Spring 2008

Political Science 8130: Formal Modeling
Tuesday 5:30 pm – 8:00 pm
466 Gladfelter Hall

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Office Hours	By appointment

> "That is the whole idea of this machine, you know. Deterrence is the art of producing in the mind of the enemy the fear to attack. And so, because of the automated and irrevocable decision making process which rules out human meddling, the doomsday machine is terrifying. It's simple to understand. And completely credible, and convincing...But the whole point of the doomsday machine is lost if you keep it a secret!"-- *Dr. Strangelove ("Dr. Strangelove, or, How I Learned to Stop Worrying and Love the Bomb")*

Course Description: In recent decades formal models have become standard analytical tools in the social sciences. As a result, it is increasingly important for students of the social sciences to acquire at least a basic familiarity with formal methods. This course is intended to provide a serious 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. This course will focus primarily on noncooperative game theory, but we will touch briefly on social choice theory and spatial modeling (initially derived from social choice theory). By the end of the semester, students should be at a skill level that allows them to be intelligent consumers of applied game theoretic research as found in the major disciplinary journals and to construct basic models for applied research. I do not presuppose mathematical proficiency, however a working knowledge of probability theory and calculus will prove beneficial.

Course Evaluation: There will be two midterms and a comprehensive final exam. These will be take-home exams. Also, several problem sets will be assigned. Each midterm is worth 25%, the final is worth 40%, and the problem sets will make up the remaining 10% of the final grade. The first midterm will tentatively be handed out on February 26 and the second one on April 1. Students are to return the exams to me by the beginning of the subsequent session. The final exam will be electronically distributed on Monday, May 5, to be returned to me no later than 5 p.m. on May 9. Barring extraordinary circumstances, I will not accept late assignments or exams.

Students are welcome to work in groups on the problem sets, but every student must hand in his/her own copy of the solutions. Students, however, are not permitted to collaborate with their peers on the exams. Anyone found guilty of cheating on exams will receive no credit for the exam.

Readings: There is one required text, available at the campus bookstore:

Osborne, Martin J. 2004. *An Introduction to Game Theory*. Oxford: Oxford University Press.

On occasion we will draw on outside readings, which I will post on Blackboard. In addition, it may be helpful to subsidize the primary text with other readings. Some useful alternative texts include (listed roughly in order of increasing complexity):

Dixit, Avinash and Susan Skeath. 2004. *Games of Strategy*, 2nd ed. New York: W.W. Norton.

Watson, Joel. 2001. *Strategy: An Introduction to Game Theory*. New York: W.W. Norton.

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

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

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

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

Course Outline:

Week 1. Introduction (1/22)

Games with Perfect Information

Week 2. Strategic Games and Nash Equilibrium (1/29)
Osborne, Chapters 1-2, 3.3, and 3.4
Assignment: Problems 31.1, 34.2, and 42.2

Week 3. Mixed Strategies (2/5)
Osborne, Chapter 4
Assignment: Problems 110.1, 114.3, and 127.2

Week 4. Extensive Games I (2/12)
Osborne, Chapters 5-6
Assignment: Problems 173.3, 177.1, and 183.4

Week 5. Extensive Games II (2/19)
Osborne, Chapter 7
Assignment: Problems 211.1 and 221.2

***Week 6. Coalition Games and the Core (2/26)**
Osborne, Chapter 8
First Midterm Distributed (Due 3/4)

Games with Imperfect Information

***Week 7. Bayesian Games (3/4)**
Osborne, Chapter 9
Assignment: Problems 282.1 and 307.1
First Midterm Due

Week 8. ***NO CLASS – SPRING BREAK*** **(3/11)**

Week 9. Extensive Games (3/18)
Osborne, Chapter 10.1-10.5
Assignment: Problems 331.1 and 331.2

Week 10. Extensive Games and Review (3/25)
Osborne, Chapter 10.7-10.9
Assignment: Problems 346.1 and 350.2

Evolutionary Games

***Week 11. Evolutionary Equilibrium (4/1)**
Osborne, Chapter 13
Second Midterm Distributed (Due 4/8)

Repeated Games

***Week 12. Repeated Prisoner's Dilemma (4/8)**
Osborne, Chapter 14
Assignment: Problems 409.2 (Evolutionary) and 445.1 (Repeated)
Second Midterm Due

Week 13. General Results (4/15)
Osborne, Chapter 15
Assignment: Problem 454.2

Social Choice Theory

Week 14. Social Choice Theory (4/22)
TBA

Week 15. Review and Wrap-up (4/29)

MAY 5.** ***FINAL DISTRIBUTED

MAY 9 (5 p.m.).** ***FINAL DUE