Research topics in game theory will cover the study of dynamic games, games of incomplete information, and evolutionary games, with applications in the fields of voting, bargaining, lobbying and violent conflict. Results from the study of social choice theory and mechanism design will also be treated. The course will concentrate on mathematical techniques for constructing and solving games. Students will be required to develop a topic relating political science and game theory and to write a formal research paper. Prerequisite: W4209 or instructor's permission.

Course Overview

Political Science W4210 is a continuation of W4209. It aims to teach the skills you need to start producing your own formal models for research in political science.

- In the first section of the course we introduce the tools you need to construct a formal model and prove results. We consider the choices that modelers need to make and the set of options that they have and we review approaches to constructing models and proving results.
- In the final section the course will take on more of a seminar format, engaging in close reading of models that use the techniques we have seen to study political problems.

Requirements

The readings are typically light in terms of page numbers but are compact and heavy in notation. As one of the aims of the course is to develop skills not just in reading but in developing models, you will be expected to work through the proofs of all propositions and theorems covered in the course. Notes on close readings of these texts follow below. In addition:

1. You will be required to write an original paper presenting a model or theorem. This paper is your key output from this course, ideally it should contribute directly to the writing of your dissertation. The paper should motivate a problem, develop a model and prove ensuing propositions, and identify testable predictions resulting from the model. This research paper will account for 55% of the final grade. You may be asked to present parts of your model in class for discussion by the group. The paper is due on 14 December.

2. There will be problem sets and exercises to complete throughout the first part of the course; these are intended to evaluate your understanding of the material and to allow for deeper exploration of models studied, and, especially, to practice model construction and proof writing. These account for 15% of the course grade and typically have to be handed in the week after they are assigned. Late problem sets will not be accepted.

3. In one of the weeks of the second section of the course you will be required to review one of the central models / theorems studied in the course. For this presentation you will be
expected to (i) give an overview of the question under study (ii) give a brief presentation of the proof, (iii) evaluate the model’s assumptions— are all assumptions necessary? are all assumptions reasonable? (iv) discuss the solution concept employed (v) discuss the generality of field of application of the results (vi) suggest ways in which the results could be pushed further. In some weeks these presentations may be constructed in somewhat of a debate format where rival papers are discussed by different students. This presentation will account for 10% of your grade.

4. You will be required to participate in weekly sections where problem sets will be reviewed, and class and research material will be discussed. The final 20% of the grade will be based on participation in these sections.

5. All submitted writing, for your research paper or your problem sets, should be typed up on a word processor capable of handling the mathematics and symbols. It is strongly recommended, if you do not already know how, that you learn to use either Scientific Word/Workplace (http://www.mackichan.com/index.html?products/sw.html~mainFrame) or LaTeX (http://www.latex-project.org, http://www.maths.tcd.ie/~dwilkins/LaTeXPrimer) during the course of the term and use these tools to write your papers.

Topics

Part I: Tools for Constructing and Solving Games

Week 1 [12 SEPTEMBER] INTRODUCTION: STUDIES OF COLLECTIVE ACTION: FROM SOCIAL CHOICE TO NON-COOPERATIVE GAME THEORY

THEOREMS AND CONCEPTS: Social Choice, Cooperative and Non-cooperative approaches to modeling public goods problems: Arrow’s Impossibility Theorem, the Impossibility of a Paretian Liberal, the Coase Theorem, Olson, Hardin and the tragedy of the commons.

Readings

- Class Notes: 1 & 2


Further reading:


**Week 2  [19 SEPTEMBER] HOW TO PROVE IT: STRATEGIES OF PROOF**


**Required Readings**
- Class Notes: 3 & 4

**Recommended Readings:**
- Osborne and Rubinstein, Section 2.4.
- The rest of Velleman
- For more on the mathematical results see the appendices in Mas-Colell, Whinston, and Green or in Rasmusen’s *Games and Information*, or in topology texts such as Berge’s *Topological Spaces*.

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**Week 3  [26 SEPTEMBER] WHAT TO PROVE: DEFINING GAMES, REPRESENTING PREFERENCES**


**Required Reading**
- Class Notes 5, 6 & 7 (include readings on proofs)
- Varian, Hal *How to Build an Economic Model in Your Spare Time* [http://www.sims.berkeley.edu/~hal/Papers/how.pdf](http://www.sims.berkeley.edu/~hal/Papers/how.pdf)

**Further Reading**
- Harry Roberts and Roman Weil, 1970. “Starting Research Early,” University of Chicago, Graduate School of Business, [http://pacioli.bus.indiana.edu/erasmuse/G1_reader/05c.roberts.htm](http://pacioli.bus.indiana.edu/erasmuse/G1_reader/05c.roberts.htm)
### Week 4  
**[3 October] Representing Information**

**Theorems and Concepts:** Using Bayes’ Rule, Common Knowledge, Can you agree to disagree? No trade theorems, Common Knowledge and Asymmetric Information, Rationality and Backwards Induction

**Required Readings:**
- Class Notes: 8

**Recommended Readings:**

### Week 5  
**[10 October] Solution Concepts for Normal Form Games and Evolutionary Games**


**Required Readings**
- Class Notes: 9, 10

**Recommended Readings:**

### Week 6  
**[17 October] Discussion of Model Ideas for Final Paper**

[1 Page Memo to be circulated in advance]
Week 7  [24 October] Solution Concepts and Tools for Extensive Form Games I


Required Readings:
- Class Notes 11 & 12
- Osborne and Rubinstein, Sections 8.1-5.

Recommended Readings:
- For a more general presentation of the Rubinstein model, see Osborne and Rubinstein, Sections 7.2-3 or the rest of Muthoo Chapter 3

Week 8  [31 October] Solution Concepts and Tools for Extensive Form Games II (With More Uncertainty)


Required Readings:
- Class Notes 13

Further Reading
- Osborne and Rubinstein, Chapter 12.

**DUE!: *** HAND IN WRITTEN MODEL OUTLINE ***
## Week 9  
### [7 November] University Holiday  
#### [Optional: Solution Concepts for Cooperative Games]


**Required Readings:**
- Class Notes 14  

**Further Reading**

## Week 10  
### [14 November] Turning Game Theory on its Head: Mechanism Design, Auction Theory


**Required Reading**
- Class Notes 15  
- Osborne and Rubinstein, Chapter 10.  

**Further Reading**
Part II: Game Theory Applied to Politics

Week 11  [21 NOVEMBER] NEW WORK IN CONFLICT AND IR

Required Readings:
- Robert Powell. 2004. The Inefficient Use of Power: Costly Conflict with Complete Information. American Political Science Review. 98 (2)
- Schultz, K. The Politics of Risking Peace: Do Hawks or Doves Deliver the Olive Branch? International Organization

Week 12  [28 OCTOBER] APPLICATIONS II: MEET THE AUTHOR I

Required Reading:

Week 13  [5 DECEMBER] APPLICATIONS III: THEORY AND DATA

Required Reading
- Sanford C. Gordon and Catherine Hafer 2005 “Flexing Muscle: Corporate Political Expenditures as Signals to the Bureaucracy” American Political Science Review 99 (2)
- Cameron, Charles, Jeffrey Segal and Donald Songer. 2000. “Strategic Auditing in a Political hierarchy: An Informational model of the Supreme Court’s Certorari Decisions.” American Political Science Review. 95 (1)

Week 14  [12 DECEMBER] APPLICATIONS IV: MEET THE AUTHOR II

Required Reading: TBA