ECONOMICS 172B:
Introduction to Operations Research (Part B)

Winter 2014

Basic information

Lectures	T/Th 12:30-13:50 CSB 001 & 15:30-16:50 SOLIS 104
Instructor	Prof. Alexis Akira Toda
Office hours	Tuesdays 14:30-15:20, ECON 211
Email	atoda@ucsd.edu
Webpage	`https://sites.google.com/site/aatoda111/`
	(Go to `Teaching` → `Operations Research`)
TA	12:30-13:50: Chen Liu (SH 232, chl110@ucsd.edu)
	15:30-16:50: William Leung (ECON 123, w2leung@ucsd.edu)

Course description

This course studies nonlinear (convex) programming and dynamic programming. Nonlinear programming means that we want to optimize (maximize or minimize) an objective function subject to some constraints, both of which may be nonlinear. Convex programming refers to the special case that the objective function and constraints are convex, in which case we can say more about the solution. The course also studies dynamic programming, which is a method of analyzing optimization problems that exploits the sequential structure of the problem. Examples of such problems are the decisions of savings or portfolio over time.

Prerequisites

Econ 172A or Math 171A. I assume that you are already familiar with some linear algebra and calculus, but we will review them during the class and TAs will provide additional instructions if necessary. Certain 'mathematical maturity' (familiarity with abstract thinking and manipulations of symbols) is helpful.

Text

There is no required textbook for this course. The reason is because textbooks on Operations Research are expensive, and I could not find a textbook in mathematics or economics that covers the material in this course at a suitable level.

Instead, I will post lecture notes on my webpage listed above. The standard textbook on Operations Research is [1], which covers all materials but at a level slightly lower than this course. [2] does not cover dynamic programming, but is a clear, concise textbook on convex programming at a higher level than the course.

Preliminary course outline

1. Introduction: overview of nonlinear and dynamic programming
2. Review of linear algebra and calculus
3. Convex analysis
4. Nonlinear programming
5. Convex programming
6. Dynamic programming
7. Duality
8. Applications

Assignments

There are no assignments for this course (because it is impossible to monitor you to do the assignments by yourselves). However, each lecture note will contain a few exercises. Solve them by yourself: this is the best way to understand the material and to get prepared for the exams. Time permitting, we will go through the solution of some of the problems during the class. Otherwise, TAs will explain them during review sections.

Exams

There will be two midterms and a final. Please mark your calendar:

Midterm 1 Thursday January 23, in class

Midterm 2 Tuesday February 18, in class

Final Tuesday March 18, time and location TBA

The exam dates are non-negotiable. If you miss a midterm for a documented, university approved reason (*i.e.*, illness, official university trip, etc.) the weight for that exam will be placed on the final. If you miss a midterm for another reason (*i.e.*, oversleep, vacation, etc.) you will receive a zero for that exam. No one will be allowed to start an exam after the first person leaves it. You are only permitted to use pens and pencils, a basic (*i.e.*, non-programmable) calculator, and a straight edge.

Grades

Your grade will be determined by the formula

$$G = 0.2 \max\{M_1, M_2\} + 0.2M_2 + 0.6F,$$

where G is the course grade and M_1, M_2, F are the scores on the midterms and the final. The idea of this formula is that I give you a chance to recuperate if you did badly in the first midterm. Regrade requests must be made through a written statement *before* the start of class one week after the exam was first passed back. Extensions will only be permitted if you have a documented, university approved reason for missing the entire week after the exam was first passed back. If you request a regrade I have the option to regrade your entire exam and your score could go up, down, or stay the same. My regrade decision is final.

Questions

If you have a question that cannot be resolved by googling or discussing with your friends, please first ask your TA. If still unresolved, you can show up during my office hour listed above (no appointment necessary).

Academic integrity

I take academic dishonesty seriously. Any student found guilty of academic dishonesty will earn a failing grade for the course. In addition to this sanction, the Council of Deans of Student Affairs will also impose a disciplinary penalty.

UCSD policy:
`http://senate.ucsd.edu/manual/appendices/appendix2.pdf`

Facts about academic integrity:
`http://students.ucsd.edu/academics/academic-integrity/facts.html`

Consequences of cheating:
`http://students.ucsd.edu/academics/academic-integrity/consequences.html`

References

[1] Frederick S. Hillier and Gerald J. Lieberman. *Introduction to Operations Research*. McGraw-Hill, 9th edition, 2010.

[2] Jonathan M. Borwein and Adrian S. Lewis. *Convex Analysis and Nonlinear Optimization: Theory and Examples*. Canadian Mathematical Society Books in Mathematics. Springer, New York, second edition, 2006.