

Game Theory

MIT | 17.810/17.811 | Spring 2021 | Tuesday 1:00-3:00 PM
<https://canvas.mit.edu/courses/6670>

Contact Information

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Logistics

- Lectures: Tuesdays 1:00pm – 3:00pm
- Recitations: Fridays 12:00pm – 1:00pm
- TA Office Hour: Fridays 1:00pm – 2:00pm

Overview and Goals

This course provides an introduction to game theoretic analysis in political science. We study the concepts and models used to analyze political behavior in strategic contexts, including normal and extensive form games, games of incomplete information, repeated games, and bargaining.

Note to undergraduates: In order to get the HASS credit, please make sure to enroll in 17.811 (17.810 is the course number for graduate students). The topics covered in this class represent only a very small subset of political science research. If you enjoy this class, please consider a HASS concentration in Political Science.

Prerequisites

Willingness to work hard on unfamiliar materials. Understanding of the multivariate calculus equivalent to the contents covered in the department's second math camp course. (If you did not complete the math camp, contact the instructor to see if you have enough background.) The course will occasionally rely on some methods of mathematical proof (e.g., proof by contradiction, proof by induction, etc), but prior exposure to them is not assumed.

Course Requirements

The final grades are based on the following items:

- **Problem sets** (50%): Eight problem sets given throughout the semester. Problem sets will contain analytical questions and mathematical proofs. Each problem set will be graded on the scale of (+, ✓, −) and contribute equally toward the calculation of the final grade. The following instructions will apply to all problem sets unless otherwise noted.
 - Late submission will not be accepted unless you ask for special permission from the instructor in advance. (Permission may be granted or not granted, with or without penalty, depending on the specific circumstances.)
 - Working in groups is encouraged, but each student must submit their own write-up of the solutions. We also ask you to write down the names of the other students with whom you solved the problems together on the first sheet of your solutions.
 - For analytical questions, you should include your intermediate steps, as well as comments on those steps when appropriate. All results should be presented so that they can be easily understood.
 - Students are *strongly encouraged* to use $\text{\LaTeX}$ to write up their solutions; handwritten solutions must be clearly legible.
- **Participation** (10%): Your regular attendance and active participation in lectures and recitation sections and on Piazza.
- **Final problem set** (40%): The final assignment of the term will be a special problem set, which will be weighted more heavily toward the calculation of the final grade. You will not be allowed to collaborate with anybody on the final problem set. This is to check if you have developed sufficient experience to work through problems on your own. The assignment will be due on the last day of class (**May 18**).

Notes on Academic Integrity

Please respect and follow the rules written in MIT's handbook on academic integrity, which is available at:

<http://web.mit.edu/academicintegrity/>

In particular, the following is a (partial) list of the acts we will consider academically dishonest:

- Obtaining or consulting course materials from previous years
- Sharing course materials with people outside of the class, such as problem sets and solutions
- Copying and pasting someone else's answers to problem sets electronically, even if you collaborated with the person in a legitimate way (as specified above)

Recitation Sessions

We will hold weekly recitation sessions over Zoom. Please fill out our poll by the end of the day of the first class meeting (**February 16**) so that we can find the most convenient time for everyone. These sessions will provide a review of the class material and also help with problem sets. The teaching assistant will run the sessions and can give more details. Attendance is strongly encouraged.

Course Website

The course website is located at the following URL:

<https://canvas.mit.edu/courses/6670>

This site will provide lecture slides, homework assignments, links to Zoom meetings and recordings, and reading materials.

You may buy any course materials in print if you wish, but everything you need for the course will be available in pdf form on the Canvas site, under Files/Readings.

Discussion Board

In this course, we will use an online discussion board called *Piazza*. In addition to recitation sessions and office hours, please use the Piazza Q & A board when asking questions about lectures, problem sets, and other course materials. You can access the Piazza course page here:

<http://piazza.com/mit/spring2021/1781017811/home>

Using Piazza will allow students to see other students' questions and learn from them. Both the TA and the instructor will regularly check the board and answer questions posted, although everyone else is also encouraged to contribute to the discussion. Please do not email your questions directly to the instructors or TAs unless they are of personal nature — we will direct you to post them to Piazza.

Books

Required Book

There will be required readings for each section of the course. Students are expected to complete them before the relevant materials are covered in the lectures. The following textbook is required and will be used throughout the course. All these books have been put on reserve at MIT Libraries.

