# PS 2703: Formal Political Theory I

(Cross-listed as PIA 2421)

**Spring 2014**

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| Professor Stephen Chaudoin  [chaudoin@pitt.edu](mailto:chaudoin@pitt.edu)  4612 Posvar Hall | TA: TBD |
| Class Meetings  Thursdays 10:00AM – 11:55PM  4430 W.W. Posvar Hall  Optional Recitation Time/Room TBD | Office Hours  By appointment |

Formal political theory involves constructing and analyzing mathematical models to gain insights about social and political phenomena. The advantages of mathematical modeling are that it forces the analyst to identify key features of the situations under investigation and to ensure that claims and predictions follow logically from the premises of a model. Mathematics provides the basic language, notation, and tools for such analysis, and game theory provides a standard framework for representing and analyzing strategic interaction (i.e. models of multi-person decision-making in which outcomes depend on the interdependent decisions of two or more people). Regardless of whether or not students intend to develop formal models in their work, knowledge of game theoretic ideas and analysis is essential for new political scientists in every subfield.

This is the first of a two-course sequence in formal theory for doctoral students in political science. It introduces the basic concepts and techniques for analyzing game theoretic models. Although examples and applications will draw mainly from political science, the emphasis of this course is on developing *methodological* *skills* rather than substantive knowledge. While the formal theory sequence is not intended to produce “pure theorists,” I do hope that students will have sufficient skills to be competent and intelligent consumers of formal models, to be able to derive empirical implications of existing models, and to construct and analyze models of their own. Specifically, the goals of the course are to enable you to:

* Think in terms of mathematical models
* Construct and analyze basic classes of games and apply solution concepts
* Gain familiarity with several well-known applications
* Enhance your ability to think logically and rigorously

**Assumptions and Expectations**

This course emphasizes *precision* and *logical rigor* over technical sophistication, and I assume that students are familiar with algebraic computations (manipulating expressions and solving equations), have had some exposure to calculus and probability, but have little or no experience writing proofs. Students must have taken the math short course or have my permission to take the course.

**Learning formal analysis is not easy, especially for students with the typical math background entering the political science program. However, a willingness to think carefully and systematically as well as persistence and dedication will definitely compensate for any lack of prior mathematical knowledge.**

I also assume that you are “professional” students—that is, you are here to obtain your doctorate because you have a desire to become a professional researcher and that your goal is to acquire the necessary skills to conduct serious, high quality research. Even if you do not end up constructing models of your own (although I hope you do), **my goal is for you to have more than just a cursory knowledge of formal modeling and that you will at least become intelligent consumers and critics of formal models.**

I also strongly believe that the only way to learn any kind of mathematical or methodological skills is through practice. **Most of your learning will take place outside the classroom when you work through and attempt to solve problems on your own.** Solving problems will often involve more than simply replicating the examples in class or in the textbooks, and **sometimes this will be frustrating—*just like real research can be frustrating*—but once you have struggled with and worked out the solutions yourself, your analytical skills will be greatly enhanced.**

**Problem Sets**

Problem sets will be assigned and due every week, and I expect you to adhere to the following guidelines:

* You must attempt to work through *as much as possible* *on your own*, and then only work with others when you are stuck or to check your answers.
* You must write-up your own answers, *using your own words and explanations*.
* Your answers must include explanations, including how you set up the problem and the derivation of the solution (including proofs where appropriate). Think of your written answers not as “homework” but as practice in professional communication.
* As much as possible, your problem sets should be typed. If they are not typed, they should be legible and the steps you took to derive the solution should be clear.

**Recitation/Tutorial**

In lieu of regular office hours, I will schedule an hour every week where we can work through additional examples, practice problems, and provide appropriate hints for the homework. This additional class time is ***completely optional***. It can be very useful for you to attend, but you are in no way compelled to do so. If you need additional assistance, I am also available by appointment.

