Course Description:
We explore the tools and principles used to model operational procedures in economic and business systems -- mathematical sets, types of variables, and functional forms in constrained and unconstrained optimization. Other topics include tractability, duality, Kuhn-Tucker theory, algorithms and computation. Prerequisites: admission to the doctoral program, basic algebra, calculus, or special permission.

Plan: The following is a tentative and general guide; deviations will reflect participants' backgrounds, interests and aspirations. Changes & assignments will be given in class or posted on the web.

Session/Topic
Introduction: Mathematics in Economic Theory & Models of Consumer Choice
Fundamentals: Sets; discrete, continuous, & homogeneous functions; convexity
Properties of matrices; the algebra of vectors; differential & integral calculus, Implicit function theorem
Differentiability & continuity; Partial derivatives; matrix notation for derivatives; classical (unconstrained) optimization; supporting hyper planes, concavity & convexity
Production, Cost, Revenue & Profit functions; Demand functions & Elasticity
Deterministic/stochastic modeling; motivation & economic interpretation of optimization; decisions, constraints & objectives; feasible, optimal, exact, & heuristic solutions; tractability, validity, & sensitivity; linear & nonlinear programs; graphing linear models (feasibility, optimality); linear independence
Searches: local-global optima; feasible & improving directions; gradient methods
Problem session; computer methods & software
Fixed point theorems, envelope theorem (2nd half)
Linear programming -- fundamentals, formulation
Quadratic forms; definiteness
Constrained optimization; Kuhn-Tucker formulation; duality & related insights;
Review; discussion of extensions, applications, & special problems in optimization
Time permitting: topics in probability, statistics & stochastic analysis

- Text Chapters: 1-4, 6-11, 13-19, 21-22, (20 and remaining chapters, time permitting)

Text:
Mathematics for Economists
by Carl P. Simon, Lawrence Blume
Norton, 1994

ISBN # 0-393-95733-0
NOTES:

I. As a rule, students have accounts on Pegasus. For assistance on how to get your account initialized, read the RUCS instruction sheet or ask the staff at the Info Center in Engelhard Hall room 313, Newark, Ext 5083 (Generally, hours are 9am-8pm Mo-Fri, subject to change).

II. On this campus, access to computers and related assistance may be found in Engelhard Hall room 311.

III. The work you submit must be your own. Others' ideas, whether repeated verbatim (must use quotes) or described otherwise, must be referenced in a footnote or in your bibliography. You must properly cite any source you use -- a book, a journal, even anecdotal, unpublished information written or spoken by a person other than yourself. Failure to do so constitutes plagiarism, a crime punishable by public flagellation and academic banishment! If you are unsure of how to create citations/bibliographies, see the instructor.