

**Political Science 505**  
**Theories of Collective Choice (Introduction to Game Theory)**

Washington University  
Fall 2004

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Course website: [http://bdm.wustl.edu/classes05/ps505\\_05.html](http://bdm.wustl.edu/classes05/ps505_05.html)

## Course Information

### Course Description

This course is intended as an introduction to the major formal approaches in rational choice theory. Rational choice theory breaks down roughly into two general approaches: social choice theory and noncooperative game theory. Another species of game theory, called “cooperative” game theory, has perhaps more in common with social choice theory than with its noncooperative cousin. Techniques of “spatial” modeling, used to study legislative voting processes and electoral competition, are derived from social choice theory, but have developed a considerable overlap with noncooperative game theory. This course will primarily focus on noncooperative game theory. We will also touch on basic social choice theory and the spatial model.

I assume that all students have had at least a brief introduction to theories of individual rational choice, as offered in PS 5052 Mathematical Modeling. I also assume the level of mathematics used or covered in that course, including sets and relations, basic calculus, and basic probability theory.

### Course Requirements

#### Assignments and Exams

1. Problem sets will be distributed at the end of every class and will be due at the beginning of the next class period. Because working problems is critical to learning game theory, these problem sets will constitute 50% of your grade. You are encouraged to work on problem sets in groups, but you must write up your own answers. Late problem sets will not be accepted.
2. There will be a take-home midterm exam distributed March 1 and due March 15. You may *not* work collaboratively on the exam. It will count for 15% of

your grade.

3. There will be a comprehensive in-class final at the end of the semester that will make up the remaining 35% of your grade.

## Reading

The required textbook for this course is Martin J. Osborne. 2004. *An Introduction to Game Theory*. Oxford: Oxford University Press.

## Other Resources

In addition to the required book, you may be interested in some additional reading on math for social scientists and/or game theory. Here are few recommendations.

## Math Books

- Daniel Kleppner and Norman Ramsey. *Quick Calculus: A Self-Teaching Guide*. SPEND A WEEKEND WITH THIS BOOK IF YOU NEED A QUICK CALCULUS REFRESHER.
- Carl P. Simon and Lawrence Blume. *Mathematics for Economists*. A GOOD INTRODUCTION TO MOST OF THE BASIC MATHEMATICS YOU WILL NEED TO DO APPLIED THEORY.
- Morris DeGroot. *Optimal Statistical Decisions*. THIS CLASSIC INTRODUCTION TO THE USE OF PROBABILITY TO THINK ABOUT DECISION MAKING IS FINALLY BACK IN PRINT AFTER MANY YEARS. A WONDERFUL BOOK.

## Game Theory Books

- James D. Morrow. *Game Theory for Political Scientists*. A FAIRLY EASY (AROUND THE SAME LEVEL AS OSBORNE) INTRODUCTION TO GAME THEORY, FOCUSING ON POLITICAL APPLICATIONS.
- Robert Gibbons. *Game Theory for Applied Economists*. A SLIGHTLY HARDER (NOT MUCH, BUT WITH SOME CALCULUS) INTRODUCTION TO GAME THEORY. THE APPLICATIONS ARE TO CLASSIC ECONOMIC PROBLEMS.
- Ken Binmore. *Fun and Games*. A QUIXOTIC, CLASSIC INTRODUCTION TO GAME THEORY THE WAY ONLY BINMORE COULD DO IT. WITH APPLICATIONS TO ALICE IN WONDERLAND, KANT, . . . .
- Drew Fudenberg and Jean Tirole. *Game Theory*. A FAIRLY ENCYCLOPEDIA, SOMEWHAT HARD TO READ, PRETTY TECHNICAL TREATMENT.

- Martin J. Osborne and Ariel Rubinstein. *A Course in Game Theory*. ONE OF THE TWO MOST RIGOROUS, COMPLETE GAME THEORY TEXTS AVAILABLE. OUTSTANDING, BUT HARD.
- Roger B. Myerson. *Game Theory: Analysis of Conflict*. THE OTHER OF THE TWO MOST RIGOROUS GAME THEORY TEXTS AVAILABLE. MY FAVORITE, BUT QUITE HARD.

### **One more recommendation**

There is an advanced undergraduate text on econometrics that, I think, gives a valuable introduction to thinking about data analysis from a theoretical perspective. You might check it out. It is:

- James H. Stock and Mark W. Watson. *Introduction to Econometrics*.

### **Prerequisites**

Political Science 5071 (Game Theory), equivalent course, or permission of the professor. This course is intended for graduate students but qualified undergraduates are welcome.

## **Course Schedule**

### **January 18: Course Introduction and Foundations of Decision Theory**

#### **Social Choice Theory**

#### **January 25: Arrow's Theorem and the Chaos Theorems**

- Geanakoplos, John. "Three Brief Proofs of Arrow's Impossibility Theorem." <http://cowles.econ.yale.edu/P/cd/d11a/d1123-r3.pdf>
- An easy introduction to the Chaos Theorems: Shepsle, Kenneth A. and Mark S. Bonchek. 1997. *Analyzing Politics: Rationality Behavior and Institutions*. New York: W.W. Norton. Pages 91–103.

### **Models of Complete Information**

#### **February 1: Normal-Form Games and Pure Strategy Nash Equilibrium**

- Osborne, Chapter 2 and pp. 70–79

**February 8: Expected utility**

**February 15: Dominance, Continuous Strategy Spaces, and Mixed Strategy Equilibria of Normal-Form Games**

- Osborne, Chapter 4

**February 22: Extensive-Form Games and Subgame Perfection**

- Osborne, Chapter 5, 6.1, 6.3

**March 1: Infinitely Repeated Games, the One-Shot Deviation Principle, and the Folk Theorem**

- Osborne, Chapter 14, 15

## **Games of Imperfect Information**

**March 8: Bayesian Games**

- Osborne, Chapter 9

**March 15: Spring Break**

**March 22: Extensive-form Games with Incomplete Information and Perfect Bayesian Equilibrium**

- Osborne, Chapter 10

**March 29: Applications: Costly Signaling and Cheap Talk**

## **Further Topics**

**April 5: Comparative Statics**

- Scott Ashworth and Ethan Bueno de Mesquita, “Monotone Comparative Statics in Models of Politics: A Method for Simplifying Analysis and Enhancing Empirical Content.” <http://bdm.wustl.edu/PDF/mcs.pdf>

**April 12: The Median Voter Theorem**

**April 26: Collective Action**

**April 19: Bargaining**

- Osborne, Chapter 16

- David Baron and John Ferejohn. 1989. "Bargaining in Legislatures" *American Political Science Review* 83.