Introduction to Operations Research

Economics 172A, Fall 2014

General Information

Homepage (with link to handouts for course):
`http://weber.ucsd.edu/~jsobel/172f14/172f14home.htm`
Instructor: Joel Sobel, office hours 12:30-1:50 Wednesday in 311 Econ.
TAs: Ying Jenny Feng, office hours 8:00- 9:20 AM, Tuesday in SH 208
Seung-Keun Martinez, office hours 3:300-4:50, Monday in SH 236

My office phone: (858) 534-4367
Warning: I will not answer my phone if a student is in the office.
If you want to contact us via email, please use the class account: econ172af14@gmail.com.

Description

Economics 172A is the first course in the two-quarter Operations Research sequence. It covers linear and integer programming. Linear and integer programs are types of mathematical optimization problems. The class will introduce you to the problems, teach you how to formulate economic problems as programming problems, teach you how to solve these problems, and teach you how to interpret the solutions to these problems.

Course Material

I will follow the lecture notes that you can view and download from the class web page or at soft reserves. The notes concisely describe the main ideas of the class.[1] These notes do not cover everything, nor do they give all of the details, but they will make lectures easier to follow. Tests cover only material discussed in lectures, lecture notes, and in problems.

I have posted the notes on the class web page (that means that there is no need to buy them at soft reserves). In addition, the web page contains links to old problems and exams (and solutions).

The Bookstore also has copies of (HL) Hillier and Lieberman: Introduction to Operations Research, McGraw-Hill. Copies of the book are also available at Geisel Reserves. Page references below are to the ninth edition. Earlier editions are fine, but pagination may differ. This book is a useful supplement. You should buy the book if you have trouble following the lectures or my notes. You should buy the book if you have more money than you can spend. The book is quite expensive, however, and not essential. Most of the material in the course is standard. You can find decent treatments in other sources. See me if you need advice.

It would be useful to have access to software that solvers linear programming problems. There are several options. The Hillier and Lieberman comes with software. Google documents has a free "cloud based" solver. There are also free solvers than are compatible with Microsoft Excel. (Recent versions of Excel already have the solver: To enable solver in Excel 2011 for MAC, open Excel, click Tools then Addins. Within the Addin box, check 'Solver.xlam' then hit OK. For Excel 2010 for PC, the instructions are: Click the Microsoft Office Button Button image, and then click Excel Options. Click Add-Ins, and then in the Manage box, select Excel Add-ins. Click Go. In the Add-Ins available box, select the Solver Add-in check box, and then click OK. If Solver Add-in is not listed in the Add-Ins available box, click Browse to locate the add-in. If you get prompted that the Solver Add-in is not currently installed on your computer, click Yes to install it. After you load the Solver Add-in, the Solver command is available in the Analysis group on the Data tab.

In some cases you must download a free add on.) The notes describe how to use Excel's solver.

[1] The web page contains links to some material that will not be covered in the class or on examinations.

Preparation

You should be comfortable with linear algebra, basic microeconomics, and the operation of a spreadsheet computer program. In order to enroll in the class you must have the requirements listed in the UCSD catalog.

Wait List

I have no authority to add people to the class. Direct all questions to the departmental undergraduate office, Sequoyah Hall 245.

Grading

There will be an in-class midterm examination on Thursday, November 6. There will also be an in-class final examination on Thursday, December 18 from 8:00 AM-11:000 AM. There will be four short quizzes, to be held on October 16, October 30, November 20, and December 4. I will determine your grade on the basis of your three best quiz performances (15% total); the midterms (35%); and the final examination (50%). The final will be cumulative.

Homework assignments are an important way to prepare for the examinations. For a variety of reasons, I find that they are not a good way to evaluate effort or understanding. I urge you to work problems (available on the class web page).

I do not follow a rule that determines the fraction of the class that receives a particular letter grade. There is no strict percentage needed to attain a particular letter grade. I will give vague feedback after assessments, but I will not provide letter grade information until the end of the class.

How to Study

This course introduces a few ideas and mathematical techniques. You will need to learn the ideas and how to apply the techniques. Doing so requires practice. The web page has many old problems and exam questions (with solutions). The text also contains many good practice problems. Working these problems is the best way to prepare for the examinations. Old programs and homework assignments help you develop the skills needed to do well on exams. On examinations I usually want you to demonstrate that you understand how to solve problems and what the answers mean.

Paternalistic advice: Listening to lectures/reading the book/reading the notes/reading the answers to problems and thinking "I followed that" is not a good way to guarantee you are prepared for examinations. Much better is working problems and then checking to see whether your answers are correct. Better still is creating problems similar to exam questions and then answering them correctly.

There will be sections on Thursdays in WLH 2204 from 6–6:50 PM and from 7–7:30 PM.

Administrative Matters

I will give no late examinations without compelling (and fully documented) medical excuses. I am generally unsympathetic to requests for special timing of examinations. Under no circumstances will I change the time of a quiz. If you are unable to come to class for one quiz, the other three quizzes will determine your grade.

You may use no electronic devices, notes, books, or your classmates' exam papers during the midterm or the final.

I take violations of academic honesty seriously. Any act of academic dishonesty will be reported to your academic dean, will lead to a failing grade in the course, and possibly dismissal from the university. If you have any doubts about what constitutes academic dishonesty, please consult me.

Outline and References

Below is a schedule of topics to be covered and associated readings in (HL). (The page references are from the edition that I ordered - earlier editions do not differ greatly. If you have access to an

earlier edition, you should have little trouble finding the relevant reading.) In the column labeled "problems" the first line gives page and problem numbers in Hillier and Liebermann's book.

The class web page has links to old problem sets and the last final examination of the course (and answers to these questions). These also contain relevant problems.

Date	Topic	Notes	Reading	Text Problems
10-2, 10-7	Introduction/Problem Formulation	I	30-60	77:3.1-7–10; 81:3.4-9–17
10-9	Graphing	II	27–29	79:3.1-12–14: 80: 3.4-5–8
10-14, 10-16	Duality	VI:1-6	195-206	261:6.1-4–10
10-16	Quiz I			
10-21 10-23	Complementary Slackness	VI: 7-12	206–215	262: 6.5,6
10-28, 10-30	Interpretation of Dual	VI: 12–17		
10-30	Quiz II			
11-4	Sensitivity Analysis	VII	217–259	271:6.8-1–8
11-6	Midterm Examination			
11-13	Sensitivity Analysis Continued			
11-18, 11-20	Integer Programming: Basics	X: 1-4	464–491	p. 524:11.1-1–7
11-20	Quiz III			
11-25	Branch and Bound	X: 4-8	491–515	529:11.6-1–6; 530: 11.7-2–3
12-2, 12-4	Network Algorithms	X: 8-21	358–389	412:9.3-2–5, 414:9.4-1-3; 9.5 3–5
12-4	Quiz IV			
12-9, 12-11	Transportation Problem	VIII	304–318, 334–347	350:8.2-1–3, 355:8.4-4–6
12-18	Final Examination 8:00 AM- 11:00			