

G53.2108.001: Game Theory and Politics; Spring 2006

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The class meets once a week from 6:20pm – 8:20pm on Tuesdays in Room 747. I will hold office hours before class from 5:20pm – 6:20pm. I suspect that I will hold them in the student lounge near the main office of the Department of Politics. If that setting is unavailable, then I will determine a different location (possibly the classroom, if it is not in use).

There is one required textbook for this course:

Osborne, Martin J. 2004. *An Introduction to Game Theory*. New York, NY: Oxford University Press. (ISBN: 0-19-512-895-8).

Any time more than one person make decisions that affect their own and the others' outcomes can be modeled by game theory. The decisions can be made simultaneously or sequentially and with or without knowledge of explicitly how one's decisions affect the others. The decisions and outcomes may be symmetric or asymmetric. The relationships can be competitive or cooperative. There may be one or repeated interactions between decision makers. Game theory is the collection of mathematical tools to model and analyze the above behaviors. This course will introduce the basic concepts and tools of game theory and will demonstrate how formal models are used in the social sciences. At the end of this course, you should be in a position to read and evaluate game theoretic models in the political science literature.

The course begins by introducing ideas from utility and decision theory, thereby forming the foundation of game theory. From this foundation, classical game theoretic ideas are constructed; these ideas are motivated by applications and reinforced with examples and problem sets. This pattern persists through the many types of behavior that game theory can model. Diverse applications motivate an area of game theory. The mechanics are introduced and solution concepts determined. For future reference, examples become canonical representatives of the area. We will cover many of the recent developments in non-cooperative game theory.

The course will consist of a combination of lectures, discussions, and problem-solving sessions. Besides the in-class problems, homework problems will be regularly assigned. An understanding of previous material will often be necessary for new material. Hence, assignments will have to be completed in a timely fashion. Problems will be discussed in class and will make up part of your grade. The final grade will be based on written work on problem sets (20%), oral discussion of problem sets (20%), an in-class midterm exam (25%), and a take-home final exam (35%).

Although the course content concentrates on the concepts, intuition, and structure of game-theoretic models, some mathematics is required to analyze the models. Students in this class should be comfortable with elementary linear algebra and elementary probability theory. Knowledge of elementary differential calculus is helpful, but not essential.

Additional supplementary readings may be distributed in class. Homework problems will be assigned from this text. Additional perspectives are often useful in learning a subject area. An incomplete list of supplementary texts follows the outline of the course.

Course Outline.

Utility and Decision Theory

The properties of ordinal and cardinal preferences. Lotteries and expected utility. Risk aversion and risk seeking. Decision theory. Optimization as a transition to equilibrium.

An Introduction to Normal Form Games

Players, (discrete) strategies, payoffs. Classic games: Prisoners' Dilemma, Matching Pennies, Stag Hunt, Chicken. Nash equilibrium. Best response functions. Domination. Symmetric games and symmetric equilibria.

Applying Normal Form Games

(Continuous) strategies. Applications: Oligopolies, Electoral competition, War of Attrition, Auctions, Accident Law.

Mixed Strategy Equilibria for Normal Form Games

Randomization, dominated actions. Expert diagnosis. Reporting a crime.

Extensive Form Games with Perfect Information

Game trees. Decision theory: Let's Make a Deal. Equilibria. Subgame perfection. Backward induction. Combinatorial game theory.

Applying Extensive Form Games with Perfect Information

Sports drafts. Ultimatum game, holdup game, agenda control. Stackelberg duopoly. Buying votes. Race to develop new technologies.

More Applications of Extensive Form Games

Entry into a monopolized industry. Committee decision making. Chain-store paradox. Centipede game. Experiments.

Nash Equilibria.

Nash equilibria in normal form games. Mixed strategy Nash equilibria. The existence of Nash equilibria. (Readings: Morrow Chpt. 4)

Cooperative Games.

Coalitions. Core. Applications: horse and house trading. Airport runway costs. Matching.

Bayesian Games.

Imperfect information. States. Types. Beliefs. Bayesian updating. Cournot revisited. Providing a public good. Auctions revisited.

Extensive Form Games with Incomplete Information

Sequential equilibria. Signaling games. Information transmission in legislatures. The threat of Presidential veto in bargaining. Price as a signal of quality. Education as a signal of ability.

Repeated Games

Finitely repeated games: Prisoners' Dilemma. Infinitely Repeated Games: Prisoners' Dilemma. Subgame perfection. One-stage deviation principle. Folk theorem.

Bargaining theory.

As an extensive game. Trade in a market. Pork barrel model of legislatures. Two-level games as models of international negotiations. Nash's axiomatic model.

Alternative Solution Concepts.

Minimax. Maxminimization. Rationalizability. Iterated deletion of dominated strategies. Evolutionary stable strategies.

An Incomplete List of Supplementary Texts

Aliprantis, Charalambos D. and Subir K. Chakrabarti. 1999. *Games and Decision Making*. New York, NY: Oxford University Press.

Banks, Jeffrey S. 1991. *Signaling Games in Political Science*. Chur Switzerland: Harwood Academic Publishers.

Fudenberg, Drew and Jean Tirole. 1991. *Game Theory*. Cambridge, MA: The MIT Press.

Gibbons, Robert. 1992. *Game Theory for Applied Economists*. Princeton NJ: Princeton University Press.

Kreps, David M. 1988. *Notes on the Theory of Choice (Underground Classics in Economics)*. Boulder, CO: Westview Press.

Morrow, James D. 1994 *Game Theory for Political Scientists*. Princeton NJ: Princeton University Press.

Myerson, Roger B., 1991. *Game Theory: Analysis of Conflict*. Cambridge MA: Harvard University Press.

Osborne, Martin J. and Ariel Rubinstein 1994. *A Course in Game Theory*. Cambridge MA: The MIT Press.

Rasmusen, Eric. 1989. *Games and Information*. Cambridge MA: Blackwell Publishers Inc.