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

Winter 2019 Lectures: MWF 1:00 – 1:50 pm in Solis 104

Prof: Herb Newhouse email: hnewhouse@ucsd.edu
Office Hours: TBA Office: Econ 108
Course webpage: https://tritoned.ucsd.edu/

TAs: Wonhyong Choi (woc001@ucsd.edu) and Songyu He (soh038@ucsd.edu) Office Hours: TBA

This course primarily studies non-linear programming. We will examine optimization problems where the objective function, the constraint, or both are non-linear. We will use computational methods to find approximate solutions and calculus to find exact solutions. The course also studies dynamic programming, search models and inventory models. Dynamic programming is a method of analyzing optimization problems that exploits the sequential structure of the problem.

Prerequisites:

ECON 172A or Math 171A.

Lectures and Problem Sessions:

You are responsible for all the material in the lectures and problem sets. Partial notes will be available on the class webpage before each lecture. I recommend that you print these out before hand and fill in the missing information as we go. I'll do my best to avoid typos but you're responsible for the correct material. I want you to understand the material instead of simply memorizing it. The audio and material projected on the screen will be podcasted. If you miss a lecture, borrow someone's notes. Discussion Sessions are optional but recommended.

Exams:

Your grade will be determined on the basis of two Midterm Exams (25% each) and the Final Exam (50%). Alternatively your lower midterm will count for 15%; your higher midterm will count for 25% and your final will count for 60%.

Midterm 1 will be held in class on Wednesday, January 30th. Midterm 2 will be held in class on Monday, February 25th. The final exam will be held on Friday, March 22nd from 11:30am – 2:30pm. If you know in advance that you cannot make an exam, please let me know as soon as possible.

You must get the instructor's permission (in advance if possible) if you miss a midterm. If you miss a midterm for an approved reason the weight for that exam will be placed on the final. If you miss the final exam for a documented, university approved reason (ie., illness, official university trip), you will most likely receive an Incomplete for the class and will need to make-up the exam during the following quarter. If you miss the final exam for another reason (ie., oversleep) you will receive a zero for the 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 straight edge and a **single** note sheet during each exam. Calculators are **not** permitted. The note sheet can be any size up to 8.5" by 5.5" for the midterms and up to 8.5" by 11" for the final. It may **only** have handwritten notes on both sides. Computer printed, typed or mechanically reproduced notes are not permitted. Do **not** attach anything to your note sheet. If your note sheet does not adhere to any of these conditions it will be immediately confiscated during the exam. Additionally a report may be filed with the Academic Integrity Office.

If seats are assigned for exams, anyone not sitting in his or her assigned seat will lose points (potentially to zero) for that exam. If there is a problem with your assigned seat please let us know so we can reassign you.

Academic dishonesty:

I take academic dishonesty seriously. Any student found guilty of academic dishonesty will most likely 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. For a review of UCSD policy, please see http://www-senate.ucsd.edu/manual/appendices/app2.htm.

Regrade requests:

Regrade requests may be submitted via Gradescope during the weeklong regrade period. The regrade period will probably begin a day or two after the midterm results are made available to the class and will probably take place during week one of Spring 2019 for the final exams. **Anyone who contacts the instructor or any of the TAs regarding the grading of an exam or the grading for the course before the regrade period begins forfeits his or her option to request a regrade for that exam.** If your TA agrees with your request, your score for that question will be corrected. If your TA disagrees with your request, you will lose 1 point for a midterm question and 3 points for a final question.

Text:

Introduction to Operations Research, 10th Edition, Hillier and Lieberman, McGraw-Hill. I will give references for the 10th edition but other recent editions should also be fine. The material for this course is fairly standard; other Operations Research texts are also likely to be helpful.

Practice Questions:

Practice questions will be available online. We will go over these questions in office hours and in the discussion sections. Your best practice for the exams is to try these questions yourself first.

Preliminary Course Outline:

1. Introduction
    - Ch. 12: Intro.
    - 12.1: Sample Applications.
    - 12.2: Graphical Illustration of Nonlinear Programming Problems.
    - 12.3: Types of Nonlinear Programming Problems.
2. Concavity and Convexity
    - Appendix 2: Convexity.
    - Appendix 3: Classical Optimization Methods.
3. Unconstrained Optimization
    - 12.4: One-variable Unconstrained Optimization.
    - 12.5: Multivariable Unconstrained Optimization.
4. Equality Constrained Optimization
    - Briefly covered in readings for Introduction and Concavity and Convexity.
5. Inequality Constrained Optimization (KKT)
    - 12.6: The Karush-Kuhn-Tucker (KKT) Conditions for Constrained Optimization.
    - 12.7 Quadratic Programming.
    - 12.8 Separable Programming.
    - 12.9: Convex Programming.
    - 12.10: Nonconvex Programming (with Spreadsheets).
6. Dynamic Programming
    - 10.1: A Prototype Example for Dynamic Programming.
    - 10.2: Characteristics of Dynamic Programming Problems.
    - 10.3: Deterministic Dynamic Programming.
    - 10.4: Probabilistic Dynamic Programming.
7. Search Models