The University of Colorado at Boulder  
Department of Economics  
ECON 7800—August, 1995  

COURSE SYLLABUS

Course  
Course title: Mathematical preparation for studying economics  
Meeting time: Monday – Friday 9:00 A.M. – 12:00 NOON; August 14, 1995 – August 25, 1995  
Meeting place: Room 205 of the Economics Building

Instructor  
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Course description  
A fundamental concept in economics is optimization; most economic analysis has optimization at its heart in one guise or another. This course prepares students to study economics by considering a set of archetypal optimization problems and some techniques for their solution. We will introduce mathematical tools and concepts as necessary to understand and solve the set of archetypal problems. The set of problems includes static- and dynamic-, constrained- and unconstrained optimization by choice of few- and choice of many variables with certainty and without. The set of mathematical tools and concepts we will discuss in the course of addressing these optimization problems includes the structure of a proof, curvature properties of functions, differential and integral calculus of single and of multiple variables, approximation by Taylor's series, the envelope theorem, Young's theorem, randomness, special functional forms such as Cobb-Douglas and CES, homotheticity and homogeneity, the maximum principal, and Bellman's equation. A daily schedule of topics will be distributed at the start of the course. In addition to pencil and paper methods we will introduce computer software specialized for both analytical (Mathematica) and numerical (GAMS) solutions to optimization problems. As long as you are studying economics you will be posing and solving optimization problems related to ones introduced in the course. The course is intended to be a solid, intensive beginning to studying economic optimization, but only a beginning.

Course prerequisites  
The most important prerequisite is intending to study graduate economics upon completion of the course. Beyond that, I will assume that students are fairly familiar with single variable differential and integral calculus, somewhat familiar with multivariate differential calculus, and fairly familiar with the basic rules (addition, multiplication, transposition) of matrix algebra. Also, I will assume that students know at least the basics of using a personal computer and that they have and know the basics of using a CU e-mail address.
Textbooks
This course will not follow any textbook very closely for long. Optimization techniques are common among most graduate economics texts, but none of the books collects and presents them in a very uniform way. Instead, most collect and present just the results used elsewhere in that book, and usually in a way that doesn’t take good advantage of the principles that underlie all of optimization. That said, however, we will regularly refer to Varian (Microeconomic Theory, 3rd edition, 1992), to Simon and Blume (Mathematics for Economists, 1994), to Chiang (Elements of Dynamic Optimization, 1992, as well as Fundamental Methods of Mathematical Economics, 3rd edition, 1984) and to Kreps (A Course in Microeconomic Theory, 1990). In the conduct of the course, it will not be assumed that students own any of these books, but if you like having written material to supplement class notes, these are the books to have. Varian is a required text for first-year doctoral microeconomic theory.

Lectures
The course meets daily for three hours (less some break time). The first half (roughly) of each daily lecture session will be devoted to posing and solving an optimization problem or two, introducing mathematical terms and concepts as necessary to understand the problem and a solution. The latter half of each session will be devoted to solving example problems that illustrate the day’s results. Parts of some sessions might be spent in a computer room.

Study room
Students are encouraged to work together on studying the material and doing suggested exercises outside of lecture time. To facilitate this, a room has been reserved from 12 NOON to 5 P.M. on lecture days. This study time will be a good opportunity to meet and to start to work with the students with whom you will be studying throughout your degree program: many successful graduate students consider such collaborative study essential to cementing their understanding of course material. I will stop by the study room from time-to-time to field questions.

Examination
While participation in this course is not a compulsory part of the graduate program in economics, passing its final exam is. The exam will consist of four or so optimization problems to solve and to answer questions about. The problems on the exam will be similar to those used as examples throughout the course. The examination will take place 9:00 A.M. – 12:00 NOON on Friday August 25, 1995 in room 205 of the Economics Building.