- Robert Gibbons. *Game Theory for Applied Economists*. Princeton University Press.

Optional Books

The following books are optional but may prove useful to students looking for additional coverage of some of the course topics. Most of these books have also been put on reserve at MIT Libraries. Also, you may be able to get them via interlibrary loan services such as Borrow Direct.

Other good textbooks:

- Martin J. Osborne. *An Introduction to Game Theory*. Oxford University Press
 - Drew Fudenberg and Jean Tirole (FT) *Game Theory*. The MIT Press.
 - Mas-Colell, Whinston, and Green (MWG) *Microeconomic Theory*. Oxford University Press
- FT and MWG are recommended if you want more rigorous treatments of the materials covered in the course

For political science applications:

- Torsten Persson and Guido Tabellini. *Political Economics: Explaining Economic Policy*. The MIT Press.
- McCarty and Meirowitz. *Political Game Theory*

For math background:

- Gill, Jeff. *Essential Mathematics for Political and Social Research*. 1st Edition. 2nd printing. New York: Cambridge University Press.
- Simon, Carl and Blume, Lawrence. *Mathematics for Economists*. New York: Norton.

Course Schedule and Reading Assignments

1 Rationality and Rational Choice

Class 1 (February 16)

Required Readings:

- Cameron, *Veto Bargaining*, Ch.3
 - Ignore the specific application to presidential vetoes; the method described (and defended) here is what this course prepares you to practice.
- MWG: Ch.1
- McCarty and Meirowitz: Ch.1

2 Games in Strategic Form and Nash Equilibrium

Class 2 (February 23)

Required Readings:

- Gibbons: 1.1

Optional Readings:

- Gibbons: 1.2
- McCarty and Meirowitz: Chapter 5.1, 5.2, 5.6

3 Mixed Strategy Nash Equilibrium

Class 3 (March 2)

→ **Problem Set 1 Due**

Required Readings:

- Gibbons 1.3.A

Optional Readings:

- McCarty and Meirowitz: Chapter 3.1
- Fudenberg and Tirole: Chapter 1 (advanced)

Note: March 9 is a Monday schedule; no class meeting.

4 Extensive Form Games with Complete Information

Class 4: Dynamic Games of Complete and Perfect Information (March 16)

→ **Problem Set 2 Due**

Required Readings:

- Gibbons: 2.1A, 2.1B

Note: March 23 is a student holiday; no class meeting.

Class 5: Dynamic Games of Complete and Imperfect Information (March 30)

→ **Problem Set 3 Due**

Required Readings:

- Gibbons: 2.2A, 2.2B, 2.4

Optional Readings:

- Grossman, Gene and Elhanan Helpman (1994). “Protection for Sale.” *The American Economic Review*. 84 (4), 833–850.

5 Repeated Games

Class 6: Finitely Repeated Games (April 6)

→ **Problem Set 4 Due**

Required Readings:

- Gibbons: 2.3.A

Class 7: Infinitely Repeated Games (April 13)

→ **Problem Set 5 Due**

Required Readings:

- Gibbons: 2.3.B

Optional Readings:

- Grossman, Gene and Elhanan Helpman (1995). "Trade Wars and Trade Talks." *Journal of Political Economy*, vol. 103, pp. 675–708
- Baron and Ferejohn (1989). "Bargaining in Legislatures." *American Political Science Review*, vol. 83, pp. 1181–1206

Note: April 20 is a student holiday; no class meeting.

6 Static Games of Incomplete Information

Class 8 (April 27)

→ **Problem Set 6 Due**

Required Readings:

- Gibbons. Ch.3

Optional Readings:

- James Fearon (1995). "Rationalist Explanations for War." *International Organization*. 49 (3), 379–414

7 Dynamic Games of Incomplete Information

Class 9 (May 4)

→ **Problem Set 7 Due**

Required Readings:

- Gibbons. 4.1, 4.2, 4.3A

Optional Readings:

- Potters, Jan and Frans van Winden (1992). "Lobbying and Asymmetric Information." *Public Choice* 74 (3), pp. 269–292

8 Social Choice

Class 10 (May 11)

→ **Final problem set distributed**

9 Additional Topics

Class 11 (May 18)

→ **Final problem set due**

- Bounded Rationality
- Algorithmic Game Theory
- Evolutionary Game Theory
- Agent-Based Modeling