

Instructor: Herb Newhouse (hnewhouse@ucsd.edu)

Course webpage: <https://canvas.ucsd.edu/>

Office Hours: Tue from 10:00 am – 12:00 pm on Zoom and Wed from 10:10 – 11:10 am in Econ 108

Lectures: MWF 8:00 – 8:50 am in PETER 102      Discussions: M 2:00 – 2:50 pm in WLH 2204 or Zoom

Note: Discussion sections will begin in week two. You may attend the week one discussion section on Wednesday from 6:00 – 6:50 pm in FAH 1450 or on Zoom.

TA: Evgenii Baranov (evbarano@ucsd.edu)

Office Hours: TBD

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 and search models. Dynamic programming is a method of analyzing optimization problems that exploits the sequential structure of the problem.

Prerequisites:

ECON 172A or Math 171A.

You are responsible for all the material covered in lecture and in the problem sets. Partial notes will be available on the class webpage before each lecture. I recommend that you print these out beforehand and fill in the missing information. I will try to avoid typos but you are responsible for the correct material. I want you to understand the material instead of simply memorizing it. If you miss a lecture, watch the appropriate podcast or borrow someone's notes. We will schedule a review session for each exam. Discussion sections are optional but recommended.

Lectures will be held in person and podcasted. Review sessions and discussion sections will be recorded.

Grading:

My prediction of how I will assess you in this course is:

Your grade will be determined based on two Midterm Exams (25% each) and a 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%. If you miss an exam for a documented, university approved reason (ie., illness, official university trip), the weight for that exam will be shifted to your final exam. If you miss an exam for another reason (ie., oversleep, forget the time), you will receive a zero on the exam.

Midterm 1 will be held in class on Friday, April 21st. Midterm 2 will be held in class on Monday, May 15th. The final exam will be held on Friday, June 16th from **8:15 – 10:45 am**. If you know in advance that you cannot make an exam, please let me know as soon as possible.

You are only permitted to use pens and pencils, a straight edge and a **single** note sheet during each exam. The note sheet can be double-sided. It can be any physical 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. Electronically produced (computer/iPad printed, photocopied, etc.) notes are **not** permitted. Do **not** attach anything to your note sheet.

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

While I will do what I can to keep to the predicted assessments for this course, it may become necessary for me to make changes.

#### 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 only be submitted via Gradescope during the weeklong regrade period. A separate request needs to be made for each part that you would like regraded. The regrade period will probably begin a day or two after the exam results are made available to the class. Please do not contact the instructor or any of the TAs regarding the grading of an exam or the grading for the course before the regrade period begins. If your TA and I agree with your request, your score for that question will be corrected. If we disagree with your request, you will lose 1 point for each part of a midterm question and 2 points for each part of a final exam 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.

#### Problem Sets:

Problem sets 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