ECON 496 003 / MATH 493 002 / SYST 465 001
Pricing in Optimization and Game Theory
George Mason University
Spring 2010

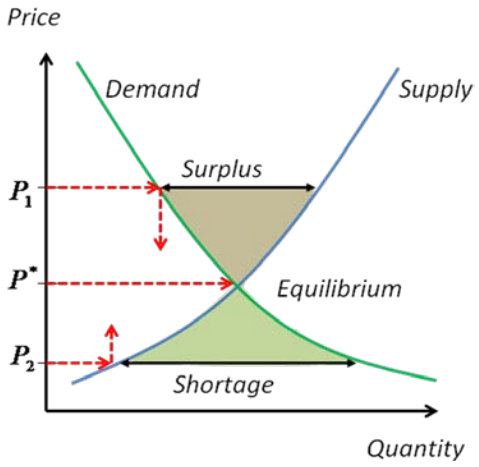
Instructor: Ursula Morris
Class Time: Fr. 10:30 - 1:10
Class Room: Engineering Building R4457
Office Hours: by appointment
Email: **UMorris1@gmu.edu**

Course Description

Finding the adequate mechanism for pricing limited resources, goods and services is one of the main goals of the theoretical analysis of complex systems. Pricing is one of the driving forces for developing numerical methods to find optimal solutions and economic equilibria. Game theory provides methods to analyze the likely responses of competitors to strategic decisions about prices, expenditures and investments.

The first part of the course will cover the basic ideas and methods in Linear Programming. The fundamental role of pricing in Linear Programming will be emphasized: duality, sensitivity analysis and decomposition are important topics. The introduction of matrix games will show the close relationship between solving the dual pair of an LP and finding an equilibrium in a two person matrix game. The introduction of two-person nonconstant-sum games leads to an understanding of the Nash equilibrium.

After an introduction into nonlinear optimization, the lecture will finish with the demonstration of an algorithm for finding an equilibrium in a linear market using modified barrier functions.



Text: Wayne L. Winston, Operations Research, Applications and Algorithms, Fourth Edition, Thomson, Brooks/Cole 2004.

Software: The computational project will use LINDO software which is provided with the book by Wayne L. Winston.

Course Schedule (tentative):

	Lecture Topics	**Date**
1	Introduction and real life applications that led to Linear Programming; Gauss-Jordan elimination method	1/22/2010
2	Simplex method	
3	Shadow prices and sensitivity analysis.	
4	Duality in LP; basic duality theorems and their economic interpretation; primal-dual systems	
5	Two person matrix games; pure and mixed strategies; John von Neuman's theorem for matrix games	
6	Matrix games and duality in LP; solving matrix games using LP	
7	**Midterm**	**3/5/2010 10:30-1:15**
	Springbreak	
8	Lemke-Howson's Method for zero-sum matrix games; Prisoner's Dilemma, Nash Equilibrium, Lemke-Howson's method for bimatrix games	
9	Brown-Robinson iterative method for solving matrix games;	
10	Dantzig-Wolfe decomposition; pricing mechanism for LP based on BR method.	
11	Intro. into Nonlinear Programming	
12	Method of steepest ascent, Newton's method	
13	Constrained Optimization; Lagrange Multipliers; KKT conditions	
14	Equilibrium in a linear exchange market model	
15	**Final**	**5/7/2010 10:30-1:15**

Grading:

Homework	20%
Midterm	35%
Final Exam	35%
Computational Project	10%

Students are expected to adhere to the George Mason Honor Code.

Make-up midterm exams will be 10% harder.