

ECON 673: Information, Game Theory and Market Design

- Lecture:** Tuesdays, 6:45 – 9:30pm
1400 16th St., NW
- Professor:** Nathaniel Higgins, Ph.D.
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- ELMS Site:** <https://elms.umd.edu/>
<http://www.nathanielhiggins.com/>
- Office Hours:** By appointment; 30 minutes before and after lectures
- Required Text:** *Markets, Games, & Strategic Behavior*, Pearson, Charles A. Holt
Game Theory for Applied Economists, Princeton University Press, Robert Gibbons
MobLab Subscription (\$18): Register for a student account here (game.moblab.com)
and join class with class code: *wc9g49qt*

Course Description

This course studies strategic decision-making and the design of organized markets, focusing on efficient organization and the incentives created by market rules. Applications include online auction markets, government auctions of natural resources, procurement auctions, spectrum auctions, electricity markets, environmental auctions, matching markets (students to classes or schools, medical residents to hospitals, kidneys to recipients). The analysis relies on a mix of documenting the rules of real-world markets, game theoretic analysis, empirical analysis, and experimental work.

Prerequisites

ECON 641 and ECON 644 (can be taken concurrently with ECON 644)

Supplemental Texts: Each of these has a section dedicated to game theory that might be useful

Microeconomics, Prentice-Hall, Robert Pindyck and Daniel Rubinfeld

Microeconomics, Worth Publishers, Austan Goolsbee, Steven Levitt, and Chad Syverson

Microeconomic Analysis, W. W. Norton and Co., Hal Varian

Structure of the Course

The course is taught in a seminar format meeting once per week for 2.75 hours including one 15 minute break. Each topic will begin with an explanation of fundamental microeconomic principles and will be followed by a discussion of economic models and empirical evidence related to specific issues of market design. We will also play a game related to the topic of the class. After class, we will post 1 or more discussion topics about the game played in class, the readings, or the lecture and everyone is expected to respond to the topic either directly or in response to what other students have posted (please no more than 3 comments per student per week). Discussions will remain open for 24 to 48 hours. These online discussions will be monitored and

contributed to by one or both professors. Everyone will receive a grade each week on the discussion board on a scale of 0 to 3, as follows:

3pt – students correctly answer questions and say something profound, above and beyond what is expected (this is the equivalent of an A+);

2 pts – students correctly answer questions and almost always use correct economic intuition;

1 pts – students get at least some part of the question correct but have errors in their economic intuition;

0 pts – students didn't participate or conveyed consistently wrong economic intuition.

Grading for the rest of the class is as follows:

- 10% Class Participation and Game Performance
- 10% Online Discussion boards
- 15% Problem sets (6)
- 25% In-class midterm
- 25% In-class final
- 15% Group presentation

Game performance and associated online discussions will provide students an opportunity to play economic games with their classmates. To encourage thoughtful active participation, “winnings” from each game will be recorded over the quarter and the top student will receive a half point bump in their letter grade. If you need to miss a class for an emergency, you must contact one of us prior to class. Homework is due at the beginning of class. Homework submitted more than 15 minutes into class will not be accepted.

Group Project:

The objective of the project is to study an existing market, describe the relevant market design questions, and evaluate how the current market design works and/or propose improvements on the current design. Specifically, the presentation (20 minute in-class presentation and 2 page class handout) should do the following:

- Describe the market (who participates, why do they participate, what is being traded)
- What is the purpose of the market
- What incentives exist in the market, both incentives that are consistent with the primary objective of the market operator and incentives that are inconsistent with those objectives
- What market failures are present?

Each group should be 2-3 people so we have no more than 4 presentations during the last class. Presentation should be no more than 20 minutes, which means no more than 15 slides. Grades will be based on the presentation, answers to questions from classmates and professors, and the quality of the written handout. Project topics must be cleared with one of the two professors by April 5, 2016.

Course Outline: Students are expected to have done the readings prior to class so they can participate in the class discussion.

