Syllabus for Political Science 118:
Game Theory in Political Science

Fall 2020
(Last updated on September 23, 2020)

Instructor:	Sean Ingham	**Time**:	MWF 9:00-9:50am
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Course description

This course introduces students to game theory and its applications in political science. It covers the concepts of Nash equilibrium and subgame perfect equilibrium and their application to the study of electoral competition, collective action problems, and agenda-setting, among other topics. The goals of the course are to give students a solid understanding of core concepts in game theory and their canonical applications in political science, and to sharpen student s' problem-solving and analytical reasoning skills.

Prerequisites

The course has no formal prerequisites and presupposes no mathematical knowledge beyond what is typically taught in high school (there is no calculus, for example). However, the material presents some of the same challenges as mathematics generally: special symbols and notation, abstract concepts, and the difficulty of careful analytical reasoning.

Course materials

We will use Martin Osborne's *An Introduction to Game Theory*. The first three chapters are available on Osborne's website:

`https://www.economics.utoronto.ca/osborne/igt/`

You can find my complete lecture notes and the assigned lecture videos on Canvas.

Assignments and grades

The final grade reflects participation (5%), weekly quizzes (10%), problem sets (30%), a midterm exam (25%), a final exam (30%), and an extra credit opportunity.

- *Participation.* You can receive credit for participating in the Zoom meetings and for participating in the online discussion forum on Canvas. You do not need to engage in both modes of participating. **If you are able to participate in the Zoom meetings, you are strongly encouraged to do so.**

- *Quizzes.* Weekly quizzes ask simple questions about the assigned lecture videos (not the Zoom recordings). The schedule below indicates the deadlines for submitting one's answers.

- *Problem sets.* There will be four problem sets. Students are permitted to work on the problem sets in groups, but each student must write up and submit their own solutions, and a student must be prepared to explain their answers to the TA or instructor upon request.

  The deadlines for the problem sets are indicated on the schedule below. They should be submitted to the Canvas website before 9:00am, pacific time, on the day indicated.

- *Exams.* The midterm exam covers all the material from lectures and the problem sets prior to the date of the midterm exam. The final exam is cumulative and tests all material covered in lectures and the problem sets during the quarter.

- *Extra credit.* You will receive extra credit if you volunteer for my list of "ready interlocutors" whom I will sometimes call on during the Zoom meetings to answer questions. The questions will typically be easy, or perhaps moderately challenging. You are permitted to answer with "pass" up to two times during the quarter without jeopardizing the extra credit (and if you are absent from the Zoom meeting then that automatically counts as using one of your two "pass" options). Your answers will not be graded. Students who are unable to participate synchronously in the Zoom meetings because of their time zone should contact the instructor if they would like an alternative opportunity for equivalent extra credit. **You must sign up the first week of the quarter if you wish to take advantage of this opportunity for extra credit.**

Zoom URL

To register for the recurring Zoom meeting, which takes place 9:00-9:50am, pacific time, MWF, use the following url:

    https://ucsd.zoom.us/meeting/register/tJMpcOqtrT8iG9BLy_s7vmiVbmkC8Ki8q7Om

After registering, you will receive a confirmation email containing information about joining the meeting.

Zoom sessions will take place during the scheduled class time. They will be recorded and the recordings made available via Canvas.

How to succeed in this course

- *Remote learning.* Taking classes remotely presents its own set of challenges. I recommend watching at least the first half of this video by a UCSD psychology professor for some tips on how to learn effectively in online classes:

`https://www.youtube.com/watch?v=1IIUVU-d1DM\&feature=youtu.be`

- *Preparing for the Zoom sessions.* You should read the assigned sections of the textbook and lecture notes and watch the assigned lecture videos (see schedule below) before coming to the Zoom meeting. You should use the Zoom meeting to ask questions about what you didn't understand.

- *How to read/watch.* When you sit down to read the textbook or the lecture notes, or to watch a lecture video, think of this activity as analogous to participating in a strenuous group exercise class. The text/notes/video are like the instructor of group exercise class. If all you do is read the text and watch the video, this is like passively watching the instructor as the instructor performs the exercises, and you will not gain much by this. To get "fit," you need to participate in the exercises, not just watch passively from afar. You should have a pencil and paper on hand as you read so that you can work through exercises and examples on your own. You should try to come up with your own examples, in addition to those given in the book or notes, to illustrate the abstract concepts being presented. This is the hard work that will actually create and strengthen the neural connections that produce understanding and problem-solving ability.

- *Mindset.* It's also important to have the right attitude. Be patient, adopt a growth mindset, and take personal responsibility for your education. When you are confused, do not blame the author. Go back and re-read, slowly, and figure out why you are confused. After re-reading the textbook and notes, consult with a peer, TA, or the instructor. To meet with the TA or instructor via Zoom, send an email.

- *How to study.* Do as many of the exercises in the textbook and lecture notes as you can. Try constructing your own exercises by making modifications to the games presented in the textbook or lecture notes and seeing whether the modifications affect your solutions, and why or why not. Try explaining your solutions and the definitions of game-theoretic concepts to a peer.

