Economics 741: Advanced Mathematical Economics  
Syllabus UNCG Spring 2010

INSTRUCTOR  
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Office Hours: WF 11 am -12 pm or by appointment

COURSE LOCATION AND TIMES  
January 19-April 29   TR 12:30-1:45 in Bryan 456  
March 4             Midterm exam 12:30-2:30?  
April 15            Writing project due.  
Final Exam: Saturday, May 8, 12:00-3:00, Bryan 456 (Take-home exam?)

COURSE DESCRIPTION  
A PhD in economics requires an extensive familiarity with mathematical modeling. In this course, you will learn the mathematical tools necessary for economic modeling.

TEXTBOOK  
There are two required texts for this course: Mathematics for Economists by Carl Simon and Lawrence Blume (SB). In addition, we will use the text Microeconomic Theory by Mas-Colell, Whinston, and Green (MWG).

Articles:  

GRADING  
Grading will be determined by homework assignments (10%), a modeling project (20%), a midterm exam (30%), and a final exam (40%).

SPECIFIC COURSE LEARNING OBJECTIVES  
Students will learn about the following:  
1. simple proofs.  
2. the basic properties of sets and functions of several variables.  
3. constrained optimization problems.  
4. homogeneity, homotheticity, and (quasi-)concavity.  
5. random variables and probability distributions.  
6. the implicit function theorem.  
7. matrix properties.  
8. correspondences and fixed points.  
9. linear and dynamic programming.  
10. choice under uncertainty.  
11. expected utility theory.  
12. stochastic dominance.
COURSE OUTLINE
The assigned readings from the text are given below. Please read the assigned chapters before class.

A. Sets, numbers and proofs. (SB App. A1)
B. Limits and open sets. (SB #12, MWG M.F.)
C. Functions of several variables. (SB#13, MWG M.F)
D. Calculus of several variables. (SB#14, MWG M.A.)
E. Implicit functions and their derivatives. (SB #15, MWG M.E.)
F. Quadratic forms and definite matrices. (SB #16, MWG M.D.)
G. Unconstrained optimization (SB #17, MWG M.J.)
H. Constrained optimization (SB #18-19, MWG M.K.)
I. Homogeneous and homothetic functions (SB #20, MWG M.B.)
J. Concave and quasi-concave functions (SB #21, MWG M.C.)

Midterm exam

K. Correspondences (MWG M.H.)
L. Fixed points (MWG M.I.)
M. Intertemporal economics
   1) Economics of intertemporal utility and production
      a. Arrow-Debreu extensions of welfare theorems
         i. Varian Chap 19
         ii. Nicholson Chap 17 (p. 500-523)
         iii. MWG 20.A,B,C,D (p. 732-753)
         iv. Frederick, Lowenstein & O’Donoghue JEL 2002.
      b. Overlapping generations failure of welfare theorems
         i. Varian Ch. 19 (p. 365)
         ii. MWG 20.H (p. 769-777)
         iii. Weil JEP 2008

   2) Optimal control theory
      a. Discrete time
         i. Conrad & Clark 1.1 & 1.2 (p. 1-22)
      b. Continuous time & the Maximum principle
         i. Conrad & Clark 1.4 (p. 25-30)
      c. Discounting and the current value Hamiltonian
         i. Conrad & Clark 1.5 (p. 31-39)

   3) Dynamic programming
      a. Adda & Cooper Ch. 2 (p. 7-31)
      b. Conrad & Clark 1.3 (p. 22-24)
      c. MWG M.N (p. 968-970)

Final Exam