

# ECE 490: Introduction to Optimization

Instructor: Bin Hu (binhu7@illinois.edu)

Homework TAs: Aristomenis Tsopelakos (tsopela2@illinois.edu)

Course Information:

Lectures: T/Th 11:00AM - 12:20PM taught remotely

Prerequisites: Linear algebra at the level of Math 415, programming skills at the level of ECE 220

Course Description:

This is a senior/first year graduate-level course on optimization. Topics include necessary and sufficient conditions for local optima; characterization of convex sets and functions; unconstrained optimization, gradient descent and its variants; constrained optimization and the gradient projection method; optimization with equality and inequality constraints, Lagrange multipliers, KKT conditions; penalty and barrier function methods; weak and strong duality and Slater conditions; augmented Lagrangian methods; sub-gradient methods; proximal gradient descent; applications.

Course Outline:

- Mathematical background
- Unconstrained optimization
- Constrained optimization
- Applications

Grading: Grading will be done separately for the 4 credit hour and 3 credit hour students.

3 credit hour: 5% class participation+50% HW+20% midterm +25% final (take-home)

4 credit hour: 5% class participation+45% HW+15% midterm +20% final (take-home) +15% paper review project

Textbook:

Nonlinear Programming by D. Bertsekas (Edition 3)

We will closely follow the lecture notes and slides distributed via email.

Office Hours: These will be on-line via zoom.

Bin: M 2-3pm, Th 9:30-10:30am, F 3-4pm

Aristomenis: Wed 9-11am

Course Logistics: This course will be taught in an on-line format. We will meet via Zoom for synchronous discussions during the regular scheduled lecture time. All lectures will be recorded and posted on Compass. For some lectures, flipped classroom will be used. In this case, three short 5-minute videos covering related topics will be posted in Compass, and you should watch them before the lectures. The lecture time will be devoted to problem solving and discussions. The problems used in the lectures will be very similar to the problems appearing in the assignments. We are all adjusting to the changes due to COVID-19. Do not hesitate to email me if you have questions, concerns, and/or suggestions for how I might support your learning in this course.

Class participation: You are expected to participate in class activities and discussions actively. More explanations regarding the grade for class participation will be given in Lecture 1.

Homeworks: Homework problems will be assigned on a (approx.) fortnightly basis and be submitted via Gradescope: <https://www.gradescope.com/courses/357787>

Use entry code **N8BJ24** to add the course on Gradescope where you will be submitting assignments. Best practice is to use your Illinois e-mail ID to make an account. Collaboration on the homework is permitted, however each student must write and submit independent solutions. No late homework will be accepted (unless an extension is granted in advance by the instructor).

Midterm: There will be one midterm. The time will be announced later. The regular scheduled lecture time will be used for the midterm. More instructions will be sent out later.

Policy on re-grades: Re-grades will be considered if you believe there is an error in the grading of your homework, or exam. You should explain the issue in writing and resubmit it to the TA with a detailed explanation attached. The TA will re-grade which means you could end up with a higher or lower grade than before.

Accommodations for students with disabilities: If you think you need an accommodation for a disability, please let me know at your earliest convenience. Some aspects of this course, the assignments, the in-class activities, and the way the course is usually taught may be modified to facilitate your participation and progress.

Academic Integrity: All students are subject to the university's academic integrity policies. A quick reference guide, as well as links to the official student code, can be found at: <https://provost.illinois.edu/policies/policies/academic-integrity/students-quick-reference-guide-to-academic-integrity/>