EE364A : Convex Optimization I (CME364A) Syllabus Summer 2024

Course Information

- Welcome to EE364A (also listed as CME364A), Summer quarter 2023–2024.
- EE364A will be taught by Mehmet Giray Ogut.
- Lectures are Tuesdays and Thursdays 09:30 AM –11:20 AM, at classroom 420-040. The first lecture is June 25.
- We will post more information such as the time and location of office hours as we get closer to the start of Summer quarter. Please check the course website. We will be mainly using Ed for homework, discussions and announcements. This is also the best way to reach us to get the fastest response.
- If you're looking for something to do before class starts, you could read Chapter 1 of the textbook, or install CVXPY. We will only support Python and CVXPY for coding assignments in this class.
- The course will be on SCPD, so videos of the lectures will be available to enrolled students on Canvas.
- Midterm and final exams will be remote (i.e. take-home) with submissions to be done via Gradescope.
- Attending class and office hours are not mandatory but highly recommended to get your questions answered. We also encourage you to work in study groups.
- We recommend a solid linear algebra background before taking this course such as EE263 and a basic understanding of probability at the level of EE178 (or an equivalent introductory probability class in another department).

Course Overview/Description

Concentrates on recognizing and solving convex optimization problems that arise in applications. Convex sets, functions, and optimization problems. Basics of convex analysis. Least-squares, linear and quadratic programs, semidefinite programming, minimax, extremal volume, and other problems. Optimality conditions, duality theory, theorems of alternative, and applications. Interior-point methods. Applications to signal processing, statistics and machine learning, control and mechanical engineering, digital and analog circuit design, and finance.

Course Learning Goals

- to give students the tools and training to recognize convex optimization problems that arise in applications

- to present the basic theory of such problems, concentrating on results that are useful in computation
- to give students a thorough understanding of how such problems are solved, and some experience in solving them
- to give students the background required to use the methods in their own research work or applications

Intended Audience

This course should benefit anyone who uses or will use scientific computing or optimization in engineering or related work (e.g., machine learning, finance). More specifically, people from the following departments and fields: Electrical Engineering (especially areas like signal and image processing, communications, control, EDA & CAD); Aero & Astro (control, navigation, design), Mechanical & Civil Engineering (especially robotics, control, structural analysis, optimization, design); Computer Science (especially machine learning, robotics, computer graphics, algorithms & complexity, computational geometry); Operations Research (MS&E at Stanford); Scientific Computing and Computational Mathematics. The course may be useful to students and researchers in several other fields as well: Mathematics, Statistics, Finance, Economics.

Course Materials

- The digital textbook is available for free and is available online
- We will assign some homework problems from additional exercises
- You can access all lecture slides here

Coursework and Grading Scheme

This course is worth 3 units of credit. Students may opt to take the course for a letter grade, or Credit/No Credit. Final letter grades will be assigned based on class curve. There is no preset threshold for any letter grade. You are asked to submit:

- *Weekly homework assignments*, due each Friday at midnight, starting the second week. We will use Gradescope for homework submission, with the details on Ed. Each question on the homework will be graded on a scale of {0, 1, 2}.
- *Midterm quiz*. The format is a timed online 75 minute exam, at the end of the 4th week. The midterm quiz covers chapters 1–3, and the concept of disciplined convex programming (DCP).
- *Final exam*. The format is a 24 hour take home exam, scheduled for the end of the last week of classes. You can take it during any 24 hour period over a multi-day period we'll fix later. We can arrange for you to take it earlier (as a beta tester, and only if you really need to) but not later. The final exam will **require the use of CVXPY**.

Deadlines and Late Submissions

We have a late day policy: students are allowed one free late day, i.e., students can submit one homework up to 24 hours after the deadline without needing to notify the course staff and without facing any score penalties. Always reach out if you have any extenuating circumstances or unusual disruptions. Late day policy does not apply to midterm and final exams. They must be submitted in the allowed time interval.

The Honor Code

While we encourage collaboration during homework assignments as an aid to your learning (with collaborators and their contributions cited in submissions), we expect you to complete all the exams (midterm and final) in the course unaided, to demonstrate your proficiency with course material. This means conversations about exam questions, and consultation of course or other resources while working on exams questions, are not permitted.

Failure to abide by these expectations is a violation of Stanford's Honor Code and is a serious offense, even when the violation is unintentional. Conduct prohibited by the Honor Code includes all forms of academic dishonesty, among them unpermitted collaboration and representing others' work as one's own. Please review Stanford's Honor Code, and documentation and citation resources from the Hume Center for Writing and Speaking. When in doubt, contact your instructor.

Course Policies for Use of Generative AI

Depending on the context, artificial intelligence (AI) can either enhance and impede learning. Being mindful of when to use these tools will help us navigate the complexity of interacting with AI technologies in the classroom and beyond.

In this class, we allow students to refer to any online resources while doing homeworks. For midterm and final exams the use of generative AI is not allowed.

Our class agreement will be consistent with guidance from the Board of Judicial Affairs regarding use of AI and the Stanford Honor Code, which notes that use of generative AI to "substantially complete" an assignment or exam by entering the prompt and submitting the output as one's own work is **not permitted.**

Extended Absences

If a student requires an extended absence before more than 70% of coursework is completed, there might be opportunities to Withdraw from the course, or develop a schedule for making up and submitting coursework later in the quarter. Students in this

situation should talk to a staff member at the Office of Accessible Education and to their section or course instructor as soon as possible.

If a student requires an extended absence after at least 70% of coursework is completed at a passing grade or higher, students may request an Incomplete. Incompletes do not award any credit and can drop students below the minimum required unit load. This could negatively impact academic progress, graduation, NCAA and Veteran's certifications, and financial aid. Students in this situation should talk to their section leader to discuss options.

Course Privacy Statement

As noted in the university's recording and broadcasting courses policy, students may not audio or video record class meetings without permission from the instructor (and guest speakers, when applicable). If the instructor grants permission or if the teaching team posts videos themselves, students may keep recordings only for personal use and may not post recordings on the Internet, or otherwise distribute them. These policies protect the privacy rights of instructors and students, and the intellectual property and other rights of the university. Students who need lectures recorded for the purposes of an academic accommodation should contact the Office of Accessible Education.

Academic Accommodations

Stanford is committed to providing equal educational opportunities for disabled students. Disabled students are a valued and essential part of the Stanford community. We welcome you to our class.

If you experience disability, please register with the Office of Accessible Education (OAE). Professional staff will evaluate your needs, support appropriate and reasonable accommodations, and prepare an Academic Accommodation Letter for faculty. To get started, or to re-initiate services, please visit oae.stanford.edu.

If you already have an Academic Accommodation Letter, we invite you to share your letter with us. Academic Accommodation Letters should be shared at the earliest possible opportunity so we may partner with you and OAE to identify any barriers to access and inclusion that might be encountered in your experience of this course.

Students who are immunocompromised should register with the OAE as soon as possible. Student athletes who anticipate challenges in being able to participate in class or submit assignments on time should speak to a course instructor or teaching assistant as soon as possible about available alternatives or allowances.