Economics 701: Analytical Methods for Mathematical Economics

Contacts

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Course

Meetings

Monday/Wednesday, 9:05am–10:20am
Gardner 001

Friday, 9:05am–9:55am
Gardner 001

Office hours

Wednesday, 1:30pm–3:30pm
Gardner 305A

[TBD]
[TBD]

Goals

The purpose of this course is twofold: first, it is to help you become conversant in the necessary tools underlying formal economic analysis. Second, it is to help you learn to employ robust logical arguments as a matter of habit. These goals are mutual side effects, and will be treated as equally important.

Prerequisites

There are no prerequisites for this course.

Resources

There is no textbook for this course. If you are interested in further references, the following texts may prove useful:

- ⊞ C. Pugh. *Real Mathematical Analysis*, Springer International Publishing, 2015.
- ⊞ A. Kolmogorov and S. Fomin. *Introductory Real Analysis*. Courier Corporation, 1975.
- ⊞ W. Rudin. *Principles of Mathematical Analysis*. McGraw-Hill, 1976.
- ⊞ N. Stokey and R. Lucas. *Recursive Methods in Economic Dynamics*. Harvard University Press, 1989.

As with other things in life, many problems that you run into — or definitions that you forget — may be addressed through Google. Peter Norman has also developed a comprehensive set of notes for this course.

You are encouraged to use your classmates as resources. If you need further assistance, contact Haoran or myself.

Grading

Problem sets

There will be five problem sets, roughly evenly distributed across the semester. You are expected to be able to complete the problem sets yourself, but may submit your final work in groups of up to three students; this reduces both Haoran's labor and your own. **Submitted problem sets must be typeset and not handwritten.** Problem sets will be due **at the beginning** of Monday lecture, and will be graded on a $\checkmark+|\checkmark|\checkmark-$ basis.

Exams

There will be one midterm and a final exam. The final exam will be cumulative, but will over-emphasize the material that did not appear on the midterm.

Grades

Your final grade will be one of $\{\mathrm{H}, \mathrm{P}, \mathrm{L}, \mathrm{F}\}$. Five problem sets will comprise 25% of this grade, the midterm will count for a further 30%, and the final exam will make up the remaining 45%.

Agenda

There is some room for variance in each of the topics we will discuss. Depending on time and interest, we may go more or less in depth into a particular area.

1. **Set theory**
   Sets, functions, countability

2. **Metric spaces**
   Metrics, sequences, convergence, basic topology

3. **Function spaces**
   Convergence, basic measure theory

4. **Fixed points**
   Brouwer, Kakutani, contraction mappings, Blackwell

5. **Linear algebra**
   Convexity, separating hyperplanes

6. **Optimization**
   Concavity and quasiconcavity, maximum theorem, envelope theorem