

Mathematical Methods of Economic Analysis

ECO 7405 (Fall 2019)

Class Times

The class meets on Tuesday and Thursday from 5:00pm to 6:15pm in DM-193.

Course Description

The most commonly used mathematical methods in economics relate to optimization problems, and this course focuses on methods of optimization.

The first part of the course develops some basic mathematical tools of analysis which we will use to solve optimization problems. This covers roughly parts II and III of the text, and may include excerpts from part VI. The second part (part IV of the text) covers classical, calculus-based methods of optimization—Lagrange multipliers and the Kuhn-Tucker theorem. The methods of Lagrange and Kuhn-Tucker have been invaluable in solving many of the problems you will typically encounter in economics (consumer and producer choice, social welfare max, etc.). The remainder of the course covers more advanced topics from Parts VII and V of the text. These include the issue of whether an optimization problem actually has a solution, and a look at economic dynamics. If time, we will look at dynamic optimization.

Textbook

- Carl Simon and Lawrence Blume, *Mathematics for Economists*, W. W. Norton, New York, 1994.

Simon and Blume's book is the main text. I plan to cover Parts II-IV and VII of Simon and Blume, with some excerpts from Part VI. Time permitting, we will then turn our attention to Part V and dynamic models.

Optimization Handout

You may find this handout on basic optimization helpful: [Constrained Optimization Survival Guide](#).

Office Hours and Contact Info

If you have questions, you may ask immediately after class, or come to my office. Regular office hours are 12:45-1:45pm and 3:30-4:15pm on Tuesdays and Thursdays. I will be happy to make an appointment for another time if that is more convenient. My office is **DM-311A**, my office phone number is **348-3287**, and my email is <boydj@fiu.edu>.

Exams and Homework

Grades will be based on two in-class midterm exams (worth 25% each), a final exam (40%), and homework assignments (10%). In addition to being announced in class, homework assignments will be posted below.

Homework Assignments and Answers

Assignments will appear here. Answers will be posted sometime after the homework is collected.

Exams

There will be two in-class midterm exams, each worth 25% of your grade, and a final, worth 40% of your grade.

- The first midterm is tentatively scheduled for **Tuesday, October 1** in **DM-193**.
- The second midterm is tentatively scheduled for **Tuesday, November 5** in **DM-193**.
- The final will be at the officially scheduled time, **Tuesday, December 10** at **5 pm** in our usual classroom, **DM-193**.

Sample Exams

The material covered varies from year to year and some of the questions on previous exams may not be relevant for the material we cover this year. A few of the answers contain minor errors.

Old First	Old Second	Old Finals
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Midterms	Midterms	
2000	2000	2000
2001	2001	2001
2002	2002	2002
2003	2003	2003
2011 questions, answers	2011	2011
2012, with answers	2012, with answers	2012, with answers
2013, with answers	2013, with answers	2013, with answers
2014, with answers	2014, with answers	2014, with answers
2015, with answers	2015, with answers	2015 questions, answers
2016 questions, answers	2016 questions, answers	2016 questions, answers
2017, with answers	2017, with answers	2017, with answers
2018 questions, answers	2018 questions, answers	2018 questions, answers

Course Outline

Subject to change, as happened due to Hurricane Irma.

Aug. 27	6: Intro to Linear Algebra (and use in Economics)
Aug. 27, 29	7: Linear Systems
Sept. 3	8: Matrix Algebra
Sept. 5	9: Determinants & some of 26: Determinants
Sept. 10, 12	10: Euclidean Spaces
Sept. 17	11: Linear Independence, Bases (see also Chap. 27)

Sept. 19	12: Limits and Open Sets
Sept. 24, 26	29: Limits and Compact Sets + Completeness
Oct. 1	Exam #1 — through Chapter 12 + part of 26 and 27
Oct. 3	13: Functions of Several Variables
Oct. 8	14: Calculus of Several Variables 30.1: Weierstrass Theorem
Oct. 10	29.3: Connected Sets Intermediate Value Theorem
Oct. 15	15: Implicit Functions and their Derivatives
Oct. 17	16: Quadratic Forms and Definite Matrices
Oct. 22	17: Unconstrained Optimization
Oct. 24	30.1-3: Mean Value & Taylor's Theorems 18: Constrained Optimization I: First-order Conditions
Oct. 29	18: Constrained Optimization I: First-order Conditions
Oct. 31	19: Constrained Optimization II: Multipliers and Second-order Conditions
Nov. 5	Exam #2 — Chapters 13-18, 29 & 30
Nov. 7	20: Homogeneous and Homothetic Functions
Nov. 12	21: Concave and Quasiconcave Functions
Nov. 14, 19	23: Eigenvalues and Eigenvectors
Nov. 21	23: Eigenvalues and Eigenvectors, Complex Solutions
Nov. 26	24: Ordinary Differential Equations: Scalar Equations
Nov. 28	<i>Thanksgiving Holiday (no class)</i>
Dec. 3	25: Ordinary Differential Equations: Systems of Equations
Dec. 5	Introduction to Control Theory
Dec. 10	Final Exam: 5pm in DM-193