

Econ 4020: Game Theory

TR 10:10 - 11:25, Goldwin Smith Hall 132

Cornell University, Spring 2019

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Office hours: Mon 1:30 - 3:30, Uris Hall 420

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Office hours: Wed 11:00 - 12:30, Fri 10:00 - 11:30, room TBD

Syllabus version: January 22, 2019

Description. This course is an introduction to game theory and its economic applications. In this course a “game” is any situation where people make choices whose consequences depend also on others’ behavior. Game theory studies how people anticipate others’ behavior and act accordingly. The course focuses on economic applications, but the theory reaches disciplines as diverse as computer science, biology, political science, law, and musicology. Examples of games are chess, tennis, jam sessions, stock markets, elections, kidney exchange, wars, . . .

Prerequisite. The language of game theory is math. The math for this course is pretty basic, some probability theory and calculus. However it is important to be comfortable with mathematical reasoning or “carrying out an argument with sufficient precision,” as game theorists D. Gale and L. Shapley put it.¹ The formal prerequisites for this course are Econ 3010 and Econ 3030, but if you think game theory is for you anyway, you should contact me.

¹See the last page of their Nobel prize winning “College Admissions and the Stability of Marriage.”

Textbooks. The official reference is Steve Tadelis' *Game Theory: An Introduction*. I will not follow closely any textbook, but Tadelis' book covers most of the material and is as formal as the course aims to be. This could be paired with a less rigorous but more concise read, such as Robert Gibbons' *Game Theory for Applied Economists*. For more exercises (solving many problems is necessary to learn game theory), useful references are Martin Osborne's *An Introduction to Game Theory*, Joel Watson's *Strategy*, and Prajit Dutta's *Strategies and Games*. For more conceptual discussions, see Pierpaolo Battigalli's lecture notes on Blackboard.

Requirements. The course grade will be based on two midterms (20% each), five problem sets (the best four count for 20%), and a cumulative final exam (40%). For problems sets you are encouraged to work in groups, but every student has to write his or her own solution and submit it individually. Problem sets will tentatively be due on Feb 5, Feb 19, Mar 12, Apr 26, Apr 23, and May 7.

Outline. References to Tadelis' chapters in parentheses.

- Jan 22 and 24: Static games (1, 2.1-2.3, 3.1-3.2)
- Jan 29: Iterated strict dominance (3.3, 4.1-4.2)
- Jan 31 and Feb 5: Nash equilibrium (5)
- Feb 7 and 12: Mixed strategies (6.1-2, 6.4)
- Feb 14 and 19: Rationalizability (4.3, 6.3)
- Feb 21: First midterm
- Feb 28: Dynamic games (2.4, 7)
- Mar 5, 7, and 12: Subgame perfect equilibrium (8)
- Mar 14, 19, 21, and 26: Repeated games (9, 10)
- Mar 28: Second midterm
- Apr 9 and 11: Games of incomplete information (12.1)
- Apr 16 and 18: Bayesian Nash equilibrium (12.2-5)

- Apr 23: Auctions (13)
- Apr 25 and 30: Signaling games (16)
- May 2 and 7: Cheap talk (18)
- May 11: Final exam

Rules of the game.

- All emails should be addressed to Franco.
- The textbook is complementary and optional. Exams will be based solely on the material covered in class.
- Taking all exams (two midterms and a final) is a requirement of the course. Missing an exam without a valid excuse will result in a failing grade for the entire course.
- To be considered valid, an excuse must be proffered prior to the exam that is to be missed, if at all possible, the excuse must be in writing, and it must be verifiable. These criteria are necessary, not sufficient, however. We reserve the right to deem an excuse meeting the above criteria invalid.
- No makeup test will be offered for midterms. If a midterm is missed with a valid excuse, the other midterm will count 30% and the final exam will count 50%. If both midterms are missed with valid excuses, the final exam will count 80%.
- All requests for regrades must be submitted in writing within one week of the exam being handed back. Regrades may raise or lower your score.
- Together with all the members of the department of economics, we respect and uphold university policies and regulations pertaining to racial or ethnic discrimination, sexual harassment, assistance available to handicapped, visually and/or hearing impaired students, the observation of religious holidays, and plagiarism. All students are advised to become familiar with the respective university regulations and are encouraged to bring any questions or concerns to our attention.