

SOSC 13110/1
Social Science Inquiry: Formal Theory I
Autumn Quarter 2023
T/Th 9:30-10:50 am
Meeting Location: Stuart Hall 020

Instructor: Dr. Juan Qian

Office: 1155 E 60th, Room 402

Office Hours: by appointment ([Book time with Juan Qian](#))

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Course Description & Objectives

Formal theory is the theoretical analysis of individual and social behaviors using *logical reasoning* and *mathematical tools*. This course is the first quarter of the Social Science Inquiry sequence dedicated to formal theory. It will cover three fundamental topics in contemporary formal theory: (1) preferences, choices, and utility; (2) social choice theory; and (3) basic concepts and models of game theory. These topics are “nuts and bolts” of modern political economy, which familiarize you with both the language and analytical tools necessary for further studies in this sequence.

- This course is divided into three parts. The first part focuses on how individuals make choices based on their preferences, and how individual preferences translate into *utilities* – a basic concept in modern economics. How do people make decisions based on a variety of available options? Which assumptions do we usually make when analyzing individual preferences?
- The second part focuses on social choice theory – namely, how a group of individuals collectively make decisions that affect all members of the group. Can we aggregate the preferences of individuals into a group-wide preference? Can different voting rules affect the outcome of collective decision-making, and how? Finally, how can we apply the knowledge of social choice in designing better political institutions?
- In the third part, we will begin our inquiry into game theory, which will be a central theme in the two subsequent courses in this series. What is a *game*, and what are the elements of a game? What is Nash Equilibrium? In this part, we will primarily focus on *normal form games* – the simplest (yet most fundamental) category of games and discuss its properties and applications.

Textbook

We will primarily use three textbooks for this course:

1. David Austen-Smith and Jeffrey S. Banks. 2000. *Positive Political Theory I: Collective Preference*. University of Michigan Press. (Hereafter “A-S & B”)
2. Scott Gehlbach. 2013. *Formal Models of Domestic Politics*. Cambridge. (Hereafter “Gehlbach”)
3. Martin J. Osborne. 2003. *An Introduction to Game Theory, 1st edition*. Oxford. (Hereafter “Osborne”)

Please be noted that it's not required to purchase these textbooks. I will upload scanned chapters of those textbooks to Canvas. However, if you prefer using hard copies of these books, you can purchase them or borrow them from the library.

Grading

There will be **three problem sets (10%×3)**, a **term paper (30%)**, and a **final exam (40%)**.

- **Problem sets** (due **Oct 10th**, **Nov 2nd**, and **Nov 30th**) will be uploaded **one week** before their due dates. Problem sets can either be handwritten (and scanned) or typed. If you prefer to submit a typed assignment, I strongly recommend using **LaTeX** for typesetting, which is much more efficient in typing math symbols and equations. A beginner's guide to LaTeX can be found here:
[https://www.overleaf.com/learn/latex/Free_online_introduction_to_LaTeX_\(part_1\)](https://www.overleaf.com/learn/latex/Free_online_introduction_to_LaTeX_(part_1))
- You will write a **term paper** (up to 10 pages, double-space) that summarizes the main ideas, arguments, and findings of a formal theory article in a peer-reviewed journal. In mid-October, I will provide a list of articles from which you can choose. In your term paper, you should include: (1) the research question of this paper; (2) a concise explanation of the formal model presented in the article; (3) your summary of the article's main theoretical contribution to social sciences.
- The **final exam** (exact date TBD) will be a close-book, 1.5 hour exam held during the final week. It will be cumulative and will cover all materials throughout the quarter. Sample questions will be given one week before the final exam.

Late Work Policy

- Please read and familiarize yourself with the syllabus and important due dates for the quarter. Students will be penalized **1/3 of a letter grade per day** for each day that an assignment is late. If you need an extension on an assignment, please email me in advance to discuss your reasons for such an accommodation.

Email Policy

- The easiest way to reach me outside of the classroom is by email. I will typically respond within 48 hours. If for some reason I have not, please send me a reminder **after 48 hours**.
- **I do not discuss grades over email.** If you want to discuss your grade, please [schedule an appointment](#) with me during my office hours.

Diversity, Inclusion, and Disability

- The University of Chicago believes that a culture of rigorous inquiry demands an environment where diverse perspectives, experiences, individuals, and ideas inform intellectual exchange and engagement. In line with this perspective, this course will explore challenging ideas, unfamiliar arguments, and ways of viewing the world that may differ markedly from our own. Our conversations, both in and out of the classroom, present an opportunity to interrogate our assumptions about the social sciences and each another. This will require an open mind, patience, and mutual respect.
- If at any point you are not treated with respect, or you have concerns about a conversation you have had or witnessed, please do not keep it to yourself. Please reach out to me directly. I also welcome your suggestions for how I might improve efforts to foster an inclusive learning environment in which everyone feels welcome and treated equitably.
- This course is open to all students who meet the academic requirements for participation. Any student who has a documented need for accommodation should contact Student Disability Services (773-702-6000 or disabilities@uchicago.edu) and Juan as soon as possible.