1 March 2016: What is Game Theory, Market Design, and why do we need it?

- Closed markets, market design
- **Game:** Market Failures

8 March 2016: Evidence-Based Policy

- Large Scale Field Experiments, Market Microstructure, Circuit breakers, Short sales, Congestion pricing (easy pass and changing prices)
- **Game:** TBD
- **Reading:** Roth, Alvin E. "The [Economist as Engineer: Game Theory, Experimental Economics and Computation as Tools of Design Economics](#)," *Econometrica*, 70, 4, July 2002, 1341-1378.
- **Homework #1:** due March 22

15 March 2016: Introduction to Game Theory

- Normal form games, dominant/dominated strategies
- **Game:** Prisoner's dilemma, Linear Public Good
- **Reading:** Gibbons 1.1 and 1.2, Holt chapter 3
- **Homework #2:** due March 29

22 March 2016: Game Theory Part II

- Mixed Strategies, Repeated games
- **Game:** Rock Paper Scissors; Minimum Effort
- **Readings:** Gibbons 1.3, 2.3A, and 2.3B, Holt chapter 5

29 March 2016: Game Theory Part III

- Cournot, Stackleberg, Bertrand game
- **Game:** Cournot Game, Stackleberg Game
- **Reading:** Gibbons 2.3C and 3.1, Holt chapter 6
- **Homework #3:** Due at end of class: Tool/calcs used for Cournot Game and Stackleberg Game

5 April 2016: Introduction to Auction Theory

- Static and Dynamic auctions, effect of competition, private Values
- **Game:** Private value auction
- **Readings:** Gibbons 3.2B, Holt, chapter 19
- **Reading:** Klemperer, Paul. 2002. "[What Really Matters in Auction Design?](#)" *Journal of Economic Perspectives*, 16(1), 169-189.
- **Readings:** Milgrom, P., "[Auctions and Bidding: A Primer](#)," *Journal of Economic Perspectives*, Summer 1989, pp 3-22.
- **Homework #4:** due April 26

TBD April 2016: Midterm Review Session

12 April 2016: *****In-Class Midterm on Game Theory*****

19 April 2016: Auction Theory Part II

- Common Value, Winners Curse, Reserve Prices
- **Game:** Common value auction
- **Readings:** Holt chapter 21

- **Reading:** Richard Thaler, "Anomalies: The Winner's Curse," *Journal of Economic Perspectives*, 2(1), Winter 1988, 191-202.
- **Homework #5:** due May 3

26 April 2016: Matching Markets

- Matching, unraveling, school choice, interns
- **Game:** Price/Quality market
- **Reading:** Holt chapter 10
- **Reading:** Economic Science Prize Committee. "Stable Allocations and the Practice of Market Design." Royal Swedish Academy of Sciences. Scientific Background on the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2012. Or the book: Al Roth. "Who Gets What — and Why: The New Economics of Matchmaking and Market Design" 2015.
- **Homework #6:** Matching Market worksheet due May 3

3 May 2016: Auction and Market Design Application

- Spectrum Auctions, DME Auctions, Part D, Emissions markets, Land auctions
- **Game:** Demand reduction
- **Reading:** Holt chapter 22
- **Reading:** Electricity: Wolak, Frank A. 2001. "[What Went Wrong in California's Restructured Electricity Market?](#)" Presentation at the AEI.

10 May 2016: *****In-class Presentations*****

TBD May 2016: Final Review Session

17 May 2016: *****In-Class Final Cumulative, Focus on Auctions*****

Extra Credit and Course Evaluations: Near the end of the term, you will receive an email inviting you to submit a voluntary and anonymous course evaluation. Your feedback on courses will be very helpful in improving the quality of instruction in our program. As an extra incentive for you to evaluate the course, we will offer an extra credit opportunity to the whole class if the course evaluation response rate exceeds 80%. (We won't be able to see which students have evaluated the course, only the overall response rate.) We will offer an extra credit opportunity worth up to 3 course points (~3% of your overall course grade). To earn the extra credit, students will have to send us the answer to a question we will pose after class on May 10th. Partial credit is possible (e.g. 2.5 out of the 3 possible points). Students are expected to work out their own answers to the question individually. Students who have clearly copied from each other will receive no extra credit.

Course Website: Copies of the course syllabus, your grades, and other relevant links and documents will be posted on the course's ELMS/Canvas website. You can access the site via www.elms.umd.edu. You will need to use your University of Maryland "directory ID" and password.

Email: Email is the primary means of communication outside the classroom, and we will use it to inform you of important announcements. Students are responsible for updating their current email address via <http://www.testudo.umd.edu/apps/saddr/> AND for paying attention to messages we send to the class via ELMS. Failure to check email, errors in forwarding email, and returned email due to "mailbox full" or "user unknown" will not excuse a student from missing announcements or deadlines. We will do our best to respond to email within 36 hours.

