

Game Theory
Carnegie Mellon University
Spring 2013

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COURSE DESCRIPTION Understanding how people should and do make decisions is important or a variety of different disciplines. Economics, sociology, political science, history, philosophy, and even biology all attempt to understand the process of making decisions. Some decisions are made in a context where the outcomes are determined by a single person's choice (and perhaps by some random events). Other decisions are more complicated, they involve several different decision-makers all trying to do the best they can.

These *strategic situations* surround us. Choosing investments, routes to the supermarket, and whether to honor a promise are strategic choices and all are studied by game theory. This set of mathematical techniques attempts sometimes to predict people's decisions and at other times to justify them. This course focuses on these techniques. Along the way we will discuss its philosophical foundations as well as its varied applications.

COURSE OBJECTIVES By the end of this course you should understand the basics of game theory. You should be capable of solving a game using a variety of techniques. You should be able to invent basic games which correspond to realistic situations. Finally, you should have some understanding of the underlying assumptions on which game theory rests.

REQUIRED TEXTS Martin J. Osborne (2004) *An Introduction to Game Theory*

COURSE REQUIREMENTS 6 homeworks due throughout the semester, midterm and final

Your final grade will be determined by averaging the homework scores (together worth 50%), the midterm (20%), and final (30%).

Attendance and participation in class is not required, but it is strongly recommended. Regular attendance and participation can positively influence your grade, especially if you are near the cut-off

COLLABORATION AND CHEATING You may discuss the homework with one another in attempting to solve the problems, but each individual student must write up the answers independently. If you collaborated with another student in solving a particular problem **you must note who that student is and on which problems you collaborated**. Copying verbatim answers or failing to note collaboration will be considered cheating.

For the midterm and final, you must do your own work. Any communication during the exam will be considered cheating. During the exam you may use the book or your notes, but you may not use any electronic devices.

LATE WORK If you are having trouble finishing the work on time or cannot make a scheduled exam, **contact me before the due date or exam date** and we can discuss arrangements and penalties for late work. Unless serious misfortune befell you, I will not accept late work if you don't approach me before hand.

Reading Schedule

January 14	Introduction to game theory
January 16	Simple games and Nash equilibria (Chapter 2)
January 21	No Class
January 23	Forms of dominance (Chapter 2)
January 28	Monopoly and perfect competition (no reading)
January 30	No Class
February 4	Duopoly and oligopoly (Chapter 3.1)
February 6	Auctions (Chapter 3.5)
February 11	Rationalizability (Chapter 12)
February 13	Mixed strategy Nash equilibria (Chapter 4)
February 18	Mixed strategy Nash equilibria continued (Chapter 4)
February 20	Extensive form games with perfect information (Chapter 5.1- 5.3)
February 25	Subgame perfection and backward induction (Chapter 5.3 – 5.5)
February 27	Bargaining (Chapter 16.1-16.2)
March 4	Alternative approach to bargaining (Chapter 16.3-16.4)
March 6	Midterm
March 11	No Class: Spring Break
March 13	No Class: Spring Break
March 18	Voting (no reading)
March 20	Zero-sum games (Chapter 11)
March 25	Bayesian games (Chapter 9.1-9.3)
March 27	Duopoly and auctions (Chapter 9.4-9.6)
April 1	Extensive form games with imperfect information (Chapter 10.1-10.3)
April 3	Sequential equilibrium (Chapter 10.4)
April 8	Signaling games (Chapter 10.6-10.8)
April 10	Repeated prisoner's dilemma (Chapter 14.1-14.4)
April 15	Indefinitely repeated prisoner's dilemma (Chapter 14.5-14.7)
April 17	Thinking carefully about common knowledge (no reading)
April 22	Evolutionary foundations (Chapter 13.1-13.2)
April 24	Replicator dynamics (no reading)
April 29	Asymmetric contests (Chapter 13.3)
May 1	Fictitious play (no reading)