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## Game Theory for Political Science

PSCI 6350

Spring 2016

Meeting Time: R, 2:00–4:50pm

Meeting Place: Wooten Hall 125A

Professor: Jacqueline H.R. Demeritt, Ph.D.

Office: Wooten Hall 164

Office Hours: T 12:30–2pm & 3:00–4:30pm

Email: [jdemeritt@unt.edu](mailto:jdemeritt@unt.edu)

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### **Course description**

This course is a formal introduction to the theory of games with applications to political science. Although the course is primarily a technical introduction to non-cooperative game theory, we will also work on identifying and developing substantive research projects.

Class meetings will typically be divided into two parts: new material, and problem sessions. I will introduce new material one week, and we will work problems associated with that material during the first part of our meeting the following week. Once the problem session is complete, we will take a short break and then begin the next piece of new material. I assume that you will come to class prepared to discuss new material and to participate in the problem sessions. On days where there is no problem session scheduled, we will devote the entire class meeting to learning new material.

### **Course materials**

There is one book to buy for this class. It has been listed with the usual campus bookstores, and can also be ordered from any online bookstore (such as [amazon.com](http://amazon.com), [barnesandnoble.com](http://barnesandnoble.com), [half.com](http://half.com), or [powells.com](http://powells.com)). Feel free to order used rather than new copies, if desired, but be sure to get the correct edition.

1. Osborne, Martin J. 2004. *An Introduction to Game Theory, 4th edition*. New York: Oxford University Press.

I also recommend (but do not require) that you pick up a copy of:

2. Will H. Moore and David A. Siegel. 2013. *A Mathematics Course For for Political and Social Research*. Princeton University Press.

This book begins with the fundamental building blocks of mathematics and basic algebra, then goes on to cover essential subjects such as calculus, linear algebra, and probability. It describes the intermediate steps most other textbooks leave out, features numerous exercises throughout, and grounds all concepts by illustrating their use and importance in political science and sociology. It is, in my opinion, an invaluable addition to your bookshelf for this course and your entire academic career.

In addition to the text(s), we will read a series of articles and other relevant materials. Most materials are available through JSTOR or UNT's other e-journal subscriptions. When this is not the case, I will provide them electronically.

## Course Requirements & Student Responsibilities

This course is run on 4 principles, with each principle discussed in more detail below:

1. Two examinations (each worth 25% of the course grade);
2. Model Construction (30% of the course grade);
3. Peer Evaluation (10% of the course grade);
4. Problem Session Leadership and Participation (10% of the course grade).

**Examinations:** The exams will include both problems of the sort in the text and general questions concerning the applied readings. The exams will be timed; however, you may take them at home and use your textbook, notes, etc.

**Model Construction:** At the beginning of class, you will identify a substantive research area that interests you. Over the course of the semester, you will engage this research in three short papers. The first is non-technical and requires you to review extant literature and identify a research puzzle. Then, you will construct two models designed to solve your puzzle. The first will be a strategic game. Your second model will make use of one of the extensions we cover in the remainder of the class. Thus, it can be an extensive form game, a game of incomplete information, a repeated game or all of the above. In each case, I expect you to draft a short paper (5–7 pages) in which you introduce the research puzzle, develop the model, and explain how it helps solve your puzzle.

**Peer Evaluation:** At each phase of the assignment above, you will be assigned another student's paper to evaluate. In the first evaluation, you should identify and assess the author's literature review and puzzle. Is the literature explained clearly? Does it highlight the cumulation of knowledge in this substantive area (and if not, why not)? Is the puzzle truly puzzling (and if not, why not)? Are there other puzzles in the literature review that the author has not explored? What suggestions would you give the author to help him or her improve the presentation and/or puzzle?

In the second and third evaluations, you should identify the main theoretical claim advanced by the author and the key assumptions the author had to make in order to apply the game theory model. In addition, indicate the ways in which the model helps clarify the argument and the ways in which the model limits the author's ability to solve the puzzle. For example, is there something about a strategic game with perfect information that misses something fundamental about the process the author is modeling? What suggestions would you give the author to help him or her improve the model?

**Problem Session Leadership & Participation:** You will lead one or two problem sessions. When you are the leader, you are responsible for setting the agenda. In essence, this means that you focus on the problems in Osborne that you think are most useful. I am not concerned about you getting the problems right; we will work through the answers together. Instead, I want you to be prepared on the day you are expected to lead.

## Administration

Grading/Evaluation: Grades are assigned in accordance with the following scale:

90 - 100% = A    70 - 79% = C    below 60% = F  
80 - 89% = B    60 - 69% = D

Academic Honor Code: Academic dishonesty will not be tolerated in this class. Incidents of plagiarism and/or cheating will result in a failing grade for the class and further penalties per the University's judicial process. Students are advised in the strongest possible terms to review the policies established in the UNT Policy on Academic Integrity regarding academic honesty ([http://policy.unt.edu/sites/default/files/untpolicy/pdf/7-Student\\_Affairs-Academic\\_Integrity.pdf](http://policy.unt.edu/sites/default/files/untpolicy/pdf/7-Student_Affairs-Academic_Integrity.pdf)). I assume that you are clear on what constitutes plagiarism or cheating, and on what the penalties for these violations will be; if this is not true, see me and I will be happy to clarify. Finally, students agree that, by taking this course, all required assignments may be subject to submission for textual similarity review to [www.turnitin.com](http://www.turnitin.com) or a similar plagiarism prevention system.

Accommodations (ODA / ADA): The University of North Texas is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 92-112 - The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans with Disabilities Act (ADA), pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

If you are a student with a disability and wish to request accommodations, please notify me by the second week of class. You are also encouraged to contact the Office of Disability Accommodation at (940) 565-4323. The ODA makes formal recommendations regarding necessary and appropriate accommodations based on specifically diagnosed disabilities. The Political Science Department cooperates with the Office of Disability Accommodation to make reasonable accommodations for qualified students with disabilities. Please present your written accommodation request on or before the add/drop deadline (i.e., sometime during the first six class days of the semester).

## Course Content & Outline

### PART I: Fundamentals

- 21 January:
  - NEW MATERIAL: Rational Choice Theory
  - \* Read Osborne, 2.1–2.7
- 28 January:
  - NEW MATERIAL: Developing a Research Project

\* Read:

- Zinnes, Dina A. 1980. “Three Puzzles in Search of a Researcher: Presidential Address,” *International Studies Quarterly* 24(3): 315–342.

• 4 February:

- NEW MATERIAL: Math Boot Camp

## PART II: Strategic Games (Normal Form Games)

• 11 February:

- **Paper 1 due**
- NEW MATERIAL: Nash Equilibrium
  - \* Read Osborne, 2.8–2.10; 3.3–3.4

• 18 February:

- **Paper 1 comments due**
- PROBLEM SESSION: Nash Equilibrium
- NEW MATERIAL: Nash Equilibrium 2 (Best Response Functions, Dominated Actions, Symmetric Equilibria)

• 25 February:

- PROBLEM SESSION: Nash Equilibrium 2
- NEW MATERIAL: Randomization (von Neumann-Morgenstern Preferences, Mixed Strategy Nash Equilibrium)
  - \* Read Osborne, 4.1–4.3; 4.6–4.8; 4.10

• 3 March:

- PROBLEM SESSION: Randomization
- NEW MATERIAL: Rationalizability (Iterated Elimination of Dominated Actions, Dominance Solvability)
  - \* Read Osborne, Chapter 12

## PART III: Extensive Form Games

• 10 March:

- **Paper 2 due**
- PROBLEM SESSION: Rationalizability
- NEW MATERIAL: Backward Induction and Subgame Perfection
  - \* Read Osborne, Chapter 5; 6.1; 6.3

• 17 March: NO CLASS — SPRING BREAK/ISA

- 24 March:
  - **Paper 2 comments due; Exam 1 distributed** (due by 31 March)
  - PROBLEM SESSION: Backward Induction and Subgame Perfection
  - NEW MATERIAL: Simultaneous and Chance Moves
    - \* Read Osborne, 7.1; 7.3–7.4; 7.6–7.7

#### PART IV: Extensions

- 31 March:
  - **Exam 1 due**
  - PROBLEM SESSION: Simultaneous and Chance Moves
  - NEW MATERIAL: Repeated Games—Nash Equilibria
    - \* Read Osborne, 14.1–14.8
- 7 April:
  - PROBLEM SESSION: Repeated Games
  - NEW MATERIAL: Repeated Games 2—Subgame Perfect Nash Equilibria
    - \* Read Osborne, 14.9–14.12
- 14 April:
  - PROBLEM SESSION: Repeated Games 2
  - NEW MATERIAL: Incomplete Information (Bayesian Games)
    - \* Read Osborne, Chapter 9
- 21 April:
  - **Paper 3 due**
  - PROBLEM SESSION: Bayesian Games
  - NEW MATERIAL: Incomplete Information 2
    - \* Read Osborne, 10.1–10.5; 10.8–10.9
- 28 April:
  - **Paper 3 comments due; Exam 2 distributed** (due by 5 May)
  - NEW MATERIAL: TBA
- 5 May:
  - **Exam 2 due**