Academic Honesty

- It is imperative that we all know how to distinguish between our own ideas and statements and those of others, particularly in presentation. You are expected to acknowledge the contributions of others in your work. If you have any questions about acceptable and unacceptable use of others' research and writings, please consult Charles Lipson's *Doing Honest Work in College* (University of Chicago Press, 2008), two chapters of which are in the Course Documents on Canvas, and/or contact your preceptor before submitting your work.

ChatGPT/Generative AI Use

- Students must give credit to AI tools whenever used, even if only to generate ideas rather than usable text. When using AI tools on writing assignments, **prepare an appendix** showing (a) the entire exchange, highlighting the most relevant sections; (b) a description of precisely which AI tools were used (e.g. ChatGPT, private subscription version), (c) an explanation of *how* the AI tools were used (e.g. to generate ideas, turns of phrase, elements of text, long stretches of text, lines of argument, pieces of evidence, maps of the conceptual territory, illustrations of key concepts, etc.); (d) an account of why AI tools were used (e.g. to save time, to surmount writer's block, to stimulate thinking, to handle mounting stress, to clarify prose, to translate text, to experiment for fun, etc.). Overall, AI tools should be used wisely and reflectively with an aim to deepen understanding of subject matter.

Part 1: Preference, Choice, and Utilities

Sep 26: Introduction; Set Theory

Sep 28: Continuing Set Theory; Choices and Preferences

Reading:

- A-S & B, 1.1, 1.2
- Nathaniel E. Helwig. "Introduction to Set Theory."
<http://users.stat.umn.edu/~helwig/notes/SetTheory.pdf>

Oct 3: Transitive Rationalizability; Weak Axiom of Revealed Preferences

- *Reading:* A-S & B, 1.4

Oct 5: Applications of Preference, Choice, and Utility

- *Reading:* A-S & B, 1.5-1.6

Part 2: Social Choice and Strategic Voting

Oct 10: In-Class Public Goods Experiment

- Guest lecture and participatory experiment by Ji Xue

Reading:

- Jonathan Gruber. 2016. *Public Finance and Public Policy*, 5th ed. pp. 241-273.
- David Austen-Smith and Jeffrey S. Banks. 1998. "Social Choice Theory, Game Theory, and Positive Political Theory," *Annual Review of Political Science* 1(1): 259-287.

Problem Set 1 Due, Oct 10 at 11:58pm.

Oct 12: Aggregated Preference & Arrow's Theorem, I

- *Reading:* A-S & B, 2.1-2.2
- *Optional: (a simplified proof of Arrow's Theorem)* Mark Fey. 2014. "A Straightforward Proof of Arrow's Theorem,"
<https://www.rochester.edu/college/faculty/markfey/papers/ArrowProof3.pdf>

Oct 17: Aggregated Preference & Arrow's Theorem, II

- *Reading:* A-S & B, 2.3-2.6

Oct 19: Restricting Outcomes & Voting Rules, I

- *Reading:* A-S & B, 3.1-3.2

Oct 24: Restricting Outcomes & Voting Rules, II

- *Reading:* A-S & B, 3.3-3.6

Oct 26: Single-peaked Preference & the Median Voter Theorem

Readings:

- A-S & B, 4.1-4.4
- Gehlbach, 1.1-1.2

Oct 31: Order-restricted Preferences

Readings:

- A-S & B, 4.5-4.7
- Gehlbach, 1.3-1.4

Nov 2 – The Spatial Model

Readings:

- *Reading:* A-S & B, 5.1-5.3
- *Optional:* (a non-technical explanation of the Spatial Model) Kenneth Shepsle and Mark Bonchek. 1996. *Analyzing Politics: Rationality, Behavior and Institutions*. W. W. Norton. Chapter 5.

Problem Set 2 Due, Nov 2 at 11:58pm.

Part 3: Elementary Game Theory

Nov 7 – Structure of a Game

- *Reading:* Osborne, 2.1-2.5

Nov 9 – Nash Equilibrium

- *Reading:* Osborne, 2.6-2.10

Nov 14 – Nash Equilibrium in Social Sciences

- *Reading:* Osborne, 3.1-3.6

Nov 16 – Mixed Strategy

- *Reading:* Osborne, 4.1-4.11

Thanksgiving Break – No Class

Nov 28 – Games of Collective Behavior

Reading:

- Osborne, 8.1-8.7
- Gehlbach, 8.1-8.2

Nov 30 – Selected Topics in Game Theory

Problem Set 3 due on Nov 30 by 11:58pm

Final Paper Due: 12/6

Review Session: TBD

Final Exam: TBD