

UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL

**POLI 789  
GAME THEORY I  
SPRING 2011**

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**SYLLABUS**

**MEETING TIMES AND VENUE**      Class meets on Thursdays for 2 hours and 50 minutes in Hamilton, room 351. Each class starts at 2 pm.

**OVERVIEW**                      This course is designed to provide a thorough introduction to non-cooperative game theory for political science PhD students. The objective of the course is to cover the basic concepts of non-cooperative game theory rigorously while allowing plenty of time to discuss applications in many different fields of political science. All of this takes a lot of time and there is much to cover, so we will be holding 2 hours & 50 minutes of lecture per week. The course will not cover social choice theory or cooperative game theory.

**PREREQUISITES** Statistics (Poli 783) or equivalent.

**TEXTBOOKS** **Required:** There are two required textbooks for the course, both of which I find to be excellent. It is highly recommended that you follow along in both of them as the course progresses:

- Osborne, Martin J. (2004) *“An Introduction to Game Theory”*, Oxford University Press

The outline of the first the course roughly follows the order of material in both Osborne and McCarty and Mierowitz although lectures will contain topics which require additional readings.

**Recommended:** You may wish to consult other game theory texts, in particular those listed below. Which of these additional texts is best suited to your needs should be a function of your background knowledge and how much you hope to do with game theory.

- Gibbons, Robert (1992) *“Game Theory for Applied Economists”*, Princeton University Press

This book provides less political science examples and solved exercise than Osborne, but is more formal and precise in the classification of different games and equilibrium concepts. It is not mathematically demanding and user friendly to students who do not have a technical mathematical background.

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

This text is somewhat more analytically demanding than Gibbons'. It provides a much more detailed discussion of some of the more advanced topics, e.g. equilibrium refinements in extensive-form games of incomplete information, which makes it an excellent companion to such a text, although it is a comprehensive introduction in its own right.

- Myerson, Roger (1991) *Game Theory: Analysis of Conflict*. Cambridge: Harvard University Press.

This book presents the most systematic and nuanced, but mathematically unsparing, treatment of the subject. It is the best textbook for people who are very comfortable with mathematical tools.

**COURSE  
REQUIREMENTS**

You will be graded in this course on the basis of several factors.

- First, there will be one midterm exam and one final exam which will constitute 60% of your grade (30% each). These are cumulative and will test concepts you should have learned from the assigned readings and the lectures.
- In addition, bi-weekly homework assignments will typically be handed out every other Thursday, and will be due on the following Wednesday at 12pm. Students are required to work in small groups composed of 2-3 students and to submit a single homework. Every week a group will be randomly selected (on Wednesday after having collected all the groups' homeworks) and one of the students belonging to the group will solve part of the weekly assignment in the class the day after. The material in a game theory course is cumulative, and it is extremely important not to fall behind. Because of this, late homework sets will simply not be accepted. Homework will consist of 40% of the course grade and will be calculated based on your highest  $n-1$  scores out of the  $n$  problem sets (the lowest score is dropped).

Summing up, grades will be computed on the following basis:

- Homework assignments 40%
- Midterm exam 30%
- Final exam 30%

**CLASSROOM  
ATTENDANCE**

Class attendance is mandatory and part of a student's grade. Absences may be excused only in the case of documented serious illness, family emergency, religious observance, or civic obligation. If you will miss class for religious observance or civic obligation, you must inform your instructor no later than the first week of class.

**MAKEUPS**

Make-up exams will not be available for students who fail to notify your instructor in advance of missing an examination, nor for students without an acceptable explanation. If you have a valid reason for a makeup exam, inform your instructor a.s.a.p. A valid reason is a medical emergency, a death or serious illness in the family, and, quite frankly, very little else. In all cases, you will be expected to bring in proof.

**COURSE  
OUTLINE**

**WEEK 1, 2 (1/13, 20)**

***Choices and Decision Making under uncertainty***

- ◆ Functions and optimization problem
- ◆ Uncertainty and Chance
- ◆ Decision making under Uncertainty

*Reading Assignments:*

- ❖ Osborne, ch. 1
- ❖ Handouts

**WEEK 3-4 (1/27, 2/3)**

***Normal Form Games of Complete Information I***

- ◆ Normal form games with discrete strategy spaces
  - Dominance & Iterated Dominance
  - Nash Equilibrium
  - Best Response Functions
  - Mixed Strategies

*Reading Assignments:*

- ❖ Osborne, ch. 2, 4
- ❖ Gibbons, ch.1

**WEEK 5 (2/10)**

***Normal Form Games of Complete Information II***

- ◆ Normal form games with continuous strategy spaces
  - Spatial model of electoral competition
  - Median Voter Theorem
  - Other examples from politics

*Reading Assignments:*

- ❖ Osborne, ch. 3
- ❖ Gibbons, ch.1

**WEEK 6-7 (2/17, 24)**

***Extensive Form Games of Complete Information***

- ◆ Extensive form games with discrete strategy spaces
  - Subgame Perfect Equilibrium
  - Backwards induction
  - “credible threats”
- ◆ Extensive form games with continuous strategy spaces
  - examples from politics

*Reading Assignments:*

- ❖ Osborne, ch. 5, 6, 7
- ❖ Gibbons, ch.2.1

**WEEK 8 (3/3): MIDTERM EXAM**

**WEEK 9 (3/17)**

***Bargaining***

- Bargaining as an extensive game

*Reading Assignments:*

- ❖ Osborne, ch. 16
- ❖ Gibbons, ch.2.2

**WEEK 10-11 (3/24 – 3/31)**

***Repeated Games***

- Finitely repeated games
- Infinitely repeated games
- Folk Theorem
- One-shot deviation principle

*Reading Assignments:*

- ❖ Osborne, ch. 14-15
- ❖ Gibbons, ch.2.3

**WEEK 12 (4/7)**

***Normal Form Games of Incomplete Information***

- Bayesian Nash equilibrium
- Beliefs and Types
- Examples from politics

*Reading Assignments:*

- ❖ Osborne, ch. 9
- ❖ Gibbons, ch.3

**WEEK 13-14 (4/14, 21)**

***Extensive Form Games of Incomplete Information***

- Perfect Bayesian equilibrium
- Examples with discrete strategy spaces
- Examples with continuous strategy spaces

*Reading Assignments:*

- ❖ Osborne, ch. 10
- ❖ Gibbons, ch.4.1

**APRIL, 28<sup>TH</sup> (2 PM): FINAL EXAM**