



NYU

TANDON SCHOOL
OF ENGINEERING

ECE-GY 6233 System Optimization Methods

Fall 2021

Department of Electrical and Computer Engineering
Tandon School of Engineering
New York University

Instructor: Prof. Quanyan Zhu

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Meeting times: 2:00 PM – 4:30 PM, Fridays

Location: Rogers Hall, Rm 315

Office Hours: By Appointment

Course Objective: This course is appropriate for both upper-level undergraduates and graduate students with basic knowledge in matrix theory (linear algebra) and calculus. Optimization is a very important subject which finds applications in many branches of science and engineering, to name a few, economics, computer science, financial engineering, systems engineering, electrical and computer engineering, mechanical engineering. The course aims to equip students with practical optimization methods for solving real-world applications and prepare them for a career in academia and industry. Topics to be covered include linear programming, nonlinear programming, calculus of variations, and dynamic programming.

Prerequisites: The course is offered as a first-year graduate level course. Basic knowledge of linear algebra, calculus and differential equations and scientific computing is desirable.

Grading:

Homework: 20%

Midterm Exam: 40%

Final Exam: 40%

There will be 5 assignments for this course. The exams are closed book. No calculators are needed for the exams.

Academic Integrity:

You should read the School of Engineering's code of conduct:

<https://engineering.nyu.edu/sites/default/files/2018-06/code-conduct2-2-16.pdf>

and the code of conduct of the university:

<https://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/academic-integrity-for-students-at-nyu.html>

Required Text:

[BV] S. Boyd and L. Vandenberghe, *Convex Optimization*, Cambridge University Press, 2004; Available online at <http://www.stanford.edu/~boyd/cvxbook/>

Reference Textbook:

[CB] C. Bishop, Pattern Recognition and Machine Learning, Springer, 2006; Available online at <https://www.microsoft.com/en-us/research/uploads/prod/2006/01/Bishop-Pattern-Recognition-and-Machine-Learning-2006.pdf>

Course Outline:

1. Linear programming
2. Duality and sensitivity
3. Convex optimization
4. Gradient decent
5. Calculus of variations
6. Dynamic programming
7. Variational inference
8. Classification and regression

Course Schedule (Tentative):

09/03/21	Lecture 1	Introduction
09/10/21	Lecture 2	Review of Basic Concepts (Homework 1)
09/17/21	Lecture 3	Unconstrained Optimization
09/24/21	Lecture 4	Unconstrained Optimization (Homework 2)
10/01/21	Lecture 5	Convexity
10/08/21		Midterm I
10/15/21	Lecture 6	Convex Optimization (Homework 3)
10/22/21	Lecture 7	Problems in Data Science
10/29/21	Lecture 8	Gradient Decent (Homework 4)
11/05/21	Lecture 9	Calculus of Variations
11/12/21		Midterm II
11/19/21	Lecture 10	Variational Inference (Homework 5)
11/26/21		Thanksgiving
12/03/21	Lecture 11	Dynamic Programming
12/10/21	Lecture 12	Final Review
12/17/21		Final Exam

Moses Center Statement of Disability

If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities (CSD) at 212-998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csd. The Moses Center is located at 726 Broadway on the 3rd floor.

NYU School of Engineering Policies and Procedures on Academic Misconduct

- A. Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.

- B. Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:
1. Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.
 2. Fabrication: including but not limited to, falsifying experimental data and/or citations.
 3. Plagiarism: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
 4. Unauthorized collaboration: working together on work that was meant to be done individually.
 5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.
 6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.

The NYU Tandon School values an inclusive and equitable environment for all our students. I hope to foster a sense of community in this class and consider it a place where individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations, and abilities will be treated with respect. It is my intent that all students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. If this standard is not being upheld, please feel free to speak with me.

If you are experiencing an illness or any other situation that might affect your academic performance in a class, please email Deanna Rayment, Coordinator of Student Advocacy, Compliance and Student Affairs. Deanna can reach out to your instructors on your behalf when warranted.

deanna.rayment@nyu.edu

<https://engineering.nyu.edu/staff/deanna-rayment>