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 with the objective of preparing the student to use formal models in research in political science.

- In the first two weeks of the course we state and prove results that are of very broad interest to political philosophy, public economics and positive political theory. These results are all very important in their own rights, but they will also be used to introduce key ideas about model construction to be used later on.
- In weeks 3-7, 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 these weeks we aim to provide the tools that you will need to construct a model of your own.
- In weeks 8-14 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 13 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 week 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: Some *Big Results* in Social Choice**

---

**Week 1**

[9 SEPTEMBER] SOCIAL WELFARE, COLLECTIVE CHOICE AND EFFICIENCY

**THEOREMS AND CONCEPTS:** Arrow’s Impossibility Theorem, the Impossibility of a Paretian Liberal and the Coase Theorem.

**Readings**

- Class Notes: 1 & 2


**Further reading:**

Part II: Tools for Constructing and Solving Games

Week 2  [16 SEPTEMBER] HOW TO PROVE IT: STRATEGIES OF PROOF


Required Readings
• Class Notes: 3 & 4
  • Osborne and Rubinstein, Section 2.4.

Recommended Readings:
• The rest of Velleman
• How to Write Mathematics (from the webpages of the Mathematics Society of Trent) http://xaravve.trentu.ca/mascot/handbook/SEC_write.pdf
• 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.

Week 3  [23 SEPTEMBER*] WHAT TO PROVE: DEFINING GAMES, IDENTIFYING PROPOSITIONS, REPRESENTING PREFERENCES


Required Reading
• Class Notes 5, 6 & 7
  • Varian, Hal How to Build an Economic Model in Your Spare Time http://www.sims.berkeley.edu/%7Ehal/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/GI_reader/05c.roberts.htm

*Note: Clash with ECPR meetings. This class may have to be held on 16 or 17 September.

Week 4 [30 SEPTEMBER] SOLUTION CONCEPTS FOR NORMAL FORM GAMES AND EVOLUTIONARY GAMES


Required Readings

• Class Notes: 8


Recommended Readings:


Week 5 [7 OCTOBER] SOLUTION CONCEPTS AND TOOLS FOR EXTENSIVE FORM GAMES I


Required Readings:

• Class Notes 9 & 10

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.

DUE:

---

Week 6  [14 OCTOBER] SOLUTION CONCEPTS AND TOOLS FOR REPEATED GAMES II
(WITH MORE UNCERTAINTY)


Required Readings:

- Class Notes 11

Further Reading

- Osborne and Rubinstein, Chapter 12.

Week 7  [21 OCTOBER] BREATHER

CLASS PRESENTATIONS OF MODEL DESIGNS
**Week 8  [28 NOVEMBER] SOLUTION CONCEPTS FOR COOPERATIVE GAMES**


**Required Readings:**

- Class Notes 12

**Further Reading**

- Osborne and Rubinstein, Chapter 12.

---

**Week 9  [4 NOVEMBER] TURNING GAME THEORY ON ITS HEAD: MECHANISM DESIGN, AUCTION THEORY**

**THEOREMS AND CONCEPTS:** The Revelation Principle, The Gibbard-Satterthwaite Theorem, the Revenue Equivalence Theorem. The Myerson-Satterthwaite Theorem.

**Required Reading**

- Class Notes 13
- Osborne and Rubinstein, Chapter 10.

**Further Reading**

Part III: Game Theory Applied to Politics

Week 10  [11 NOVEMBER] NEW WORK IN JUDGING, LOBBYING AND BARGAINING

Required Readings:
- 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)

Further Reading:

Week 11  [18 NOVEMBER] NO CLASSES (THANKSGIVING)

Week 12  [25 NOVEMBER] NEW WORK IN GENERALIZATION

Required Reading
- Robert Powell. 2004. The Inefficient Use of Power: Costly Conflict with Complete Information. American Political Science Review. 98 (2)

Week 13  [2 DECEMBER] VIOLENT GAMES

Required Readings:

Recommended Reading

Week 14 [9 DECEMBER] TAKING GAMES TO DATA