Catalog description: Introduction to optimization problems and algorithms emphasizing problem formulation, basic methodologies and the underlying mathematical structures. Covers the classical theory of linear and nonlinear optimization as well as recent advances in the field. Topics include: modeling issues, simplex method, duality theory, sensitivity analysis, large scale optimization, integer programming, interior-point methods, network optimization, nonlinear programming, duality theory, sensitivity analysis, large scale optimization, integer programming, interior-point methods, network optimization, nonlinear programming, optimality conditions, Lagrange multipliers, and gradient methods. Applications of the theory and techniques developed in the course will be considered.

Overview: Introduction to optimization problems and algorithms emphasizing problem formulation, basic methodologies, and underlying mathematical structures. Mostly a course focused on linear optimization techniques.

Prerequisites: The prerequisite is an undergraduate course in linear algebra. A good mathematical background is essential to doing well in this course.

Logistics:

Instructor: Prof. Alex Olshevsky
Office: PHO531
Email: alexols@bu.edu
Web: http://sites.bu.edu/aolshevsky

Lectures: Tuesday and Thursday 3:30–5:15 pm in WED (Wheelock College of Education) 130

Web site: http://learn.bu.edu/

Textbook: Bertsimas, Tsitsiklis, Introduction to Linear Optimization, Athena Scientific. We will also occasionally use material from Optimization Models by Calafiore and El Ghaoui, Cambridge University Press. Additionally, Understanding and Using Linear Programming by Matousek and Gartner published by Springer is a good reference.

Grading: Homework: 10%
First midterm exam: 25%
Second midterm exam: 25%
Final exam: 40%

I will drop your lowest two homework grades. Moreover, if your final exam grade is higher than one of your midterm scores, I will replace the lower of your two midterm scores with your final exam grade.
Schedule:

1. Introduction to Linear Programming and Linear Algebra Review
2. Geometry of Linear Programming: Polyhedra, Extreme points
3. The Simplex Method for Solution of Linear Programs
4. Duality Theory for Linear Programs
5. Sensitivity Analysis
6. Time permitting, a selection of:
   (a) Interior Point Methods for Linear Programming
   (b) Graphs and Network flow Optimization
   (c) Least Squares, Regularization, and Learning
   (d) Linear, Semidefinite, and Cone Programs

Exams: Exams are closed-book and closed-notes. Calculators, computing, and communication devices are neither needed nor permitted. However, you are allowed to bring one 8.5 × 11-inch sheet of handwritten notes (both sides) to the first midterm exam, two sheets (all four sides) to the second midterm exam, and three sheets (all six sides) to the final exam. If you want to bring your sheet from the first exam to the second, then you have only one additional sheet for the second exam. Similarly, if you want to bring both your sheets from the second exam to the final, then you have only one additional sheet for the final exam.

General policies

Academic misconduct

The student handbook defines academic misconduct as follows.

Academic misconduct occurs when a student intentionally misrepresents his or her academic accomplishments or impedes other students’ chances of being judged fairly for their academic work. Knowingly allowing others to represent your work as theirs is as serious an offense as submitting another’s work as your own.

If you are ever in doubt as to the legitimacy of an action, please talk to me immediately. The penalty for academic misconduct at BU is severe.

Make-up exams

There will be no make-up exams. If there is a legitimate reason for missing an exam, such as illness as supported by a doctor’s note, then the scores of other exams will be used appropriately to compensate for the missed exam. If there is no legitimate reason provided for missing an exam, a grade of zero will be assigned for the missed exam.
Incomplete grades

Incomplete grades will not be given to students who wish to improve their grade by taking the course in a subsequent semester. An incomplete grade may be given for medical reasons if a doctor’s note is provided. The purpose of an incomplete grade is to allow a student who has essentially completed the course and who has a legitimate interruption in the course, to complete the remaining material in another semester. Students will not be given an opportunity to improve their grade by doing “extra work”.

Drop dates

Students are responsible for being aware of the drop dates for the current semester. Drop forms will not be back-dated.