: The syllabus is on the course [website](#).

Discussion: We will use [Ed](#) for class announcements and discussion.

Resources: The primary reading material is the lecture notes. There is no required external reading material. However, the following resources have a great deal of overlap with the course contents, and so you may find some of them helpful to consult.

- Introduction to Algorithms (Cormen, Leiserson, Rivest, and Stein). Available digitally [here](#).
- Algorithms (Erickson). Available digitally [here](#).
- Mathematics for Computer Science (Lehman, Leighton, and Meyer). Available digitally [here](#).
- Algorithm Design (Kleinberg and Tardos). Available physically through the UT library.
- Algorithms Illuminated (Roughgarden). Available for purchase [here](#).

Grading: 40% HWs (6, lowest dropped), 30% tests (2), 30% final exam.

Late policy: HWs -15% if late, -15% off per 24 hrs (20 hrs late = -15%, 28 hrs late = -30%).

Collaboration policy: Collaboration is encouraged, but all submissions should be independent and in your own words. Please state your collaborators on your homework.

Feedback: Any feedback on notes or lectures is strongly appreciated. There will be opportunities to do so at the end of every class, as well as forms on the website.

Names and pronouns: Class rosters provide instructors with legal names. Please let us know as early as possible if you prefer an alternate name or gender pronoun, we are happy to do so.

Accommodations: If you are in need of any disability-related accommodations please contact Disability and Access (D&A); refer to D&A's [website](#) for contact details and more information. If you are already registered with D&A, please deliver your Accommodation Letter to me as early as possible in the semester so we can discuss your approved accommodations. For any absences or missed assignments due to observance of religious holy days, UT requires you notify instructors fourteen days prior, or the first day of the semester if within the first two weeks.

Academic integrity: Plagiarism is taken very seriously at UT Austin. You are responsible for understanding UT's Standards of Conduct and the University Honor Code, see [here](#). Students who violate these rules are subject to disciplinary penalties, so let us please avoid this (talk to me instead). For more information, see the Student Conduct and Academic Integrity [website](#).

AI tools: The use of AI tools for homework is prohibited in this class. Moreover, we note that 60% of your grade comes from in-class tests and the final, during which you will not be able to consult external references, and solving homework problems for yourself is one of the most valuable opportunities in this course to practice independently designing algorithms.

University resources: Here are some links of possible interest for supporting your learning.

- Sanger Learning and Career Center: <https://undergradcollege.utexas.edu/slc/>.
- University Writing Center: <https://uwc.utexas.edu/>.
- ITS: <https://its.utexas.edu/>.
- Counseling and Mental Health Center: <https://www.cmhc.utexas.edu/individualcounseling.html>.
- Student Emergency Services: <https://deanofstudents.utexas.edu/emergency/>.
- Libraries: <https://www.lib.utexas.edu/>.
- Canvas: <https://utexas.instructure.com/courses/633028/pages/student-tutorials>.

Senate Bill 212 and Title IX: Instructors for this course are required to report any information pertaining to sexual harassment, assault, dating violence, and stalking committed against UT students or employees, as well as sex and gender-based discrimination and misconduct (i.e. Title IX incidents). If you need to talk to someone who can maintain confidentiality, please contact University Health Services at (512)-471-4955 or the UT Counseling and Mental Health Center at (512)-471-3515. For reporting Title IX incidents, please contact the [Title IX Office](#).

Health and safety: For personal crises, please contact the Counseling and Mental Health Center Crisis Line at (512)-471-2255. For any concerns about safety or behavior at UT, please contact the Behavior Concerns Advice Line at (512)-232-5050. Your call can be anonymous.