Shengwu Li
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Tue/Thu 1:30 pm-2:45 pm East Coast time
Spring 2021

ECON 1052: Game Theory and Economic Applications
Syllabus

updated Feb 2 2021

A. COURSE OVERVIEW

Game theory is a mathematical method for analyzing strategic situations. It deals with situations in which multiple people must make interdependent decisions, such as chess, poker, bargaining, oligopoly pricing, and warfare. Topics include strategic-form and extensive-form games, rationalizability, Nash equilibrium, and subgame-perfect equilibrium. We will study applications such as long-term cooperation, auctions, mechanism design, and division of treasure between pirates.

The goal of this class is to introduce you to the concepts and methods of game theory. By the end, you should be able to:

1. Understand what game theory is, what its assumptions are, and how to relate its results to real-world strategic interactions.
2. Take standard game-theoretic models in economics and
    a. solve for equilibria
    b. analyze how these change when the primitives change
3. Take new strategic situations and write game theory models about them.

B. PREREQUISITES

The only formal prerequisite for this course is Mathematics 21a or equivalent (any course that demonstrates a strong grasp of calculus and constrained optimization). To benefit from this course, you should have calculus, basic probability theory, and some exposure to mathematical proofs. No prior knowledge of economics or game theory is necessary.

C. COURSE MATERIAL

We will cover the following topics, in this order:

1. Representation of games
2. Dominance
3. Rationalizability
4. Nash Equilibrium
5. Application: Imperfect competition

6. Supermodular games
7. Backward induction
8. Application: Negotiation
9. Subgame-perfect Nash equilibrium
10. Application: Infinite-horizon bargaining
11. Repeated games
12. Application: Implicit cartels
13. Games of incomplete information
14. Dynamic Bayesian games
15. Signaling games
16. Sequential equilibrium
17. Auctions
18. Mechanism design
19. Communication and information design
20. Reputation

D. COURSE WEBSITE AND TEXTBOOK

We will use the course website (on Canvas) to distribute information and materials relevant to the class.

The primary textbook for this course is Game Theory by Muhamet Yildiz. This book is not yet published, so we will provide PDFs of relevant chapters on Canvas.

E. ASSIGNMENTS

Each class corresponds roughly to one chapter of the textbook. You should read the relevant chapter before the class starts (except for the first class, for which there are no assigned readings). Occasionally, I will call on students to fill in or explain the basic concepts.

I will post problem sets every two weeks, with each due shortly before the next problem set is posted. I recommend that you attempt the relevant problems shortly after each lecture, rather than doing them all in one burst. The two week deadline is so that you have flexibility to manage your time.

There will be a midterm and a final (details to be announced later). For grading, the weights will be 50% problem sets, 20% midterm, 30% final.

F. OFFICE HOURS

Please schedule (Zoom) office hours with Shengwu by e-mail, one day in advance.

Shengwu's office hours are:
3:00 pm-5:00 pm on Wednesday afternoons (East Coast time)
shengwu_li@fas.harvard.edu

Chang's office hours are:
7:00 pm-9:00 pm on Tuesday evenings (East Coast time)
2:00 pm-3:00 pm on Friday afternoons (East Coast time)
chang_liu@g.harvard.edu

G. AUDITING

Students enrolled at Harvard are welcome to audit the class, provided that they complete the problem sets.

H. SCHEDULING EXCEPTIONS

There will not be class on Thursday, March 4.