Academic honesty

Please familiarize yourself with the university's policies regarding academic integrity. Academic dishonesty will be punished to the maximal extent permitted by university policy. For more information about what constitutes academic dishonesty and the potential repercussions, see the information at the following link:

`https://academicintegrity.ucsd.edu/`

In this course, copying text from another student's problem set and discussing the midterm exam or the final exam during the exam period constitute academic dishonesty. However, working on problem sets with other students is permitted—indeed, encouraged—but students must write up their own solutions.

Schedule

[1] October 2. Introduction

- Syllabus.
- Lecture notes, §1

[2] October 5. Rational agents, preferences, and payoff functions

- Osborne, *Introduction to Game Theory*, 1.1, 1.2
- Lecture notes, §§2, 3

Assigned video: "Rational agents, payoff functions"

[3] October 7. Concept of a strategic game; the Prisoner's Dilemma

- Osborne, 2.1, 2.2
- Lecture notes, §§4–6

Assigned video: "The concept of a strategic game"

[4] October 9. Additional games; concept of a Nash equilibrium

- Osborne, 2.3–2.6
- Lecture notes, §§7, 8
- **Week 1 quiz due, 9am**

Assigned video: "Nash equilibria to strategic games"

[5] October 12. Nash equilibria to simple games

- Osborne, 2.7.1–2.7.3
- Lecture notes, §9

Assigned video: "Additional simple games"

[6] October 14. Stag hunt game

- Osborne, 2.7.4
- Lecture notes, §10
- **First problem set due**

Assigned video: "Stag hunt"

[7] October 16. Justification for the Nash equilibrium concept

- Lecture notes, §11
- **Week 2 quiz due, 9am**

[8] **October 19.** Public goods provision

- Osborne, 2.7.5-2.7.7
- Lecture notes, §§12–15

Assigned video: "Public goods provision"

[9] **October 21.** Voter participation

- Osborne, Exercise 32.2 (Voter participation)
- Lecture notes, §16

Assigned video: "Voter participation"

[10] **October 23.** Dominant actions

- Osborne, 2.9.1-2.9.4
- Lecture notes, §17
- **Week 3 quiz due, 9am**

Assigned video: "Dominant actions"

[11] **October 26.** Voting games

- Osborne, Exercise 47.1 (Voting)
- Lecture notes, §18

[12] **October 28.** Electoral competition

- Osborne, 3.3, up until Exercise 72.1
- Lecture notes, §20
- **Second problem set due**

Assigned video: "Hotelling-Downs model of electoral competition"

[13] **October 30.** Application to empirical inquiry: why is there not ideological convergence?

- **Week 4 quiz due, 9am**

[14] **November 2.** Elections with ideologically motivated candidates

- Exercise 73.1 (candidates who care about location of winning position) in Osborne

- Lecture notes, §21

Assigned video: "Ideological candidates"

[15] November 4. More models of electoral competition

- Exercise 72.3 (Electoral competition in two districts) in Osborne
- Lecture notes, §22

[16] November 6. Review session.

- **Week 5 quiz due, 9am**

[17] November 9. Midterm exam

[18] November 11. Expected utility theory

- Osborne, 4.1
- Lecture notes, §23

Assigned video: "Expected utility"

[19] November 13. Mixed strategies

- Osborne, 4.2
- Lecture notes, §24
- **Week 6 quiz due, 9am**

Assigned video: "Mixed strategies"

[20] November 16. Nash equilibria in mixed strategies

- Osborne, 4.3
- Lecture notes, §24
- **Third problem set due**

Assigned video: "Nash equilibria in mixed strategies"

[21] November 18. Voter turnout, revisited

- Exercise 118.2 (Voter participation) in Osborne
- Osborne, 4.6
- Lecture notes, §25

[22] November 20. Extensive-form games; strategies in extensive-form games

- Osborne, 5.1, 5.2
- Lecture notes, §§26, 27
- **Week 7 quiz due, 9am**

Assigned video: "Extensive-form games," "Strategies in extensive-form games"

[23] November 23. Nash equilibria to extensive-form games

- Osborne, 5.3
- Lecture notes, §28

Assigned video: "Nash equilibria to extensive-form games"

[24] November 25. Backwards induction and subgame perfect equilibria

- Osborne, 5.4
- Lecture notes, §§29–30
- **Week 8 quiz due, 9am**

Assigned video: "Subgame perfect equilibria"

[25] November 30. Ultimatum game; holdup game

- Osborne, 5.5, 6.1.1, 6.1.2
- Lecture notes, §§31, 32
- **Fourth problem set due**

Assigned video: "Ultimatum game"

[26] December 2. Agenda control

- Osborne, 6.1.3
- Lecture notes, §33

Assigned video: "Agenda control"

[27] December 4. Agenda control, continued

- **Week 9 quiz due, 9am**

[28] December 7. Buying votes

- Osborne, 6.3
- Lecture notes, §34
- **Week 10 quiz due, 9am**

Assigned video: "Buying votes"

[29] December 9. Application to empirical inquiry: experimental tests of altruism

- Steffen Andersen et al. 2011. "Stakes Matter in Ultimatum Games." *American Economic Review* 101: 3427–3439.
- James Andreoni, Justin M. Rao, and Hannah Trachtman. 2017. "Avoiding the Ask: A Field Experiment on Altruism, Empathy, and Charitable Giving." *Journal of Political Economy* 125(3): 625–653 (read through the end of the second paragraph on p. 629).

[30] December 11. Review session.