

Game Theory and Applications

Economics 6110: Spring 2025

Game theory is the study of *interdependent* decision-making. Firms in an oligopolistic industry, diplomats at a negotiation table, bidders at an art auction, applicants and employers in a job market — these are some of the environments where people must consider the behavior of other *players* when deciding on their own actions. Unlike single-agent decision problems, these multi-agent *games* represent economic situations where decentralized choices made by several individuals jointly determine outcomes. This course will equip you with the tools of game theory to model and analyze these and other strategic interactions.

My contact information: Andrew Postlewaite, apostle@econ.upenn.edu, office hours Fridays 10:30 AM to noon in Perelman Center for Political Science and Economics (PCPSE) 515 and by appointment. There may be occasional time conflicts, so check before coming any distance.

Teaching Assistant: Siqi Li, siqili@sas.upenn.edu, Drop-in office hours: Tuesday 3-4 PM Wednesday 2:30-3:30 PM at PCPSE 141.

Class Logistics:

- We meet on Tuesdays and Thursdays from 10:15 AM to 11:45 AM in CHEM 514.
- Links to all course material are on Canvas.

Assignments and Assessments:

- Almost weekly problem sets, except no problem sets will be due in the same weeks as the midterms. Problem sets will be graded coarsely (\checkmark^+ , \checkmark , \checkmark^- , 0). You are expected to hand in the solutions to the problem sets, but they will be taken into account only in marginal cases.
- Exams (100% total): There will be three midterm exams during normal class time. The three midterms are weighted equally. **The dates of the three midterms will be announced later.**
- Class participation will be taken into account to improve your final grade if you are just below a grade boundary.
- There is no final exam for this class.

Textbooks: Both textbooks are optional as the course will be based on the lecture notes and the slides. The slides and notes have been written by Kevin He, with very slight editing by me. I will point out chapters in the textbooks that relate to each lecture as supplementary reading. The course roughly follows the order of topics in the Gibbons textbook, but with a level of emphasis on theory that is closer to the Jehle and Reny textbook.

- Robert Gibbons, Game Theory for Applied Economists, ISBN: 978-0691003955
- Geoffrey Jehle and Philip Reny, Advanced Microeconomic Theory (3rd Edition), ISBN: 978-0273731917

Prerequisites: Mathematical maturity at the level of the Mathematical Appendix in the Jehle and Reny textbook. You should be comfortable with optimization, probability, and basic real analysis. Prior coursework in economics (e.g., Economics 6100) is helpful but not required.

Course Policies: Courses taught in the Department of Economics are bound by a standardized set of department course policies that govern grading appeals, academic integrity, etc. Please see <https://economics.sas.upenn.edu/undergraduate/course-information/course-policies>.

Topics: The course will cover four families of games, including both theory and applications.

- (1) Static games with complete information. Applications include Cournot and Bertrand oligopolies.
- (2) Dynamic games with complete information. Applications include bargaining, repeated games, and folk theorems.
- (3) Static games with incomplete information. Applications include auctions and the revenue-equivalence theorem.
- (4) Dynamic games with incomplete information. Applications include job-market signaling.