

PSC 288/ECO 288 INTRODUCTION TO GAME THEORY

Fall, 1998
T, Th 3:25-4:40
Meliora 178

Professor Duggan
Office: Harkness 320b
Hours: T, Th 1:30 - 3:00

Game theory, despite its frivolous sounding name, gives us a unified approach to understanding social phenomena. It helps us understand not just the way people play games in the usual sense, like tic-tac-toe, chess, or poker, but the way they behave in complex social situations as well. Examples of situations to which we will apply the theory include (but are not limited to): arms races, provision of public goods, competition between firms, electoral campaigns, voting, auctions, and bargaining. There are no formal prerequisites, but some aptitude for logical or mathematical reasoning is desirable.

Readings: The main textbook for the course is *Game Theory for Applied Economists*, by Gibbons. This will serve as a good (but by no means complete) reference for the lecture material. There are two optional texts: *Thinking Strategically*, by Dixit and Nalebuff, is informal yet informative; *A Non-technical Introduction to Game Theory*, by Davis, is also available.

Course work: Work in the course will consist of readings from textbooks and possibly an occasional reserve reading; from four to six homeworks assigned every two to three weeks; possibly some short quizzes throughout the semester; a mid-term; and a final. One or two homeworks may take the form of a short essay.

The worst of the homework grades will be dropped, and, for this reason, I will not accept late homeworks. (If you come to me with pressing circumstances, like illness, *before* an assignment is due, we may be able to work out an alternative arrangement.)

Note: Because I drop the worst homework grade, the homework policy provides you with some insurance against random disasters (like, “I forgot the homework was due.”); you should try not to take advantage of it too early in the semester.

Grading: Final grades will be determined on the basis of course work with the following weights: 20% homework, 30% mid-term, 40% final, and 10% participation. Your “participation” mark will depend on attendance, participation in class (asking/answering questions), quizzes (if any), and generally demonstrating an interest in the material.

Outline: Below, I list the main topics to be covered during the semester.

1. **UTILITY AND PROBABILITY.** An analysis of decision-making by individuals. We first consider decision-making under certainty, preferences, and utility functions. We then consider decision-making in the presence of uncertainty, probabilities, lotteries, and expected utility. This lays the foundation for the material covered in the rest of the course.

2. **GAMES: STRATEGIC, EXTENSIVE, AND COOPERATIVE.** We consider three different ways of thinking about strategic interaction in social situations. The first two models of social situations, “strategic” and “extensive,” are appropriate when individuals can’t make binding promises about their actions. That is, interaction is non-cooperative. The last type of model, “cooperative,” is appropriate when groups of individuals may get together and commit to joint plans of action. In the rest of the course, we use game theory to try to understand how individuals behave in these different kinds of situations.

3. **ANALYSIS OF STRATEGIC GAMES.** Here, we focus on the individuals’ choices of strategy, leaving aside issues of the timing of strategic decisions. Some of the game theory topics we will cover are dominant and undominated strategies, Nash equilibria, mixed strategies, and the special case of games of conflicting interest.

4. **ANALYSIS OF EXTENSIVE GAMES.** Here, we account fully for the timing of individuals’ strategic choices. We take up topics including perfect information games, repeated games, infinite horizon games, incomplete information.

5. **ANALYSIS OF COOPERATIVE GAMES.** Finally, we allow individuals to form binding coalitions. We consider the stable outcomes, also known as the “core” outcomes, in situations like majority voting, mutually advantageous trade, assigning dorm rooms, stable outcomes of match-making, and two-person bargaining.