SOSC 13210
Social Science Inquiry: Formal Theory II
Winter 2022

Instructors: Professor Scott Gehlbach, gehlbach@uchicago.edu
Class time and location: Tuesday/Thursday 9:30–10:50, C403
Office hours: Reserve at https://calendly.com/gehlbach/office-hours

Course description

This course is the second quarter of the subsequence of Social Science Inquiry that is devoted to formal theory. It serves as a prerequisite to Social Science Inquiry: Formal Theory III in the spring quarter. Together, the second and third quarters constitute a two-quarter sequence in game theory: the mathematical analysis of strategic decision making. The bulk of both courses is organized around classes of "games," that is, representations of strategic environments. For each class of games we will develop and learn to use one or more "solution concepts," that is, methods of deriving predictions. Many of our applications relate to politics, but the concepts are general and apply to numerous problems from neighboring disciplines.

Course requirements

There are three components to the course grade:

- Midterm exam: 35 percent
- Final exam: 50 percent
- Problem sets: 15 percent

Problem sets will be distributed the first class of every week except February 8 and March 8. They are due the following Tuesday, with accommodations for the end of the quarter. Grading of the problem sets will be "coarse," with each problem set given a check plus (exemplary effort), check (complete/good effort), check minus (incomplete/poor effort), or zero (not turned in). Despite the coarseness, and notwithstanding the small direct contribution to your final grade, by far the most important thing you can do in this course is to give yourself heart, body, and soul to the problem sets. Do not be tempted into easing back for a problem set or two, with the thought that you can catch up before the exam. This material is like a train: if you get off at one station, you will find it very difficult to get back on at the next. Do work in groups, but ideally only after you have already attempted to solve the problems on your own; the final writeup should be yours. Please see me when you have questions.

Your solutions to all problem sets should be written in LaTeX. For those new to LaTeX, an excellent point of entry is Overleaf—a free online editor. Overleaf itself provides a good

introduction to LaTeX, which you can find at https://www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minutes.

Reading

In contrast to many topics in the social sciences, game theory is best taught from a textbook. The primary text for the course is:

> Osborne, Martin J. 2004. *An Introduction to Game Theory.* Oxford: Oxford University Press.

You may also find the following text valuable (below I provide relevant readings in brackets):

> McCarty, Nolan and Adam Meirowitz. 2007. *Political Game Theory: An Introduction.* Cambridge: Cambridge University Press.

Additional readings are listed below and will be made available through Canvas.

Special accommodations

The University of Chicago, and I personally, support the right of all enrolled students to a full and equal educational opportunity. The University's policies regarding students with disabilities are available here. If you have a disability accommodation awarded by the University Student Disability Services Office, please let me know as soon as possible so that we coordinate accommodations.

Diversity and inclusion

We learn from each other. A diverse classroom encourages us to see the world from new perspectives. To take full advantage of this resource, we must maintain an environment of open inquiry in which all are able to participate. It is our commitment as instructors to foster this environment.

You can find the University's statement on civil behavior in a university setting here.

Support

University life poses numerous challenges; the pandemic has only added to these. If you are feeling overwhelmed and/or depressed, you are not alone. We urge you to attend to your mental health. All services of the Student Counseling Service (SCS) are fully covered by the Student Life Fee. If you are seeking new services or resources, please call 773-702-9800 during business hours (Monday—Friday, 8:30 am–5:00 pm) and ask to speak with a clinician. If you need urgent mental-health care, you can speak with a clinician 24/7 by calling the SCS at 773-702-3625. More information is available here.

Beyond SCS, the University provides numerous other forms of support for online learning. Please peruse the available options here.

Academic integrity

You are a student at the University of Chicago. As such, you have assumed responsibility to uphold the highest standards of academic integrity and honesty. Among other things, this means that you will not represent another's work as your own or otherwise gain unfair academic advantage. We will report any plagiarism, cheating, or other form of academic dishonesty to the dean of students. We reserve the right to impose sanctions beyond those imposed by the dean, including a grade of zero on the assignment in question; this could result in a failing grade for the course.

Readings and course schedule

Readings are given in *chapter.section.subsection* format.

I Strategic Games with Perfect Information

January 11 and 13—Nash Equilibrium

Osborne 2

[McCarty and Meirowitz 5.1, 5.2.2, 5.6]

January 18 and 20—Applications: Electoral Competition and the Commons Problem

Osborne 3.3

Dutta, Prajit K. 1999. *Strategies and Games: Theory and Practice.* Cambridge, MA: MIT Press. Chapter 7.

[McCarty and Meirowitz 5.3]

January 25 and 27—Mixed-Strategy Nash Equilibrium

Osborne 4.1-4.5, 4.7-4.10, 4.12

[McCarty and Meirowitz 5.4, 5.13]

February 1 and 3—Rationalizability and Iterated Dominance

Review Osborne 2.9, 4.4

Osborne 12

[McCarty and Meirowitz 5.2.1, 5.5]

February 8—Stepping Back

Aumann, Robert J. 1985. "What is Game Theory Trying to Accomplish?" *Frontiers of Economics*, edited by Kenneth Arrow and Seppo Honkapohja. Oxford, UK: Blackwell.

February 10—MIDTERM EXAM

II Extensive Games with Perfect Information

February 15 and 17—Subgame-Perfect Nash Equilibrium

Osborne 5, 7.1

[McCarty and Meirowitz 7.1, 7.3, 7.5]

February 22 and 24—Application: Repeated Games

Osborne 14, 15

[McCarty and Meirowitz 9]

March 1 and 3—Application: Bargaining Models

Osborne 16.1

[McCarty and Meirowitz 10.2–10.4]

III Other game theories

March 8—Evolutionary Game Theory

Osborne 13

March 10—Cooperative Game Theory

Osborne 8