AEB 6933: MATHEMATICAL OPTIMIZATION AND ECONOMIC ANALYSIS
Fall 2017

Meeting time:
Tues 11:45 am - 1:40 pm
Thurs, 12:50-1:40 pm, Flint Hall Rm 109

Instructor:  
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Teaching Assistant:  
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Course Description: This is a course in quantitative economics and its applications, with heavier emphasis on linear models and how they relate to microeconomic theory in both static and dynamic settings.

The first part of the course reviews the foundations of the mathematical analysis with the goal of modeling feasibility; i.e., the set of possible choices. This prepares us to next move to modeling the optimal choice with an extended presentation on optimization theory and application in the static setting. The final part of the course moves on to the methods for engaging in dynamic optimization.

Prerequisites: Multivariate calculus, matrix algebra. Concurrent registration with graduate microeconomic theory is expected.

Course Requirements: Grades for the course will be based on:

- Midterm examinations (30%), the midterm examination will be given in class.
- Final exam (40%)
- Several problem sets and small projects (total 30%).
Course Materials:

- **Text:** There is no formal text being used in the course, but we will follow topics that are accessible in a number of outlets. I will assign and recommend readings that are available digitally through University of Florida Libraries. These include:

  - Hackman, Steven, Production Economics: Integrating the Microeconomic and Engineering Perspectives, Springer 2008 [DOI: 10.1007/978-3-540-75751-1]

  There are a number of fine mathematical economics texts available that you could also use for reference. Examples include:


- **Software:** Some of the outside work for this course will involve computer assignments. R will be the software of choice but students may use any computer software that they are familiar with for this purpose.
Readings: Some relevant articles from the literature will be suggested (not required). A few are useful pedagogical literature, and students intending to do empirical research for their dissertations will probably find them worthwhile reading. The others are a selection from a huge literature that should be both interesting and accessible to students in this course.

PART I: FOUNDATIONS OF MATHEMATICAL APPROACHES

Most readings to support this area can be found in Simon & Blume, Chapter 12; Rockafeller, Part I; Hackman, Appendix

A. General Analysis
   a. Sets
   b. Vectors
   c. Relations and Functions

B. Convex Sets
   a. Representations
   b. Lines and hyperplanes
   c. Convex cones
   d. Extreme point
   e. Convex hull
   f. Convex and concave functions [Simon & Blume, Chapter 21]

C. Continuity
   a. Metric spaces
   b. Convergence and limits
   c. Completeness
   d. Compactness
   e. Continuity
PART II: Optimization

A. Mathematical Programming
   a. Types of Maxima/Minima
      i. Weierstrauss & Local-Global Theorem [Simon & Blume, Chapter 30]
   b. Classical Programming (Unconstrained) [Luenberger & Ye, Chapter 1]
   c. Nonlinear Programming [Luenberger & Ye, Chapter 1; Stefanou Lecture Notes]
      i. Primal/Dual [Luptacik, Chapter 3]
      ii. Equality
      iii. Inequality (Kuhn-Tucker Theory) [Stefanou Lecture Notes; Luptacik, Chapter 2]

B. Linear Programming [Luptacik, Chapter 4; Luenberger & Ye, Chapter 2 & 3]
   a. Primal and Dual
   b. Complementary slackness
   c. Simplex Algorithm

C. Microeconomic Theory Applications
   a. Input requirement set construction (inner vs. outer bounds) [Hackman, Chapters 3 & 4]
   b. Distance Functions as LP problems [Hackman, Chapter 7; Luptacik, Chapter 5]
      i. Radial Distance Functions
      ii. Directional Distance Functions
   c. Optimization

PART III: Dynamic Optimization

Most of this work is supported by lectures and material to be distributed.

A. Two period problem [Silva, Stefanou & Oude Lansink, Chapter 3]
   a. Functionals vs. Functions
   b. Microeconomic theory applications: Cost minimization

B. Continuous time problem
   a. Hamilton-Jacobi-Bellman equation
      i. Optimal Control
      ii. Economic interpretations
b. H-J-B equation as mathematical programming problem [Silva, Stefanou & Oude Lansink, Chapters 6 and 7]
c. Applications

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The Honor Code (http://www.dso.ufl.edu/sscr/process/student-conduct-honorcode/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.”

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If you or a friend is in distress, please contact umatter@ufl.edu or 352 3921575 so that a team member can reach out to the student.

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University Police Department, 392-1111 (or 9-1-1 for emergencies).
http://www.police.ufl.edu/

Academic Resources E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learningsupport@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. http://teachingcenter.ufl.edu/


Student Complaints Campus:
Students Complaints: http://www.distance.ufl.edu/student-complaintprocess

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The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Contact information is at 0001 Reid Hall, 392-8565, www.dso.ufl.edu/drc/