SYLLABUS

Course title: Mathematical Economics
Term: Spring 2020
Meeting times and location:
TA session:

Course Description

This course is to provide the necessary mathematical background for the undergraduate courses in microeconomics, macroeconomics. This course includes three parts: (1) we first cover introductory real analysis and static optimization;(2) we discuss dynamic optimization in both continuous-time and discrete-time; (3) we introduce useful numerical methods and fundamental computation theory. The objective of the course is to teach several important tools to be used in future research in model economics.

Learning Outcomes or Course Objectives

Understand the basic mathematical structure and conclusion of modern economic models. Become familiar with both analytical and numerical methods in solving both static and dynamic models. While improving mathematical literacy and sophistication is an important goal, this course will not provide adequate preparation for those wishing to specialize in econometric theory.

Instructor Information

Name: Shenzhe Jiang
Email address: shenzhejiang@nsd.pku.edu.cn
Office Hours:
Office location: Exchange Center 417N

TA Information

Name:
Email address:

Textbook and/or Resource Material

1. **Principles of Mathematical Analysis** Walter Rudin, McGraw-Hill Education, 1976, Third Edition.
2. **Introductory Real Analysis** A. Kolmogorov, S. Fomin and Richard Silverman, Dover Publications, 1975.
3. **Mathematics for Economists** Carl Simon and Lawrence Blume , W. W. Norton Company , 1994,

4. **Recursive methods in economic dynamics.** Nancy Stokey, Robert Lucas and Edward Prescott, Harvard University Press, 1989.

5. **Recursive macroeconomic theory.** Lars Ljungqvist and Thomas Sargent, The Mit Press, Third Edition.

6. **The Economics of Inaction** Nancy Stokey, Princeton University Press, 2009.

7. **Numerical Recipes: The Art of Scientific Computing** William Press,Saul Teukolsky, William Vetterling and Brian Flannery, Press Syndicate of the University of Cambridge, 1992

Grading Policies

Your final grade $\in [0, 100]$ will be based on homework assignments (20 percent), one midterm (35 percent) and a comprehensive final exam (45 percent). Late work is not accepted, unless proof of a university-authorized excuse is presented. Make-ups on the midterms and the final exam are available only to those with university approved valid justification. If you miss a midterm or the final, you are responsible for providing the evidence of unusual circumstances. Based on satisfactory evidence, you will receive a prorated score.

Grading Scale

Standard Letter Grading Scale:
A = 90-100
B = 80-89
C = 70-79
D = 60-69
F = $<$ 60

Course Outline

- Mathematical Foundation
  - basic concepts in topology
  - metric space
  - measure spaces and probability
- Finite-Dimensional Convex Analysis
  - convex separation and neoclassical duality
  - Kuhn-Tucker Theorem and Lagrange multipliers
  - fixed-point theorem and general equilibrium
- Dynamic Optimization in Discrete Time
  - sequential problems and difference equations
  - recursive representation and optimally principle
  - contraction mapping theorem and maximum theorem

  - dynamics of neoclassical growth model
  - stochastic dynamic programming
- Dynamic Optimization in Continuous Time
  - deterministic optimal control and Hamiltonian system
  - introductory stochastic process and Brownian motion
  - Hamilton-Jacobi-Bellman equation
  - impulse control and instantaneous control
- Numerical Computation
  - interpolation and extrapolation
  - root finding and nonlinear sets of equations
  - minimization or maximization of functions
  - integration of ordinary differential equations