Political Science 152/352
Introduction to Game-theoretic Methods in Political Science

Fall Quarter 2002
Stanford University

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Office Hours: Wed. 1:30-3:30pm

This course introduces the basic concepts and tools of non-cooperative game theory, using primarily political science examples to motivate and illustrate their application. The course is aimed at two audiences: first, students who want to get some sense of how modern game theory works without necessarily wanting to become specialists; and second, students interested in problems that might be usefully examined with these methods. While I will try hard to convey the intuition and substance behind the formalizations, this is really a methods course rather than a survey of applications or philosophy-of-the-approach course.

Interspersed with the presentation of the raw game-theoretic tools, I will be developing a series of examples based on Hobbesian political theory and some major critiques of it. My ultimate intention is to develop a textbook that teaches game theory for political scientists at the same time as it uses these tools to work through some of the basic questions of political theory in an enlightening way. In particular, we will focus on questions about the nature of political order (why do we have governments and what keeps them from falling apart?) and the nature and workings of political democracy. (Most likely the examples used in this year's class will focus more on the political order than democracy.)

Prerequisites. The only absolutely necessary mathematical prerequisite is algebra. It will, however, prove very helpful to have had some exposure to calculus and to the basics of probability theory. All students should read the math review contained in the appendix of the assigned text by James Morrow.

Requirements. The course requirements are a final exam and short problem sets that will be posted on the web site at the end of each week (or so). You will be responsible for material presented in class and on problem sets. The assigned readings are intended as an aid to comprehending what goes on in class; you are NOT responsible for understanding everything they cover. *The course is really based on the lectures rather than the texts.* If you find the readings confusing at some point, you may wish to ask me or Jonathan but you should not panic. If a lecture becomes confusing, *please let me know immediately*, in class if possible.

The main texts for the course are listed below. Readings assignments from the first three are required; the Hobbes' assignments will be optional and so is the purchase of the book.

- David M. Kreps, *Game Theory and Economic Modelling* (Oxford, 1991)

- David M. Kreps, *A Course in Microeconomic Theory* (Princeton, 1990).

- James D. Morrow, *Game Theory for Political Scientists* (Princeton, 1994)

- Thomas Hobbes, *Leviathan* (Penguin Classics 1985).

These books should be available for purchase at the Stanford Bookstore and they should be on reserve at Green as well. Note that only a few chapters of Krep's textbook are assigned; you may wish to use or copy from the reserve copy to save money.

Other helpful readings. Martin Osborne and Ariel Rubinstein's *A Course in Game Theory* (MIT Press 1994) is a superb although quite abstract higher-level treatment of game theory; it may be a useful reference for some of the notation, definitions, and concepts covered in the course. The notational conventions I use are very similar to those of Osborne and Rubinstein. Osborne and Rubinstein will be put on reserve at Green. Other textbooks that can be very helpful are: Drew Fudenberg and Jean Tirole, *Game Theory* (MIT 1991), which is technical but amazingly comprehensive; Roger Myerson, *Game Theory: Analysis of Conflict* (Harvard, 1991), which is very good on certain subjects; Eric Rasmusen, *Games and Information* (Blackwell, 1989), which is much easier and more accessible than either of these, although less comprehensive and occasionally misleading; Kenneth Binmore, *Fun and Games* (Heath, 1992), which has some very helpful mathematical reviews.

Two more applied textbooks might be especially helpful to political scientists. These are (1) Douglas C. Baird, Robert H. Gertner, and Randal C. Picker, *Game Theory and the Law* (Harvard 1994), and (2) Robert Gibbons, *Game Theory for Applied Economists* (Princeton 1992). Both will be put on reserve at Green.

Readings and lecture topics follow. "M" refers to Morrow. "K" refers to Kreps, *A Course in Microeconomic Theory.* "k" refers to Kreps, *Game Theory and Economic Modelling.*

Nota Bene: Although the topics below are numbered, they probably will not correspond well to weeks in the course. This is merely the sequence of topics we will cover.

Topics and Readings

1. Course introduction: Hobbes' explanation and justification for government. Introduction to game-theoretic argument and ideas.

    Hobbes, chapters 13, 14, 15, 17, 18.

M: 1-22.

k: 1-3, 37-41.

K: 3-14.

2. Representing actions and their consequences: Normal and extensive form games.

   k: 4-25.

   K: chap. 11.

   M: chapter 3.

3. Preferences over outcomes, expected utility theory, definitions of rationality

   K: chap. 2, 17-32; chap. 3.

   M: chapter 2.

   (recommended) Binmore, chapter 3.

4. Normal form solution concepts: Rationalizability, Nash equilibrium, mixed strategy Nash equilibria, problems with Nash equilibrium

   k: 26-36, 133-150

   K: 387-417

   M: chapter 4

5. Nash Equilibrium in the Extensive Form (Sub-game Perfection)

   k: 41-77

   K: 399-402, 421-425

   M: chapter 5

6. Repeated games and folk theorems

   M: chapter 9.

   K: 503-515

7. Non-cooperative bargaining theory

   - K: chapter 15.

8. Incomplete information/Perfect Bayesian Equilibrium

   M: 161-87, maybe skip 166-70

   K: 425-435

9. Simple signaling games

M: 188-218 (don't worry about trembling hand perfection)

K: 463-468, 536-543

k: 66-90

10. Continued

K: chapter 17.

k: 108-132

11. Review, Overflow

M: 302-314

k: chapter 6

The final will be held on a day in exam week chosen by consent of the class. It will be made available at 9am from my office (Encina Central, 441) and must be returned with answers by 5pm that day.