Mathematical Economics (ECON 600)
Fall 2006

Instructor: Yusufcan Masatlioglu

Lectures: W 1:00-3:00 PM in 173 Lorch Hall

Office Hours: Thursday, 9:00 to 11:00 and when needed.

Suggested Textbooks:

- Royden *"Real Analysis"* (Prentice Hall, 3e: 1988)
- Sundaram *"A First Course in Optimization Theory"* (Cambridge, 1e: 1996)
- Simon and Blume *"Mathematics for Economists"* (W.W. Norton, 1e: 1994)
- All of these texts are classics for their respective subjects, and are important reference books. You can also look at the lecture notes of Efe Ok (NYU), *"Real Analysis & Probability Theory with Economic Applications."*

A Recent Change:

Econ 600 (Mathematics for Economists) used to be a course that meets four hours a week in the fall. Now it is changed to a course that meets two hours a week for the first 13 weeks of the fall and two hours a week for the first 10 weeks of the winter semester. You will receive a single grade for the fall and winter combined.

Brief Description and Aim:

This course is concerned with developing the basic mathematical tools needed for advanced study in economics. It will also improve your understanding of economic theory; make your other economics courses much easier.

Do we have to study math in order to do economics? Yeah. You got to have a quantitative mind. It might even be fun. We should consider "math" as a language which is a way of representing and conveying information. You might not like to learn another language but you have to if you want to communicate with others. Now I am guiding you to learn and love (if possible) a different language, math. Math helps us to understand much more complicated material.

In this course, we will not only solve problems but also prove things, and that is a significant conceptual part of this course. This will require you to take a more formal approach to mathematics. Not only will you need to know these, but you will have to understand them, and be able (through the use of them) to demonstrate that you understand them. Simply learning the definitions without understanding what they mean is not going to be adequate.

I highly recommend you to study for this course on a daily basis to produce the best outcome. Doing assigned exercises is essential for your success. Since each topic is built on preceding topics, make sure that you understand the core of the material before we move to the next topic. Do not hesitate to contact me and/or your GSI for your questions.

Organization and Grading:

For each semester,

- 2 Quizzes 30%.
- Midterm 30%.
- Final (Wednesday, Nov 29th) 40%.

Homework & Quiz Policy:

Homework will usually be assigned once a week (on Wednesday) and won't be graded. However, the subject material of the quizzes will be taken from the homework assignments and lectures. That is why it is strongly recommended that you do **all of the homework yourself.** The purpose of the quizzes is to aid students in keeping current on the homework and lecture material. There will be two quizzes. Each quiz will last 30 minutes. Quizzes are important and will be part of your grade. So it is important that you do not miss any of them. Students will not be allowed to make-up a missed quiz. Both quizzes will be closed book and closed notes.

Syllabus:

FALL 2006

# 1	Sep 6	**Introduction & Basics**	Elements of Set Theory and Logic How to do "proofs"?
# 2	Sep 13	**Mappings**	Relations, Functions, Sequences, Correspondences, Vectors, Matrices
# 3	Sep 20	**Analysis in** R (**Quiz**)	Sequences in R, Lim Inf and Lim Sup, Limits Sequences in R,
# 4	Sep 27		Functions in R, Continuity, Differentiation and Integral,

# 5	Oct 4	**Metric Spaces**	Definition and Examples , Open Balls in a Metric Space, Open Subsets of a Metric Space,
# 6	Oct 11	**Quiz**	Closed sets, Closure of a set, Relatively open subsets,
# 7	Oct 18		Compact Sets, Completeness,
# 8	Oct 25		Continuity of Correspondences
# 9	Nov 1	**Midterm**	The Maximum Theorem Fixed Point Theorem
# 10	Nov 8	**Linear Spaces**	Introduction, Linear Subspaces, The Span of A Set of Vectors, Linear Independence and Basis,
# 11	Nov 15		Hyperplanes, Orthogonal Projections,
# 12	Nov 22		Subsets of Linear Spaces, Affine Sets, Convex Sets and Convex Hulls, Simplex and Convex Cone, Eigenvalues and Eigenvectors,
# 13	Nov 29	**Final**	

The dates on this Syllabus are tentative and could be varied as the course develops.

	WINTER 2007 (Tentative)
Optimization	Existence
	Unconstrained Optimization
	First Order Conditions
	Second Order Conditions
Constrained Optimization	Equality Constraints
	The Theorem of Lagrange
	Constraint Qualifications
	Second Order Conditions
	Sensitivity Analysis
Constrained Optimization	Inequality Constraints
	The Kuhn-Tucker Theorem
	Mixed Constraints
Dynamic Programming	The Maximum Principle
	Bellman Equation
	Contraction Mappings
	Existence of an Optimal Strategy
	Continuity and Differentiability