LEHIGH UNIVERSITY
Department of Economics

Game Theory
Eco/IE 358

Professor James Dearden
Fall 2005

Required Text

Martin J. Osborne, *An Introduction to Game Theory*, Oxford University Press, 2004, ISBN 0-19-512895-8

Administrative

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The Fun of Games and Interactions

Wouldn't life be simple if, in making decisions, we could ignore the interests and actions of others? Simple yes – but boring too. The fact remains that most real-world decisions are not made in isolation, but involve interaction with others. This course studies the competitive and cooperative behavior that results when several parties with conflicting interests must work together. We will learn how to use game theory to formally study situations of potential conflict: situations where the eventual outcome depends not just on your decision and chance, but the actions of others as well. Applications are drawn from economics, business, and political science. Typically there will be no clear cut "answers" to these problems (unlike most single-person decisions). Our analysis can only suggest what issues are important and provide guidelines for appropriate behavior in certain situations.

On the one hand, competitive analysis is subtle, ambiguous, and often counter-intuitive; but on the other hand, it is fascinating, challenging, and a good deal of fun. I hope to broaden your exposure to and improve your understanding of competitive situations.

Course Objectives

• To understand the importance of competitive and cooperative factors in a variety of decision problems.

• To learn how to structure and analyze these problems from a quantitative perspective.

• To understand the economics of strategic interaction, including oligopolistic markets and markets in which the participants have differing information.

Prerequisites

A vivid imagination and a tolerance for abstraction are essential prerequisites for this course. In addition, intermediate microeconomics (Eco 105 or 146) and calculus (Math 21, 31, 51, or both 75 and

76) are required of all students. If you struggled in either of these courses, then this course is not for you.

Course Requirements and Grades

Mid-Term exam	40%
Homeworks, Class Participation, Attitude and Manners	10%
Project (short paper)	10%
Final exam:	40%

Grades will be based on the midterm exam, the final exam, the solutions to analytical problem sets, a short project, class participation, as well as enthusiasm, attitude, and manners during class. For the problem sets only, you may discuss questions and answers with other students in the class, however, you must write up your own answers. Of course, no collusion is permitted when taking exams and quizzes.

You must bring a simple calculator, one that can calculate exponents, to quizzes and exams. Makeups only in exceptional circumstances, and during the final exam three-hour period.

Attendance

While attendance is not part of the final grade, you must be in class to participate and to learn the material.

Analytical Problem Sets

LEARNING-BY-DOING is an important part of the practice of game theory. And it is the consensus of many practitioners of the art that numerical problems are a highly effective educational tool. Some of the problems are relatively easy, while others will require considerable thought. The more difficult problems are well worth the effort since they insure your mastery of microeconomics. Warning: Some of these problems may take a few hours to solve.

The format for submission and instructions for the application problem sets is as follows. Work each problem carefully and check where possible that you have arrived at the correct solution. *Be sure to give a complete description of the problem and include a discussion of the economic content of the problem.* All details for solving the problem must be given with your answer (be sure to work logically through each problem and identify the basic steps associated with arriving at the solution). Finally, please ask for assistance at any time if you are having trouble with the assignment. A good idea is to review the assignment and begin working solutions to the problem set when it is assigned.

I do not accept late homework.

Academic Integrity

On the homework, you can work with others to derive the solutions. However, you cannot work with others when writing your assignment. That is, write your homework answers on your own.

Lehigh University Student Senate Statement of Academic Integrity. "We, the Lehigh University Student Senate, as the standing representative body of all undergraduates, reaffirm the duty and obligation of the students to meet and uphold the highest principles and values of personal, moral and ethical conduct. As partners in our educational community, both students and faculty share the responsibility for promoting and helping to ensure an environment of academic integrity. As such, each student is expected to complete all academic course work in accordance to the standards set forth by the faculty and in compliance with the university's Code of Conduct."

Disabilities

If you have a documented learning disability, and will be requesting academic accommodation for this class, please contact Dean Cheryl Ashcroft in the Office of the Dean of Students, UC 212, 8-4152.

COURSE OUTLINE

Section 1: Introduction, Math Review, Utility Theory

WEEK 1

Simple games
Differential and integral calculus, fixed points, graphs
Utility theory
What is a game? **Osborne, Chapter 1**

Section 2: Normal Form Games, Mixed Strategies, and Nash Equilibrium

WEEK 2

Nash equilibrium: theory. **Osborne, Chapter 2**

WEEK 3

Nash equilibrium: examples. **Osborne, Chapter 3**

WEEK 4

Mixed strategy equilibrium. **Osborne, Chapter 4**

Section 3: Extensive Form Games and Subgame Perfect Equilibrium

WEEK 5

Extensive games of perfect information: theory. **Osborne, Chapter 5**

WEEK 6

Extensive games of perfect information: examples. **Osborne, Chapter 6**

WEEK 7

Extensive games of perfect information: extensions. **Osborne, Chapter 7**

EXAM 1 Friday, October 21, in class

Section 4: Bayesian Games

WEEK 8

Bayesian games. **Osborne, Chapter 9**

WEEKS 9, 10

Extensive games with imperfect information. **Osborne, Chapter 10**

Section 5: Repeated Games

WEEK 11

Repeated games: the prisoner's dilemma. **Osborne, Chapter 14**

Section 6: Special Topics

WEEK 12

Evolutionary games. **Osborne, Chapter 13**

WEEK 13

Rationalizability. **Osborne, Chapter 12**

WEEK 14

Review and slack time (not slack-off time)