ISYE 6669 Deterministic Optimization - Fall 2026

Instructor information

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Course information

ISYE 6669 introduces concepts, models, and algorithms in linear optimization, integer optimization, and convex optimization. The first module of the course is a general overview of key concepts in optimization and associated mathematical background. The second module of the course is on linear optimization, covering modeling techniques, basic polyhedral theory, simplex method, and duality theory. The third module is on integer optimization, which augments the previously covered optimization models with the flexibility of integer decision variables. The fourth and final module is on nonlinear optimization and convex conic optimization, which is a significant generalization of linear optimization.

The course blends optimization theory and computation with various applications to modern data analytics.

Prerequisites Linear algebra, Multivariate Calculus, Basic Probability, Familiarity with programming in Python.

Course Outcomes The main objective of the course is to develop a deep understanding of mathematical optimization problems and algorithms. Student who take this course can expect to achieve the following goals:

- Learn modeling skills for formulating various analytics problems as linear, convex nonlinear, and integer optimization problems
- Learn basic optimization theory including duality theory and convexity theory, which will give the students a deeper understanding of not only how to formulate an optimization model, but also why.
- Learn fundamental algorithmic schemes for solving linear, nonlinear, and integer optimization problems.
- Learn computational skills for implementing and solving an optimization problem using modern optimization modeling language and solvers.

Reading material There is no official textbook for the class.

Lecture slides: We will treat this document, which is available on Canvas, as a textbook.

Additional resources: Material from most lectures can be found in

- Ronald L. Rardin, Optimization in Operations Research, 2nd edition, 2017, Pearson.

and

- Craig A. Tovey, Linear Optimization and Duality: A Modern Exposition, 2020, Chapman and Hall/CRC.

Course Websites The Canvas site will contain all of the information that you need in this course, including staff information and office hours, lecture notes, homework assignments and solutions, exam preparation material, course announcements. Make sure that you are enrolled on the course Canvas site and that you check the site regularly for updates, announcements, and new material. We will use Gradescope for homeworks and exam grades.

We will use Ed Discussions as a place to ask and answer questions about the course content and the homework, which can be accessed via Canvas. Please post your questions and feel free to answer other students' questions there. If you email the course staff to ask questions regarding course content and homework, we will redirect you to Discussions site. Participation in the form of asking or answering questions is strongly encouraged.

Grading Policy

Your course grade will be based upon my assessment of your understanding of the material covered throughout the semester. The weights used for grade assignment will be

Assignment type	Weight
Homework:	30%
Tests	40% (2 tests at 20% each)
Final exam	30%

Thresholds for letter grade assignment are as follows.

Letter grade	Percentage range
A:	90% ≤ total grade ≤ 100%
B:	80%≤ total grade <90%
C	70%≤ total grade <80%
D	60%≤ total grade <70%
F	0%≤ total grade <60%

Homework There will be a homework assignment every week. Homework is meant to build both basic knowledge of the course material and deeper understanding, so it is likely that some additional research beyond coming to class will be required.

Tests/Exams Tests will be given two times during the semester, and a cumulative final exam will be given during the final exam period for this course. Tests and exams are graded for correctness, with partial credit awarded for partial answers (e.g. work shown) or to account for minor errors.

Course policies

Attendance Attendance is mandatory and will be checked with an ungraded short quiz or roll call. You are allowed up to three non-excused absences without questions asked.

Academic Integrity Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct. Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Core IMPACTS https://www.usg.edu/curriculum/core-impacts/ is the University System of Georgia's General Education curriculum. If you are teaching a course that counts towards Core IMPACTS, you should include a syllabus statement about the Core area and associated career competencies. This resource developed by the Center for Excellence in Teaching and Learning and Online Education at Georgia State University includes template syllabus statements for each of the Core IMPACTS areas that you may adapt for your course.

Accommodations for Students with Disabilities If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Collaboration, Group Work, and Use of Generative AI You are allowed to work in small groups on homework and out-of-class assignments, but any work you turn in must be written in your own hand. In-class tests and exams are to be your own work. All in-class tests and exams will be closed book and notes.

Generative AI In general, use of Generative AI and of any previous semester course materials, such as homework, projects, and any other coursework, are prohibited in this course. Using these materials will be considered a direct violation of academic policy and will be dealt with in accordance with the GT Academic Honor Code. **When in doubt regarding what constitutes a violation, do not guess the answer and post on Ed Discussions for clarifications**.

Extensions, late assignments, and re-scheduled/missed exams Late homework will be not be accepted.