**Grade Components**

* Problem Sets 30%
* Midterm Exam 30%
* Final Exam 40%

**Course Materials**

Readings and problems will be assigned from two texts:

Nolan McCarty and Adam Meirowitz, *Political Game Theory: An Introduction* (2007, Cambridge Univ. Press)

Martin Osborne, *An Introduction to Game Theory* (2004, Oxford Univ. Press)

**Optional Other Readings**

These are other game theory books that might be helpful for their alternative expositions. They are not required in any way, and are listed only as suggestions for further reading:

Avinash Dixit and Barry Nalebuff, *Thinking Strategically* (informal)

David Kreps, *Game Theory and Economic Modelling* (somewhat informal)

James Morrow, *Game Theory for Political Scientists*

Robert Gibbons, *Game Theory for Applied Economists*

Peter Ordeshook, *Game Theory and Political Theory*

Two higher-level, abstract, technical treatments can be found in:

Martin Osborne and Ariel Rubinstein, *A Course in Game Theory*

Drew Fudenberg and Jean Tirole, *Game Theory*

Standard graduate microeconomic theory textbooks also contain several chapters on game theory that may be helpful for alternative expositions:

David Kreps, *A Course in Microeconomic Theory*

Andreu Mas-Colell, Michael Whinston, and Jerry Green, *Microeconomic Theory*

**Course Outline**

Lectures will be drawn primarily from readings marked with an asterisk (\*) and are required. The symbol § denotes “section.” Readings without an asterisk are for you to reference if you want additional outside information.

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| **Week 1**  1/9 | The role of formal models  Deduction, logic and, proofs  \* McCarty and Meirowitz: Chapter 12 (math appendix), §1-2  \* Osborne: Chapter 17 (math appendix), §1-3  Vellman, *How to Prove It*, pp. 1-24, 53-70, 82-91  Individual choice I: Rationality  \* McCarty and Meirowitz: Chapter 2, §0-1  Osborne: Chapter 1 |
| **Week 2**  1/14 (PEIO) | Individual choice II: Utility theory, spatial preferences, and uncertainty  \* McCarty and Meirowitz: Chapter 2, §3 and §5, Chapter 3, §0-2  Osborne: Chapter 1, Chapter 4, §1 and §12  Social choice I: Preference profiles and aggregation rules  \* McCarty and Meirowitz: Chapter 4, pp. 66-69  Social choice II: Arrow’s Theorem, Black’s Theorem, and McKelvey’s Theorem  \* McCarty and Meirowitz: Chapter 4, pp. 70-82 |
| **Week 3**  1/23 | Normal form games I: Nash equilibrium  \* Osborne: Chapter 2  McCarty and Meirowitz: Chapter 5, pp. 87-101, 115-116, |
| **Week 4**  1/30 | Normal form games II: Continuous action spaces and applications  \* Osborne: Chapter 3, §3 and §4  \* McCarty and Meirowitz: Chapter 5, pp. 101-107, 116-122, 126-129 |
| **Week 5**  2/6 | Normal form games III: n-player games and refinements  \* Osborne: Chapter 2, pp. 30-35  \* McCarty and Meirowitz: Chapter 5, §12 and §13 |
| **Week 6**  2/13 | **Midterm Exam** |
| **Week 7**  2/20 | Mixed strategies  \* Osborne: Chapter 4 (skip §7 and §9)  McCarty and Meirowitz: Chapter 5, §4 and §5 |
| **Week 8**  2/27 | Extensive form games I: Subgame perfect Nash equilibrium  \* Osborne: Chapter 5 (all), Chapter 10, §1-2  McCarty and Meirowitz: Chapter 7, §0-4 |
| **Week 9**  3/7 (Harris) | Extensive form games II: Applications and extensions  \* Osborne: Chapter 6, §1; Chapter 7, §1, §4, §6-7  \* McCarty and Meirowitz: Chapter 7, §5-6 |
| **Week 10**  3/20 | Repeated games  \* Osborne: Chapter 14, §1-8, Chapter 15, §1  McCarty and Meirowitz: Chapter 3, §5, Chapter 9, §0-5 |
| **Week 11**  3/28 (ISA) | Incomplete information: Perfect Bayesian equilibrium  \* Osborne: Chapter 10, §3-4  McCarty and Meirowitz: Chapter 8, §0-1 |
| **Week 12**  4/2 (MPSA) | Signaling I:  \* Osborne: Chapter 10, §5  McCarty and Meirowitz: Chapter 8, §2-3  Signaling II: Applications  \* Osborne: Chapter 10, §7-9  McCarty and Meirowitz: Chapter 8, §4 |
| **Week 13**  4/10 | Bargaining Games  \* TBD |
| **Week 14** 4/17 | Principal Agent Models  \* TBD |
| **Week 15**  TBD | **Final Exam** |