POLI 118: Introduction to Game Theory

Winter 2023

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1 Course Description and Goals

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 students' problem-solving and analytical reasoning skills.

2 Texts

We will use Martin Osborne's *An Introduction to Game Theory*. The assigned chapters will be available on the course Canvas site.

Whether you grasp the intuitions behind a concept or technique often depends on how it is presented to you. Also, one of the most effective ways to learn the material in this course is by having the same ideas presented in different ways. So it is worth checking out other texts for the sake of comparison. You might find some of the following helpful.

1. Fudenberg and Tirole, *Game Theory* (MIT Press, 1991) (advanced)
2. Gibbons, *Game Theory for Applied Economists* (Princeton UP, 1992)
3. Gintis, *Game Theory Evolving* (Princeton UP, 2nd ed. 2009)
4. Tadelis, *Game Theory* (Princeton UP, 2013)

3 Assessment

Learning and developing skills requires two things:

- that you engage in training exercises in which you learn and practice the skills you are trying to develop (**assignments**);
- that you receive feedback that indicates your current skill level and how to improve (**grades**, etc.).

Training exercises. This course emphasizes the *analysis of game-theoretic models*. The course exercises are designed to build your understanding of game-theoretic concepts and their application to models of social and political behavior.

- **In-class exercises.** Class sessions will be a mix of lectures and class discussion. There will be frequent small group exercises that allow you to practice interpreting and analyzing game-theoretic models.
- **Assigned reading.** Assigned readings are for reference purposes. You should read the assigned passages before class to acquaint yourself with the concepts and models we will discuss in class. (See the Schedule section below.)
- **Problem sets.** There will be four problem sets during the quarter. Each problem set will include 3–4 questions, which ask students to apply the concepts and techniques discussed in lectures. Each problem set is worth 16 points; the top three scores will count toward your final course grade. More details on the course Canvas site.
- **Exams.** There will be an in-class midterm exam during week 6, which will cover the material covered in the lectures and problem sets up to that point. There will be a final in-class exam during finals week, which will cover the material from the entire course. The midterm exam is worth 24 points; the final exam is worth 28 points. Please be sure to bring blue books to the exams.

Note. Late assignments will not be accepted without an approved excuse. Please reach out to me in advance if you would like to request a deadline extension. You must receive approval from me prior to the submission deadline. As a matter of policy, I will ask for documentation to corroborate your reason for requesting an extension. Please keep this in mind and make sure you document your excuse.

Feedback. Here are the ways in which you will receive feedback to help you in your skill development.

- During in-class exercises, I will ask you to explain your ideas and challenge you to improve your reasoning. While these challenges are often interpreted as criticism, you should not take them as expressing a judgment that you are incompetent. Instead, you should interpret these challenges as expressing a judgment that *you are competent and able to improve* your understanding.
- Grades are also an important source of feedback. You will be graded according to a rubric so that you can clearly interpret what your grades mean with respect to what you're doing well and where you need to improve.

Here is some basic information about how your final grade will be determined. Additional details are available on the course Canvas site. Let T be the total number of points earned during the quarter.

Table 1: Final grade calculation

Total points	**Letter**
$T \geq 100$	A+
$95 \leq T < 100$	A
$87 \leq T < 95$	A−
$80 \leq T < 87$	B+
$70 \leq T < 80$	B
$62 \leq T < 70$	B−
$55 \leq T < 62$	C+
$45 \leq T < 55$	C
$37 \leq T < 45$	C−
$20 \leq T < 37$	D
$T \leq 20$	F

Table 2: Assignment point value and weights

Assignment	**Point value**	**Overall weight**
Problem sets	16 points each/48 total	48%
Midterm exam	24 points	24%
Final exam	28 points	28%

4 Expectations

1. Personal Investment. Your success in this course depends on how much you invest in your own learning. Here's some advice about how to invest in your success:

- You should read the assigned readings before class and be prepared to ask questions during class about things you didn't understand.
- When reading the text or when taking notes in class, you should think of yourself as actively engaged in training rather than passively consuming information. Always have a pencil and paper on hand, taking notes on the reading, jotting down questions, and working through exercises.
- Do as many of the exercises in the textbook and lectures as you can. Try constructing your own exercises by modifying the models presented in the text or in lecture; check whether your modifications affect your analysis of the models and see if you can explain why these modifications (fail to) make a difference.
- Be patient and adopt a growth mindset. When you get confused — and you will get confused — do not blame others for your lack of understanding. This material is abstract and difficult. Assume that you can learn it with sufficient effort and patience. Go back and re-read the text or re-read your lecture notes and try to figure out the source of your confusion. Consult with a peer, TA, or the instructor.

The requirements are designed so that success in this course will require an average investment of 2–3 out-of-class hours for every in-class hour (on average, 6–9 out-of-class hours per week).

2. Respect for Others. Learning game theory works well when it is collaborative, and students learn it best when they engage in that process. Such a participation-heavy environment requires

that each of us gives others adequate space to participate, in addition to recognizing that we don't know everything. We must work to cultivate an environment in which people do not hesitate to ask "silly" questions, make mistakes, or disagree with others. We will disagree (sometimes vigorously) with each other and we will work through our disagreements in class. But our debate will always be conducted respectfully.

