ECON 503: Mathematical Analysis for Economists

Department of Economics – State University of New York at Binghamton
Summer/Fall – 2011

Instructor: Tirthatanmoy (Tirtha) Das
Lecture (Section I): August 15 – 27, 8:30 – 11:00 (times will be adjusted to accommodate other events)
Lecture (Section II): Friday, each week in the fall semester, 2:20 – 3:20
Email: tdas1@binghamton.edu

Textbooks: Michael Hoy et al, *Mathematics for Economics*, 2nd edition (MIT Press, 2001)

Alpha C. Chiang, *Fundamental Methods of Mathematical Economics* 4th edition (McGraw-Hill 2005)

Alpha C. Chiang, *Elements of Dynamic Optimization*, Waveland

*All of the textbooks are strongly **recommended** as useful mathematics books for the duration of the PhD program.*

Overview:

This course provides an introduction to some of the more important topics in the area of matrix algebra, calculus, and classical non-linear programming. The aforementioned areas have widespread applications in the field of economics. This course also provides student with an excellent introduction to some of the abstract concepts that underpin much of modern mathematics. Throughout the course emphasis will be placed on problems of economic importance, involving individual or firm decision making.

Course Assessment:

The course will consist of several homework assignments, two midterm examinations, and one comprehensive final examination.

Course Outline:

1. **Univariate Calculus**
   - 1.1 The concept of derivative and differentiability
   - 1.2 Rules of differentiation, Taylor Series, Relative and absolute extrema
   - 1.3 Higher-order derivatives: concavity and convexity of a function
   - 1.4 Univariate optimization
2. **Multivariate Calculus**
   - 2.1 Partial differentiation, second order partial derivatives
   - 2.2 Difference equations
   - 2.3 Optimization of functions of *n*-variables
3. **Constrained Optimization**
   - 3.1 The Lagrange method
   - 3.2 The Karush-Kuhn-Tucker conditions
4. **Comparative Statics**
   - 4.1 General approach
   - 4.2 Envelope Theorem
5. **Linear Algebra**
   - 5.1 Matrix operation
   - 5.2 Real vector spaces
   - 5.3 Determinants and the inverse of a matrix
   - 5.4 Eigenvalues and Eigenvectors
   - 5.5 Quadratic forms
6. **Dynamic Optimization and Dynamic Programming**
   - 6.1 The non-linear programming problem
   - 6.1 The calculus of variations
   - 6.2 Optimal control theory