ECON 4345 **BAYLOR UNIVERSITYY** **Prof. Earl L. Grinols**
Spring 2008 **357 HCB**

Math Analysis—Economics

I. Nonlinear Programming and Mathematical Methods: Syllabus

A. **Course Description:** Increasingly, modern economics is a field of applied mathematics involving specialized content and focus. The three main types of economic analysis involve optimization (static and dynamic), comparative statics, and equilibrium. Economics 4345 provides mathematical literacy and sophistication at the upper division undergraduate and beginning graduate level by rigorously treating the foundational mathematical techniques used by professional economists. Topics include linear algebra and matrix theory, concavity and convexity, optimization, LaGrangians and constrained optimization, constraint qualifications, theorem of the maximum, and dynamic optimization.

B. **Prerequisites**: Multivariable calculus.

C. **Course Goals**: After completion of this course the student should:

1. have a broad understanding of the elements relevant to the use of mathematics in economics
2. understand concepts of agent optimization subject to constraints
3. demonstrate proficiency in computational applications of mathematics common to economics.

D. **Format:** The class will combine lecture and discussion. Each week we will consider a new aspect of mathematics in economics. Selected classes will be used for recitations of solved material. Students will be assigned which problem to be prepared to answer in class. You may consult with one another on problems but should be prepared to solve similar problems on your own in quizzes and exams after the day of recitation. Randomly selected homework assignments may collected for grading or check-off credit.

E. **Course Requirements:** Participation will count for 10 percent of the grade, the mid-term exam for 30 percent, and the final the rest. Exams will be based on problem sets and problems worked in class. Participation is evaluated at the instructor's discretion but will involve contributions to problems, class participation, special assignments, and mini-quizzes. Students taking the course for graduate credit are required to read an article from the *Journal of Economic Theory*, the *Journal of Mathematical Economics*, or comparable peer-reviewed learned journal and prepare a 2-5 page written report that reviews the article, shows how mathematics was used by the author, and relates the techniques used to class material (3% of participation will be devoted to this for applicable students).

F. **Attendance**: Students will make every effort to attend and actively participate in each class period in keeping with the attendance policy of the University.

II. References:

The text is Carl Simon and Lawrence Blume. *Mathematics for Economists*. New York: W. W. Norton and Co., 1994. In the last part of the course we will use Daniel Leonard and Ngo van Long. *Optimal Control Theory and Static Optimization in Economics*. Cambridge: Cambridge University Press, 1992. Selected references that may prove useful include:

Axler, Sheldon. *Linear Algebra Done Right*. 2nd Ed. New York: Springer, 2000.

Chiang, Alpha. *Elements of Dynamic Optimization*. Long Grove, IL: Waveland Press, 2000.

Chiang, Alpha. *Fundamental Methods of Mathematical Economics,* 3d. Ed. New York: McGraw-Hill Book Company, 1984.

Greene, William H. *Econometric Analysis*. 5th Ed. Upper Saddle River, NJ: Pearson Education, 2003.

Grimmet and Stirzaker. Probability and Random Processes. Oxford: Clarendon Press, 2001.

Hoy, Michael, John Livernois, Chris McKenna and Thanasis Stengos. *Mathematics for Economics*. 2d Ed. Cambridge, MA: The MIT Press, 2001.

Jehle, Geoffrey A. and Philip J. Reny. Advanced Microeconomic Theory. 2d Ed. New York: Addison-Wesley, 1998.

Klein, Michael W. Mathematical Methods for Economics. 2d Ed. Upper Saddle River, NJ: Pearson Education, 2002.

Mangasarian, Olvi. *Nonlinear Programming*. New York: McGraw-Hill, 1969.

Mas-Colell, Andreu, Michael D. Whinston, and Jerry R. Green. *Microeconomic Theory*. Oxford: Oxford University Press, 1995.

Munkres, James R. *Topology*. 2d. Ed. Upper Saddle River, NJ: Prentice-Hall, 2000.

Silberberg, Eugene. *The Structure of Economics: A Mathematical Analysis.* 3rd International Ed. New York: McGraw-Hill, 2001.

Stokey, Nancy L. and Robert E. Lucas, Jr. with Edward C. Prescott. Recursive Methods in Economic Dynamics. Cambridge, MA: Harvard University Press, 1989.

Sydsaeter, Knut and Peter Hammond. Mathematics for Economic Analysis. Upper Saddle River, NJ: Prentice-Hall, 1995.

Takayama, Akira. Mathematical Economics. 2nd Edition. New York: Cambridge University Press, 1985.