Note: Conducting class discussions respectfully does not mean that everyone gets to be right all the time; it does not mean that we must avoid critically evaluating one another's claims. Rather, respectful discussion involves acknowledging that you have a limited perspective on an issue and that your thinking can be enriched by viewing an issue from someone else's perspective. Respectful discussion involves seriously considering the possibility that you might be wrong and that someone who thinks differently than you might be right.

3. Technology. As a default rule, electronic devices (laptops, tablets, phones) should not be used during class. You should take notes by hand, using paper and pen/pencil. You do not need to capture every word I say; in fact, you should avoid trying to do this. You should spend most of your time in class listening, reflecting, and asking questions. (I will make exceptions to this rule if necessary. Please let me know if you need an exception.)

4. Accommodations. If you feel that you need an accommodation for any sort of disability or for religious reasons, please discuss this with me as early as possible (after class, in office hours, or by email).

5. Out-of-Class Help. You are welcome to reach out to me for help with your assignments. However, there are some guidelines to prevent last-minute calls/emails and to insure that I am able to make time to help you.

(1) Please try to see me during office hours (I've scheduled these to be at times when I'm sure to be available). If these hours are not convenient, it is possible to set up an appointment at a mutually convenient time. To set up an appointment with me, send an email with the subject line "[POLI 118] Appointment request". In the body of the email, indicate 3–5 times that work for you. I will choose a time that works for me from that list. (**Warning**: I am generally not available to meet in the mornings.)

(2) If you have a question or concern about the class, please search the syllabus or the course Canvas site for the answer. If there is no answer to be found, then feel free to post to the Canvas discussion board about any questions or concerns and I will try to reply to you within 24 hours. I can't guarantee an immediate reply; if you need an answer right away, you may have waited too long.

6. Email. If you have a question that is not specific to your situation, please post it on the Canvas discussion board so that others can benefit from my answer (this way, I won't need to ask the same question numerous times via email). If your question is specific to your situation, please come to talk to me after class or during office hours. As a last resort, you can send me an email using the Canvas email interface.

7. Grade Disputes. I am willing to re-examine assignment grades with you if you feel your work deserves a better grade. There are two steps to this process:

(1) You must wait 24 hours after the assignment as been returned before you approach me.

(2) You must approach me with a written justification for your complaint (a single paragraph is fine). In this, you must outline why you think your work deserves a better grade and where the discrepancy lies between your work and the assigned grade.

Warning: If you challenge a grade, I reserve the right to reset the grade *as I see fit.* Opening a grade dispute means a re-examination of the assignment. Thus, your grade will not necessarily improve and may even go down.

8. Academic Integrity. Academic integrity is essential to the learning process — I expect that the work you submit under your name reflects your own knowledge and ability. We will follow the UCSD Policy on Integrity of Scholarship in this course (https://academicintegrity.ucsd.edu/).

The main forms of academic misconduct for this course are: copying from another student's problem set, and discussing exams during the exam period.

To support academic integrity, all problem set solutions will be submitted to Turnitin.com (through the Canvas site). Academic misconduct in any form will not be tolerated. Any suspected case of academic misconduct will be referred to the UCSD Academic Integrity Office for investigation and review. If you are found responsible by the AIO for an academic integrity violation, the AIO will determine the administrative penalty (e.g., academic integrity training, suspension, expulsion, etc.). The academic penalty will be left to me. For the first offense, the penalty will depend on the severity of the violation. A second violation will result in an automatic F for the course.

5 Schedule

This schedule is tentative and incomplete. Please monitor the Canvas site for schedule updates.

Week 1
Jan 10/12 Set theory and logic; rationality, preferences, and payoffs
Osborne, chap. 1; Hammack, pages 3–13, 173–180, 194–198

Week 2
Jan 17/19 Strategic games; best response reasoning; examples

Week 3
Jan 24/26 Best response reasoning (cont'd); Nash equilibrium; examples
Jan 27 *Problem set 1 due at 11:59 pm*

Week 4
J 31/F 2 Nash equilibrium (cont'd); dominance reasoning; voting games

Week 5
Feb 7/9 Electoral competition
Feb 10 *Problem set 2 due at 11:59 pm*

Week 6
Feb 14 Midterm review
Feb 16 Midterm exam (in-class)
Please bring your own blue book.

Week 7
Feb 21/23 Expected utility; mixed strategies

Week 8
F 28/M 2 Extensive-form games; Nash equilibrium in extensive form games

Mar 3 *Problem set 3 due at 11:59 pm*

Week 9
Mar 7/9 Backwards induction; subgame perfect equilibrium; bargaining games

Week 10
Mar 14/16 Bargaining games continued

Mar 17 *Problem set 4 due at 11:59 pm*

Week 11
Mar 21 Final exam (11:30-2:30, in-class)
Please bring your own blue book.