Political Science 3621: Politics and the Theory of Games

Instructor: Elaine Yao (eyao@wustl.edu)[1]   Credits: 3 hours

Course Description

This course is intended to cover through analytical discussion and illustrations the basic concepts and major achievements of Game Theory in different sub-fields of research in the social sciences today. We will discuss examples of the usefulness of cooperative and non-cooperative game theory to the study of human behavior in general and political science and political economy in particular.

Objectives and organization

This course provides an introduction to game theory and its application to politics and policy-making. The aim of the course is for students to be able to represent static and dynamic games under complete and incomplete information and how to analyze them using appropriate methods and solution concepts. Applications to political science are emphasized throughout, but the primary focus will be on gaining a solid foundation in the methods of game theory. By the end of the course, students should have:

1. An understanding of the most popular methods of representing and solving games,

2. Necessary background to appreciate and critically analyze the usage of game theoretic models in political science scholarship,

3. A lens through which to analyze current events and proposed reforms to political systems.

Mathematical prerequisites. Precise logical reasoning is at the heart of doing game theory. As such, some degree of mathematical maturity can ease the learning curve. That said, the actual mathematical prerequisites required to succeed in this course are minimal. Lectures and assignments will assume a working knowledge of high school algebra. I may reference elementary calculus in lecture, but calculus is not required for any problem sets or exams.

The **textbook** for this course is Martin Osborne's *An Introduction to Game Theory*. This is a standard introductory text for students without significant mathematical background. It is available in print and in digital format at the WashU bookstore.

The following textbooks are not required, but we will draw supplemental readings and exercises from them. I encourage you to consult them based on your own need and interest:

- *Game Theory 101* (William Spaniel) and excellent accompanying videos – an accessible introductory text emphasizing international relations applications)

- *Game Theory: An Introduction* (Steven Tadelis) – a general introductory text at an intermediate level of mathematical formalism

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[1]I am indebted to Keith Schnakenberg, Ian Turner, and Matias Iaryczower for the basis of this syllabus and course.

- *Game Theory for Applied Economists* (Robert Gibbons) – an introductory course suitable to undergraduates with single-variable calculus and interests in economics

Assessments and Grading

The course grade will be determined as follows:

- **Problem sets: 25%.** Your lowest p-set grade will be dropped. Each remaining p-set is weighted equally.

- **Exams (three total): 25% each.** Exams are in-person and closed-book. No calculators or other devices are permitted.

Problem sets will be assigned (approximately) every other week and must be submitted on Canvas by the start of class time on the due date. Late submissions will not be accepted.

Collaboration policy. Students may work together on problem sets but you must each turn in your own write-up. Working together means discussing problems and methods; it does not mean splitting up the problems or copying others' solutions.

AI policy. You are free to ask generative AI questions, but you cannot pass off its output as its own (i.e. by copy-pasting its derivation into your problem set.) LLMs have become excellent at solving the sort of garden-variety models which you will largely encounter in this class, but overreliance on them may be detrimental for performance on exams.

The **grading scale** is standard and as follows. Threshold for Pass: 70%.

Score Range	Grade		Score Range	Grade
≥ 97	A+		$[77, 80)$	C+
$[93, 97)$	A		$[73, 77)$	C
$[90, 93)$	A-		$[70, 73)$	C-
$[87, 90)$	B+		$[67, 70)$	D+
$[83, 87)$	B		$[63, 67)$	D
$[80, 83)$	B-		$[60, 63)$	D-

Expectations and guidelines

- **Attendance** is encouraged, but will not be recorded and is not a component of your grade.

- **Communication policy:** I aim to respond to emails within 24 hours of receiving them during business days (M–F). If you don't receive a reply by then, feel free to send a follow-up. Emails received within 24 hours of exams/deadlines are not guaranteed a response.

- **Inclusive Learning Environment**. Please be respectful of your peers and mindful of the classroom environment. To facilitate an inclusive and productive learning environment, a number of resources are described below, which I encourage you to be familiar with.

- **Academic Integrity.** You are expected to understand and adhere to, the University's academic integrity policy. In all academic work, the ideas and contributions of others (including generative AI) must be appropriately acknowledged and work that is presented as original must be, in fact, original. If you have any doubts about this, please ask.

