

Syllabus: Economics 414, Game Theory

Professor Peter Cramton

Tuesday and Thursday, 9:30 to 10:45 am, Tydings 0111, Spring 2005

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.

Prerequisites. A vivid imagination and a tolerance for abstraction are essential prerequisites for this course. In addition, Economics 306 (intermediate microeconomics) and Math 140 or 220 (calculus) are required of all students. If you struggled in either of these courses, then this course is not for you. I will review some of the basic mathematical skills needed in the first few classes. If you find these introductory lectures impossible, then you should find another course.

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.

Course Logistics

We meet twice a week for one hour and fifteen minutes. There are bi-weekly problem sets, a midterm, and a final examination. I expect you to come to class prepared to respond intelligently to questions about the assignment. Your final grade is determined as follows:

- problem sets: 20%
- midterm exam: 30%
- final exam: 50% (8-10 am, Tuesday, May 17, 2005)

The required textbook for this course is Martin J. Osborne, *An Introduction to Game Theory*, Oxford University Press (2004). Osborne is a formal introduction to game theory and its applications. I will

assign problems from the text. The questions on the midterm and final exams will be similar to these problems in both scope and difficulty.

Course Outline

An outline of the topics in the course follows. [to be updated]

1. An introduction to games and their theory
2. Games of chance
3. Nash equilibrium for two-person games
4. Mixed strategies and mixed strategy equilibrium
5. n-person games in normal form
6. Noncooperative market games in normal form
7. Credibility and subgame perfect equilibrium
8. Repeated games
9. Signaling games and sequential equilibrium
10. Games between a principal and an agent
11. Auctions

Additional References

Other references that you might wish to consult are:

Bierman and Fernandez, *Game Theory with Economic Applications*, Second Edition, Addison Wesley (1998). [A good undergraduate text on game theory.]

Binmore, *Fun and Games*, Heath (1992). [An advanced text that gives a formal presentation of game theory with a limited treatment of games with private information.]

Dixit and Nalebuff, *Thinking Strategically*, W.W. Norton (1991). [A popular book on strategy.]

Fudenberg and Tirole, *Game Theory*, MIT Press (1991). [A comprehensive graduate text.]

Gibbons, *Game Theory for Applied Economists*, Princeton University Press (1992). [A modern treatment emphasizing applications for first-year graduate students.]

Krishna, *Auction Theory*, Academic Press (2002). [A comprehensive graduate text on modern auction theory.]

Luce and Raiffa, *Games and Decisions*, Wiley (1957). [A classic text on early game theory.]

Milgrom, *Putting Auction Theory to Work*, Cambridge University Press (2004). [An excellent graduate text on modern auction theory.]

Milgrom and Roberts, *Economics, Organization, and Management*, Prentice Hall (1992). [An excellent text on organizational and incentive issues.]

Osborne and Rubinstein, *A Course in Game Theory*, MIT Press (1994). [A graduate text focusing on games with complete information.]

Owen, *Game Theory*, Academic Press (1982). [Emphasizes zero-sum games and games with complete information.]

Raiffa, *The Art and Science of Negotiation*, Harvard University Press (1982). [An excellent book on the analysis of negotiation problems.]

Schelling, *The Strategy of Conflict*, Harvard University Press (1960). [Discussion of some of the important issues in bargaining and other situations of conflict.]

Shubik, *Game Theory in the Social Sciences*, MIT Press (1983). [A general text in game theory with numerous applications.]

Office Hours

My office hours are Tuesday, 7:30 to 9:30 am. My office is 4101A Tydings Hall. I may be reached by phone at 405-6987 or by email at pcramton@gmail.com.