INTRODUCTION TO MATHEMATICAL ECONOMICS
EC705: Fall 2009

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TEXTBOOKS: There is no single text available that covers all relevant material at a suitable level. Thus I propose that students supplement class lectures by choosing one or more of the following books; they should be available at the BU Barnes and Noble.

1. A. Kolmogorov and S. Fomin, *Introductory Real Analysis*, Dover, 1975.
2. R.K. Sundaram, *A First Course in Optimization Theory*, Cambridge U. Press, 1996.
3. E. Ok, *Real Analysis with Economic Applications*, Princeton U., 2007.

I recommend #1 to everyone. It is a nice introduction to real analysis and, being a Dover series paperback, should be inexpensive, say about $10. The other two are optional and you should buy at most one of them. The book by Ok is more advanced and covers much more than we will need in the course, but it could serve as a useful reference in the future years. Sundaram's book does not cover all the topics we will discuss, but it might be preferable for those with weak math backgrounds. I will *not* rely on any of the books explicitly - lectures will be comprehensive and assigned exercises will be written out in full and distributed. Thus you might even manage well without either #2 or #3.

COURSE OUTLINE:

1. Metric Spaces: metrics, convergence, closed/open/compact sets, continuous functions, usc/lsc functions, Weierstrass Theorem, normed spaces. Important examples: $C([a,b])$ with the sup norm, ℓ_p spaces $(1 \leq p \leq \infty)$

2. Correspondences: upper and lower hemicontinuity, Maximum Theorem

3. Dynamic Programming: Value functions, Principle of Optimality, Bellman equation, complete metric spaces, the Contraction Mapping (or Banach) Theorem, Blackwell's sufficient conditions

4. Fixed Point Theorems: Brouwer, Schauder, Kakutani, existence of "equilibrium"

5. Convexity: convex sets in $\mathbb{R}^n$, concave/convex functions, quasiconcave/ quasiconvex functions, separation theorems

6. Constrained optimization: Kuhn-Tucker Theorem

7. Order: partially ordered sets and lattices, monotone functions and correspondences, supermodular functions, Monotone Maximum Theorem, Tarski Fixed Point Theorem. (This material will be covered only if time permits.)

How Will the Course be Run?

There will be two lectures and one tutorial weekly. There will be weekly assignments. They are not to be turned in; indeed, solutions will often be made available when the exercises are assigned. However, the ONLY way to learn the material is to attempt the exercises before reading the solutions. Simply reading the solutions is a waste of time. Many of the exercises are nontrivial and you will often need help understanding the "how" and "why" of the posted solutions. That is the role of the tutorials where most important aspects of the problems will be discussed. You are strongly urged to attend.

GRADING: Grades will be based on two midterms (50% total) and one final exam (50%), all closed-book tests.

Tentative dates for the midterms are:

Midterm I:	Thursday October 1	(20%)
Midterm II:	November ??	(30%)