Contact Hours: Three credit courses at the University of Maryland require a minimum amount of contact between instructors and students. Our courses' 12 weekly 3-hour meetings only satisfy 80% of the university's contact requirement. The other 20% is usually satisfied by mandatory and graded online contact. Instructors have some discretion in how they structure the online component of their course. In principle, the contact hours requirement could also be satisfied by scheduling 3 additional 3-hour meetings per term, or one additional 45-minute meeting per week. The online components of our courses are a more flexible way to ensure that our program's courses provide the same level of student-instructor contact as a traditional 15-week, face-to-face, 3-credit course at the University of Maryland.

Work Load: Mastering the material covered in this course requires a significant amount of work outside of class. Students should expect to spend more time outside of class than in class – typically at least twice as much time. The courses in our DC program are 12-week courses that cover all the same material as a traditional semester-long 3-credit course (15 weeks). The compressed schedule makes it possible to complete our degree in just 15 months if you take 2 courses each term. But the compressed schedule also implies an accelerated pace with an average of 25% more work per week in a given course ($15/12 = 1.25$). The normal full-time load in a master's program is 3 courses per semester, or 6 courses per year. Students who take 2 courses per quarter in our program complete 8 courses per year. So taking 2 courses per quarter in our program is equivalent to 133% of a full-time load ($8/6 = 1.33$). Students who take 2 courses per term in our DC program should expect to do an average of 25-33% more work per week than a student in a full-time master's degree program.

Academic Integrity: The University of Maryland has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards applicable to all undergraduate and graduate students, and you are responsible for upholding these standards as you complete assignments and take exams in this course. Please make yourself aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information see www.studenthonorcouncil.umd.edu.

Student Conduct: Students are expected to treat each other with respect. Disruptive behavior of any kind will not be tolerated. Students who are unable to show civility to one another or myself will be referred to the Office of Student Conduct. You are expected to adhere to the Code of Student Conduct.

Medical Excuses: If you miss any class meetings for any reason, you are still responsible for all material covered during the meeting you missed. It is your responsibility – not the instructor's – to get yourself caught up in the course. If you need to miss an exam or other course deadline because of illness, injury, or some other emergency: Follow doctor's orders and get documentation. Get in touch with the instructor as soon as you're able – preferably prior to missing the exam or deadline. Communicate with the instructor to make up the course requirement as soon as possible. You are entitled to recover before you make up the course requirement, but you are not entitled to extra days to study beyond the time the doctor's note says you're incapacitated. If you are incapacitated for more than a week or so beyond the end of the term, your grade in the course will be an "Incomplete". Once you make up the course requirement the instructor will change your "I" to the appropriate letter grade.

School Closings and Delays: Information regarding official University closing and delays can be found on the campus website and the snow phone line: (301) 405-SNOW (405-7669). Since our program is an evening

program in downtown Washington, DC, rather than a day program in College Park, we do not always cancel classes on the same days as the College Park campus. The program director will always announce cancellation information to the program as an announcement on the program's ELMS/Canvas site. This will generally be done by 1:00 p.m. on days when weather or other factors are an issue.

Students with Disabilities: The University of Maryland does not discriminate based on differences in age, race, ethnicity, sex, religion, disability, sexual orientation, class, political affiliation, and national origin. Reasonable accommodations will be made to students with documented disabilities. I will make every effort to accommodate students who are registered with the Disability Support Services (DSS) Office and who provide me with a University of Maryland DSS Accommodation form.

Academic Progress: The graduate school requires that students maintain a GPA of at least 3.0. Students whose cumulative GPA falls below 3.0 will be placed on academic probation by the graduate school. Students on academic probation must ask the program's director to petition the graduate school if they want to remain in the program. The petition must include a plan for getting the student's GPA up to at least 3.0. Students who do not live up to their plan can be forced to leave the program without having earned the degree.

Building Access: The door to the building at 1400 16th Street is unlocked on weekdays until 7:00 p.m. Students who arrive after 7:00 p.m. or on weekends will find the door locked. The building's security guard is stationed at a desk just inside the door until 11:00 p.m. and will let you in. You can also call the phone on the security guard's desk by dialing (202) 328-5158. If the security guard happens to be away from his or her desk when you arrive, you can pick up the black phone to the right of the door at 1400 16th Street. You will be connected to the company that handles security for our building. If you tell them you are with the University of Maryland, they should ask you for a password. The password is "Drawbridge". When you tell them the password, they will be able to unlock the door for you.