Course Announcement - Spring 2017

Math 170: Introduction to Optimization

Instructor: Bernd Sturmfels

Office hours: Mondays 3-4:30pm; alternatively: before or after the lecture.
Contact: bernd at math, 925 Evans, phone messages: 642 6550

Lectures: Tuesdays and Thursdays 9:30-11:00, 3107 Etcheverry Hall

First Day of Class: Tuesday, January 17
Last Day of Class: Thursday, April 27
Midterm Exam: Thursday, March 2
Term Papers Due: Thursday, May 11

Prerequisites: Linear Algebra (Math 110)
Basics of mathematical software (e.g. SAGE, Maple, or Mathematica)
To brush up on MATLAB, consider enrolling in Math 98 this semester.

Course text: Introduction to Linear Optimization
by Dimitris Bertsimas and John N. Tsitsiklis, Athena Scientific 1997.

Syllabus: We will study topics from the following chapters in the text book:
1. Introduction
2. Geometry of Linear Programming
3. The Simplex Method
4. Duality Theory
5. Sensitivity Analysis
7. Complexity and the Ellipsoid Method
8. Interior Point Methods
10-11. Integer Programming
We will conclude with a brief introduction to **Semidefinite Programming**

The sections to be covered in each lecture are listed below. Please read these before coming to class.

Grading: There will be weekly homework sets and a midterm exam (in-class). The final is a term paper (take-home).
The grading scheme is: **Homework 35%, Midterm 30%, Term Paper 35%.**

Homework: There will be a weekly homework assignment, to be handed in on Tuesdays at 11:00am, at the end of class.
Late homework will not be accepted. No exceptions. The assignments, posted below, refer to the text book.
No homework after April 4, so you can focus on your term paper.

Final Exam: You will write a term paper on a topic of their choice related to the class. This can focus on foundational
mathematics (e.g. geometry and combinatorics of convex sets), or involve computing and software, or develop an
application of optimization that interests you. Your choice. You may work on this by yourself or in teams of two.
Please submit a proposal for your project by Thursday, March 23. This should fit on one page and contain:

names of author(s), title, sources, and a brief description. The final version of the paper is due on Monday, May 8.

DAILY SCHEDULE:
Jan 17: 1.1 Variants, 1.2 Examples, 1.3 Piecewise linear convex objective functions
Jan 19: 1.4 Graphical solution, 2.1 Polyhedra and convex sets
Jan 24: 2.2 Vertices, 2.3 Standard form, 2.4 Degeneracy
Jan 26: 2.5-2.6 Existence and optimality of extreme points
Jan 31: 2.7-2.8 Bounded polyhedra, 2.8 Fourier-Motzkin elimination
Feb 2:
Feb 7:
Feb 9: Mathematical Software for Optimization
Feb 14:
Feb 16:
Feb 21:
Feb 23:
Feb 28:
Mar 2: MIDTERM EXAM
Mar 7:
Mar 9:
Mar 14:
Mar 16:
Mar 21:
Mar 23:
Apr 4:
Apr 6:
Apr 11:
Apr 13:
Apr 18: Semidefinite Programming
Apr 20: Semidefinite Programming
Apr 25: Semidefinite Programming
Apr 27: Semidefinite Programming

Homework assignments:
due Jan 24: (Section 1.7) Exercises 1.1, 1.4, 1.7, 1.8, 1.12, 1.14, 1.19
due Jan 31: (Section 2.10) Exercises 2.1, 2.3, 2.4, 2.6, 2.7, 2.9, 2.10
due Feb 7:
due Feb 14:
due Feb 21:
due Feb 28:
due Mar 14:
due Mar 21:
due Apr 4: