

# POLS 60880: Applied Game Theory (Fall 2017)

## Course Information

Class Time: Tues., 6:30pm–9:15pm

Classroom: Jenkins and Nanovic Halls B058

## Professor:

Gary E. Hollibaugh, Jr.

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Office: Jenkins and Nanovic Halls 2057

Office Hours: Tues., 4:00pm-5:30pm

Wed., 1:00pm-2:30pm

By Appointment

## Course Description

Game theory is a set of tools used to study multi-player interdependent decisionmaking (often called strategic decisionmaking). Strategic decisionmaking refers to situations where the outcome depends on the actions of more than one actor, and hence each actor, in choosing his or her optimal course of action, should take into account the expected behavior of the other actors. Such situations arise in all areas of politics, from legislators considering what legislation to introduce and how to vote on it (keeping in mind how they expect other legislators to vote, and whether or not they expect the president to veto it in the American case), to candidates for political office deciding which policy positions to choose (keeping in mind the policy positions that they expect the other candidates to choose), and nations deciding whether or not to attack other nations (keeping in mind how they expect their own and the other side's allies to react).

The purpose of this course is to give students an introductory but solid exposure to the main topics in noncooperative game theory.<sup>1</sup> I anticipate that many of the students taking this course do not plan to do advanced modeling in their own research, but want to be able to understand the game-theoretic political science literature. To this end, the course will primarily emphasize the ideas and concepts of game theory. However, the course will also be rigorous enough that students who decide that they want to develop advanced game-theoretic models in their own research will have a firm foundation for pursuing that goal.

Much of the material in this course is fairly technical and most of the readings will still require several readings to fully comprehend. **Students are expected to be well-acquainted with differential and integral calculus, matrices, probability/distribution theory, set theory, and how to write proofs, at at least the level of the Math for Political Scientists course.** You may find it useful to consult the materials for that course from time to time throughout the course of the semester. Additionally, it is impossible to learn game theory simply by reading books or articles

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<sup>1</sup>Game theory has two branches, cooperative and noncooperative. Cooperative game theory is used to study strategic decisionmaking when the actors are allowed to make binding agreements to take certain actions; noncooperative game theory is used to study situations where the actors can not, and the actors always choose their actions according to their preferences. The latter is used much more extensively than the former in political science, and in economics as well, and hence we will concentrate on it.

and attending lectures. Because of this incontrovertible fact, students will be required to complete problem sets regularly. The course will end with the submission of a piece of original research that applies the techniques used in class to a question of empirical importance.

Upon successfully completing the course, students will be able to:

- Gain familiarity with several well-known applications of game theory.
- Read, interpret, and evaluate writing that uses game-theoretic models or concepts.
- Construct and analyze models for your own research.

## Books

There is one required book for this course:

- *An Introduction to Game Theory* by Martin J. Osborne.

I will also post readings from the following two books on Sakai:

- *Game Theory and Political Theory* by Peter C. Ordeshook.
- *Methods and Models: A Guide to the Empirical Analysis of Formal Models in Political Science* by Rebecca B. Morton.

Additionally, there are other books that you may find useful, several of which are listed below.

- *A Course in Game Theory* by Martin J. Osborne and Ariel Rubinstein.
- *Formal Models of Domestic Politics* by Scott Gelbach.
- *Game Theory* by Drew Fudenberg and Jean Tirole.
- *Game Theory: Analysis of Conflict* by Roger B. Myerson.
- *Game Theory for Applied Economists* by Robert Gibbons.
- *Game Theory 101: The Complete Textbook* by William Spaniel.
  - [Game Theory 101 on YouTube](#)
- *Political Game Theory* by Nolan McCarty and Adam Meirowitz.

## Grading

Class attendance is not explicitly required, though there is little prospect of success without it. That said, ability in quantitative methods varies and not everyone will be able to “master” the material. If you need a particular methodological skill to conduct your work, I do not want grades to dissuade someone from taking a course that can help them. You will receive feedback along the way on problem sets and know how you are doing in the class, but the final grade submitted in the books will be uninformative, so long as you make a good-faith effort. My goal is to give you the skills to conduct your own research, not weed people out of the program or send signals about hiring.

## Problem Sets

There will be several problem sets, which will collectively count for 30% of the course grade. Absolutely no late assignments will be accepted, but your lowest grade will be dropped. **No assignment will be accepted unless it is in Portable Document Format (PDF).**

## Original Research Paper

This paper will count for 50% of the course grade. Conduct research on the question of your choice using up to one coauthor (though you may also choose to work alone) and dataset of your choice. All students in the group will receive the same grade on the paper. Note that you **must** use some sort of game-theoretic model in your analysis. The goal of the paper is to apply a model to, or develop one for, a substantive problem in your field of study. You should aim to produce a publishable article. You must send me your final paper groups by **September 12**. A research proposal that includes an outline of the model and the research question is due on **October 24**. The research paper is due on **December 5**. **Unless you receive prior authorization from the instructor in writing (which simply means you should email me ahead of time), late papers will be penalized ten percentage points for each day—or fraction thereof—that they are late.** This paper will include an introduction to the research question, a literature review, a description of the model and the solution concept, equilibrium results, and the discussion/interpretation of the results. Additionally, all paper must include an Appendix that contains all necessary proofs. The style of the paper should be similar to that of published journal articles. If you are unsure of what this entails, consult recent issues of journals like the *American Political Science Review*, the *American Journal of Political Science*, the *Journal of Politics*, *World Politics*, *International Organization*, the *Journal of Theoretical Politics*, *Political Analysis*, the *Quarterly Journal of Political Science*, *Political Science Research and Methods*, or others that publish your favorite game theoretic research. **Nothing in this section should be construed as preventing you from including a data component in your paper, if you should so desire.**<sup>2</sup>

As you work on your papers, you will also learn to write about data analysis in a way that sounds and looks professional by using either a WYSIWYG system like Word, OpenOffice, or WordPerfect—or a typesetting system like L<sup>A</sup>T<sub>E</sub>X—to produce documents that are suitable for cor-

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<sup>2</sup>If the class is four people or fewer, and the entire class agrees to do so via secret ballot, there will also be the option of the entire class—myself included—writing one paper together. In this case, all of the deadlines will apply, and all assignments must be accompanied by summaries of what each individual contributed to what was turned in.

respondence, collaboration, publication, and reproduction. **No paper will be accepted without proofs of all formal results, either within the paper itself or in an appendix. No paper making use of empirical data will be accepted without a code appendix or reproduction archive attached (or available to me online). No paper will be accepted unless it is in Portable Document Format (PDF). No paper will be accepted with cut and pasted computer output in the place of well presented and replicable figures and tables.** Although good work requires that the analyst understand her tools, she must also think about how to communicate effectively: ability to reproduce past analyses and clean and clear presentations of formal results and data summaries are almost as important as clear writing in this regard.

## Presentation

This presentation will count for 10% of the course grade. On **December 5**, all groups will present their original research papers to the class. Each group will be allotted approximately 30 minutes for presenting and each presentation will be followed by approximately 10 minutes' worth of questions from the class. I will provide more concrete times and dates in the weeks before the presentation. At a minimum, each group will present the following about their assigned paper: the research question and a discussion of the model, including solution concept and equilibrium solution. The presentation must also include an interpretation of the findings and how these results answer the original research question. **If your paper is not turned in by the start of class on the day of presentations, you will not be able to present and you will receive a zero for the presentation. No exceptions (unless you receive prior authorization from the instructor in writing).**<sup>3</sup>

## Peer Review

The peer review will count for 10% of the course grade. You are to read and comment on a different group's paper (the group you are to review will be assigned by me) and to grade this group's paper according to certain guidelines we will provide. Your main objective is to give the group feedback on what parts of the paper were done well and why, as well as any changes and improvements need to happen in order for the paper to be published. Your comments on your fellow student's paper are due on **December 12 by 11:59pm. The feedback you receive on your paper will not affect your final paper score. You will be evaluated based on how helpful, not how destructive, you are. If your paper is not turned in by December 5, you will not be able to review a paper, nor will you receive feedback on your own. No exceptions (unless you receive prior authorization from the instructor in writing).**<sup>4</sup>

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<sup>3</sup>If the entire class decides to write a single paper, the students will be required to present. Following this, we will have an in-depth question-and-answer session, which will itself be followed by a discussion of how the paper might need to be revised for publication.

<sup>4</sup>If the entire class decides to write a single paper, this assignment will be dropped. Instead, the class will be required to write a detailed memorandum discussing how they plan to revise the paper for submission to an academic journal. The due date will remain the same.

## Typing Mathematical Notation

The most convenient way to write math is to use  $\LaTeX$ , a system for preparing documents with mathematical symbols. If you learn  $\LaTeX$ , you will be able to write mathematical formulae on your iPad, iPhone or any computing device with at least a text editor. Then, all you need to do is upload your work to typesetting program and produce a camera ready PDF. Using  $\LaTeX$  allows you to signal to your readers that you know the language of mathematics and that you take quantitative research seriously. Obviously, this is a good signal to send. (Nevermind the implications that follow from much of the discipline making judgments about the quality of one's work solely on one's choice of writing tool. But that is a rant for another time.)

If all this is not enough to convince you to invest in the time to learn  $\LaTeX$ , keep in mind that it is very easy to prepare a presentation in Beamer out of a document written in  $\LaTeX$ . You can literally copy and paste the mathematical formulas from the paper version into the presentation. **Finally, keep in mind that all material you turn in must be typed and in PDF format. There will be no exceptions.** You do not have to use  $\LaTeX$  (Microsoft's Equation Editor is also reasonable, and there are other options as well), but you need to make an investment in *something*.

## Collaboration

One of the best ways that people learn is by teaching and collaborating with others. In this class we facilitate collaboration by allowing you to work on the homework assignments in groups of no larger than two. That does not mean, however, that students are allowed to turn in identical assignments. Work out the solutions together and then write up the final answer separately. Identical assignments will result in failure of the assignment.

## Policy on Plagiarism

According to University of Notre Dame's [Academic Code of Honor for Current Graduate Students](#), "any activity that compromises the pursuit of truth and the advancement of knowledge may undermine confidence in the academic enterprise. Violation of integrity in research includes, but is not limited to plagiarism; deliberate fabrication or fabrication in proposing, conducting, reporting, or reviewing research." To learn more about where to draw the line between misjudgment and academic misconduct, I encourage you to consult the website above. To avoid engaging in plagiarism make sure that you never use words that are not your own without proper attribution. According to our [Academic Code of Honor for Current Graduate Students](#), "those who appropriate the words or ideas of another, and who attempt to present them as their own without proper acknowledgment of the source, whether intentional or not, are committing plagiarism or intellectual theft."

## Policy on Disabilities

Any student who has a documented disability and is registered with Disability Services should speak with the professor as soon as possible regarding accommodations. Students who are not registered should contact the [Office of Disability Services](#).

## Policy on Technology

This course relies heavily on access to computers, specific software, and the Internet. At some point during the semester you WILL have a problem with technology: your laptop will crash, a file will become corrupted, a server will go down, or something else will occur. These are facts of life, not emergencies. Technology problems will not normally be accepted as excuses for unfinished work. Count on “stuff” happening and protect yourself by doing the following:

- Plan ahead — start early, particularly if scarce resources are required.
- Save work often — at least every ten minutes.
- Make regular backups of files in a different location from the originals.
- Save drafts of work at multiple stages.
- When editing a file, set aside the original and work with a copy.
- Practice safe computing when surfing the web and checking email.
- On your personal computer, install and use software to control viruses and malware.

When submitting any assignment electronically in this course, you are responsible for any technological problems (*e.g.*, internet connection difficulties, corrupted files, etc.). To prevent problems along with the associated lateness penalties, you should submit papers well before the deadline and take proactive steps to ensure that the file was not corrupted (*e.g.*, check it after uploading to Sakai or copy yourself on emails and check the attached file). Again, please do not trust your computer to function correctly at the last minute.

## Calendaring Concerns

There will be no class on the following days:

- October 17: Fall Break
- November 21: Thanksgiving

## Course Topics

**Note:** The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary. We may not cover all of these topics. Conversely, time permitting, other topics might be covered in this course. **Additionally, time permitting, there will be at least one class dedicated to a workshopping session.**

**Topic 1: Introduction and Overview; What Are We Doing? (Or, All Models Are Wrong, But Some Are Useful)**

- Clarke, Kevin A. and David M. Primo. 2007. “**Modernizing Political Science: A Model-Based Approach.**” *Perspectives on Politics* 5(4): 741–753.

- Goemans, Hein and William Spaniel 2016. “Multimethod Research: A Case for Formal Theory.” *Security Studies* 25(1): 25-33.
- Johnson, James. 2010. “What Rationality Assumption? Or, How ‘Positive Political Theory’ Rests on a Mistake.” *Political Studies* 58(2): 282–299.
- Johnson, James. 2014. “Models Among the Political Theorists.” *American Journal of Political Science* 58(3): 547–560.
- Krugman, Paul. 1998. “Two Cheers for Formalism.” *The Economic Journal* 108(451): 1829–1836.
- Osborne, Chapter 1
- Rubinstein, Ariel. 1991. “Comments on the Interpretation of Game Theory.” *Econometrica* 59(4): 909–924.
- Walt, Stephen M. 1999. “Rigor or Rigor Mortis? Rational Choice and Security Studies.” *International Security* 23(4): 5–48.

#### Topic 2: Preferences and Expected Utility

- Ordeshook, Chapter 1

#### Topic 3: The Building Blocks of Models

- Morton, Chapter 2

#### Topic 4: Normal Form Games and Nash Equilibria

- Clinton, Robert Lowry. 1994. “Game Theory, Legal History, and the Origins of Judicial Review: A Revisionist Analysis of *Marbury v. Madison*.” *American Journal of Political Science* 38(2): 285–302.
- Osborne, Chapters 2 and 3
- Stokes, Susan C. 2005. “Perverse Accountability: A Formal Model of Machine Politics with Evidence from Argentina.” *American Political Science Review* 99(3): 315–325.

#### Topic 5: Mixed Strategies

- Osborne, Chapter 4
- Tsebelis, George. 1989. “The Abuse of Probability in Political Analysis: The Robinson Crusoe Fallacy.” *American Political Science Review* 83(1): 77–90.

## Topic 6: Extensive Form Games and Subgame Perfection

- Asmussen, Nicole. 2011. “Female and Minority Judicial Nominees: President’s Delight and Senators’ Dismay?” *Legislative Studies Quarterly* 36(4): 591–619.
- Bendor, Jonathan and Adam Meirowitz. 2004. “Spatial Models of Delegation.” *American Political Science Review* 98(2): 293–310.
- Huber, John and Nolan McCarty. 2004. “Bureaucratic Capacity, Delegation, and Political Reform.” *American Political Science Review* 98(3): 481–494.
- McCarty, Nolan. 2004. “The Appointments Dilemma.” *American Journal of Political Science* 48(3): 413–428.
- Osborne, Chapters 5, 6, and 7

## Topic 7: Games of Incomplete and Imperfect Information

- Austen-Smith, David. 1990. “Information Transmission in Debate.” *American Journal of Political Science* 34(1): 124–152.
- Gilligan, Thomas W. and Keith Krehbiel. 1989. “Asymmetric Information and Legislative Rules with a Heterogenous Committee.” *American Journal of Political Science* 33(2): 459–490.
- Lupia, Arthur, Logan S. Casey, Kristyn L. Karl, Spencer Piston, Timothy J. Ryan, and Christopher Skovron. 2015. “What Does it Take to Reduce Racial Prejudice in Individual-Level Candidate Evaluations? A Formal Theoretic Perspective.” *Political Science Research and Methods* 3(1): 1–20.
- Nalepa, Monika. 2008. “To Punish the Guilty and Protect the Innocent: Comparing Truth Revelation Procedures.” *Journal of Theoretical Politics* 20(2): 221–245.
- Osborne, Chapters 9 and 10.
- Sartori, Anne E. 2002. “The Might of the Pen: A Reputational Theory of Communication in International Disputes.” *International Organization* 56(1): 121–149.
- Snyder, James M., Jr. and Michael M. Ting. 2002. “An Informational Rationale for Political Parties.” *American Journal of Political Science* 46(1): 90–110.

## Topic 8: Repeated Games

- Baron, David P. and John A. Ferejohn. 1989. “Bargaining in Legislatures.” *American Political Science Review* 83(4): 1181–1206.
- Fearon, James D. 1995. “Rationalist Explanations for War.” *International Organization* 49(3): 379–414.
- Powell, Robert. 2006. “War as a Commitment Problem.” *International Organization* 60(1): 169–203.



- Osborne, Chapters 14, 15, and 16
- Slantchev, Branislav L. 2003. “The Power to Hurt: Costly Conflict with Completely Informed States.” *American Political Science Review* 97(1): 123–133.