PS232-A: Formal Models in Political Science I

Lecture details:

Spring 2026
Class time: Tues 12:30 – 3:30
Location: SSB 791

Instructor of Record:

Professor Sean Gailmard
Department of Political Science
Social Science Building 750c
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Office hours: Th 10:15 – 12:15, and by appt.

GSI:

Zach Hertz
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Office hours:
Location:

Course Description and Objectives

This is a first course on game theory and its application in political science research. It covers elements of utility theory, representations of static and dynamic games under complete and incomplete information, and analysis of games based on Nash equilibrium and refinements. The major course objectives are to enable students to solve formal problems containing these elements, and to begin consuming scholarly literature based on them.

Formal theory sequence: 232A is the first course in the Department's formal theory sequence. 232B is the second course. It covers overlapping topics in greater depth, some new theoretical topics, and more applications. Various topics courses (239) connect students to ongoing literature. Ideally, students will be able to digest simple applications of game theory in the literature after 232A, and will be able to digest more involved applications, as well as begin to understand how to develop their own, after 232B and 239s.

Required Skills

This course is designed for students with a large range of prior exposure to mathematics. Students should have a working knowledge of arithmetic, algebra, and elementary probability; some grasp of basic calculus is useful. However, *all students capable of gaining admission to a Berkeley Ph.D. program can fully succeed in this class regardless of prior technical preparation other than the required skills listed above.* On this basis I offer a guarantee: if you are interested in the material, willing to work, and willing to let me know when you need help, we will find a way for you to succeed in this class.

Students find this course challenging due to the reasoning style in game theory, as much as or more than the mathematics *per se*. In fact one of the major points I want to make in this class is that a model can be *strategically* evocative yet *mathematically* simple. While advanced game theory requires challenging math, much of the disciplinary literature in applied formal theory involves no more challenging math than high school algebra II.

Format

Class sessions will consist of lectures, and mostly on theory, concepts, and examples. In general, readings will cover more material than the associated lecture. Readings and lecture are complements, not substitutes.

Readings

The required text for the course is *Game Theory: An Introduction* by Steven Tadelis (2013, Princeton University Press). I will also occasionally distribute articles or handouts. Whether you complete readings before the associated lecture session or after is up to you. Doing both is not a bad idea.

Depending on your background and objectives, various other texts may also be useful:

- Standard undergraduate texts, less technical than Tadelis: *Games of Strategy*, Dixit, Skeath, and Reiley; *An Introduction to Game Theory*, Osborne.
- Canonical, advanced graduate texts: *Game Theory*, Myerson; *Game Theory*, Fudenberg and Tirole; *A Course in Game Theory*, Osborne and Rubinstein. Osborne and Rubinstein is available free on the internet (legally).
- Introductory treatments aimed at political science graduate students: *Political Game Theory*, McCarty and Meirowitz; *Game Theory for Political Scientists*, Morrow. McCarty and Meirowitz is more advanced; Morrow is more accessible.
- Extended but simplified treatment of major models from the literature: *Formal Models of Domestic Politics*, Gehlbach; *Game Theory for Applied Economists*, Gibbons. Both are fantastic books for teaching theory through examples.

Grades

The course grade will be determined as follows:

1. Problem sets (4 total): 60%
2. Final exam: 20%
3. Class participation: 10%
4. Section attendance: 10%

Description of assessments:

- Problem sets: will be due every few weeks throughout the term. I encourage you to collaborate with other students, where "collaboration" means "talking over solution strategies" and not "dividing up the problem set and rote copying of colleagues' work on other problems." Whether you collaborate or not, *all solutions you submit to all problems must be prepared and written on your own.* The point here is to learn, and rote copying is both academically dishonest and a waste of everyone's time. Please don't do it. **Problem set 4** will include a prompt asking you to think about applying material from this course to study your own research interests. This prompt must be completed individually, though you are certainly free to discuss research ideas with your peers.

- Comprehensive take-home final exam: will be available at the start of finals week and you will have 48 hours to complete it. It must be completed by 5 p.m. on Friday of finals week. Beyond these stipulations you can take the exam whenever you choose.

- Participation: means constructive engagement with the course in general, and I will assess it in a variety of ways. Asking questions in lecture, in office hours, over email; being generally alert; and simply being there (in general, and on time) all count.[1]

- Section attendance: You should plan to attend the GSI section every week. There are 14 section meetings. Attendance will be taken each week. Attendance at each section is worth 1% of the course grade, up to 10% total. You can miss 4 meetings with no effect on your score.

[1]That said, I do not have a specific attendance benchmark for lecture. If something comes up and you need to miss class, you do not need to clear it with me. Things happen for all of us and this will not count against you in any way.

Problem Set Due Dates

Problem sets will be due on the following dates. You should submit PDFs of your answers to Zach at his direction. These due dates are fixed so that you can better plan to meet deadlines and responsibilities for other courses, SYP, etc.

1. Pset 1: Mon Feb 9
2. Pset 2: Fri Mar 6
3. Pset 3: Fri Apr 3
4. Pset 4: Fri May 1

GSI and Discussion Section

The GSI is Zach Hertz. Zach is a Ph.D. student in the department. He will grade problem sets and exams, hold office hours to provide advice on concepts and problem sets, and will conduct a weekly discussion section. The weekly discussion section will consist of review of concepts and lingering issues from class and readings, and demonstration of concepts by working through new problems.

Course Policies

This course adheres to all UC Berkeley policies, including those on academic integrity and accommodations for differential abilities.

- Do not cheat or plagiarize. It is beneath you and a waste of everyone's time.
- In addition to accommodation for differential abilities, please talk to me if you need a temporary accommodation or adjustment due to personal exigencies. I am certain we can work out something satisfactory.

Sequence of Topics

This is the sequence of topics we will cover. Each topic corresponds to one lecture session.

1. Preference and choice. Utility. The rationality postulate. Models, empirics, and explanation.
    - Tadelis chapters 1 and 2
2. Random utility models and probabilistic voting.
    - Readings TBA

3. Normal form games: representation, strategies, best response, dominance. Nash equilibrium. Pareto efficiency.
    - Tadelis chapters 3 and 4
4. Normal form games: Nash equilibrium in pure and mixed strategies. Models of collective action, probabilistic deterrence.
    - Tadelis chapters 5 and 6
5. Extensive form games: representation, strategies. Credibility.
    - Tadelis chapter 7
6. Extensive form games: sequential rationality, subgame perfect Nash equilibrium.
    - Tadelis chapter 8
7. Applications: Agenda setting. The bargaining model of war. Games as generative causal models.
    - Tadelis, chapter 11 (sections 1-2)
8. Repeated games: representation, strategies, payoffs. Dynamic programming and Bellman equations. Nash equilibrium and SPNE.
    - Tadelis chapter 10
9. Repeated games: Folk theorems. Norms and norm-breaking.
    - Tadelis chapter 10
10. Incomplete information: representation, preferences, beliefs. Perfect Bayesian equilibrium.
    - Tadelis chapters 12 and 15
11. Extensive games of incomplete information: signaling games. Reputation building.
    - Tadelis chapter 16
12. Applications: Electoral accountability with incomplete information.
    - Tadelis chapter 17
13. Extensive games of incomplete information: Sender-receiver (cheap talk) games.
    - Tadelis chapter 18
14. Flex session. Formal models and empirical research. Conclusion.
    - Tadelis chapter 18