- **Unauthorized recording**. Except as otherwise expressly authorized by the instructor or the university, students may not record, stream, reproduce, display, publish or further distribute any classroom activities or course materials. This includes lectures, class discussions, advising meetings, office hours, assessments, problems, answers, presentations, slides, screenshots or other materials presented as part of the course. If a student with a disability wishes to request the use of assistive technology as a reasonable accommodation, the student must first contact the Office of Disability Resources to seek approval. If recording is permitted, unauthorized use or distribution of recordings is also prohibited.

- **Disability resources**. WashU supports the right of all enrolled students to an equitable educational opportunity and strives to create an inclusive learning environment. In the event a physical or online environment, learning activity, or learning interaction results in barriers to your inclusion due to a disability, please contact WashU's Disability Resources (DR) to engage in a process for determining and communicating approved accommodations. As soon as possible after receiving an accommodation from DR, send me your WashU Accommodation Letter. Because accommodations are not applied retroactively, initiate your request to DR prior to, or at the beginning of, the academic term to avoid delays in accessing accommodations once classes begin. Please see disability.washu.edu for more information.

- **Sexual assault and harassment.** If you are a victim of sexual discrimination, harassment or violence, we encourage you to speak with someone as soon as possible. Understand that if you choose to speak to me as an instructor, I must report your disclosure to my department chair, dean, or the Gender Equity and Title IX Compliance Officer, which may trigger an investigation into the incident. You may also reach out to the Relationship & Sexual Violence Prevention (RSVP) Center to discuss your rights and your options with individuals who are not mandatory reporters. Confidential resources are also available.

- **Religious holidays.** To ensure accommodations can be made for students who miss class, assignments, or exams to observe a religious holiday, please inform me in writing before the end of the third week of class, or as soon as possible if the holiday occurs during the first three weeks of the semester. For more information, please see the university's Religious Holiday Class Absence Policy.

- **Emergency preparedness.** Before an emergency affects our class, students can take steps to be prepared by downloading the WashU SAFE App. In addition, each classroom contains a "Quick Guide for Emergencies" near the door.

- **Resources for students.** WashU provides a wealth of support services that address academic, personal, and professional needs. To start exploring resources that can help you along the way, please visit: Resources for Students.

Schedule

A tentative schedule of topics and associated course readings is below. Dates and deadlines are subject to change. Please do the required reading *prior to* the start of class on that day. Unless otherwise indicated, readings are from Osborne. Handouts will be uploaded on Canvas>Files.

Topic		Reading
0. Introduction		
Unit 1: Rationality and Static Games of Complete Information		
1. Individual decision-making		Morrow handout + Ch 1
2. Pure Strategy Nash Equilibrium		2.1–2.6
3. PSNE examples, IDSDS		Remainder of Ch 2
4. Application: Electoral competition	+ *pset-1 due*	3.3
5. Electoral competition II		*Optional: Gehlbach handout*
6. Mixed Strategy Nash Equilibrium		4.1–4.3.3
7. MSNE II	+ *pset-2 due*	4.3.5 and 4.4
Unit 1 exam		
Unit 2: Dynamic Games of Complete Information		
8. Sequential games		Ch 5
9. Sequential games II		
10. Application: Agenda-setting		6.1
11. Repeated games: Prisoner's dilemma	+ *pset-3 due*	Ch 14
12. Repeated games: Folk theorem		
13. Bargaining		Tadelis handout 11.1–11.3
14. Legislative bargaining		Tadelis handout 11.4
15. Catch-up/in-class exercises	+ *pset-4 due*	
Unit 2 exam		
Unit 3: Games of Incomplete Information		
16. Static games of imperfect info (Bayesian games)		Ch 9, 9.1–9.3
17. Bayesian games II		
18. Application: Strategic voting on juries		9.7 *(Illustration: juries)*
19. Extensive games of imperfect info	+ *pset-5 due*	10.1–10.4
20. Signaling games		10.5
21. Signaling II		10.7
22. Application: Political Agency	+ *pset-6 due*	10.8–10.9
23. Cheap talk		
Unit 3 exam		