

ECON 673:
Information, Game Theory, and Market Design
Spring 2018 (College Park, MD Campus)
Course Syllabus

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Lectures: Monday, 6:30-9:15PM, Tydings Hall 0101

Office Hours: Monday, 5:30-6:00PM, Morrill Hall 1102C, and by appointment

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TA Office Hours: Monday and Tuesday, 5:15-6:30PM, Morrill Hall 1102D

General Information

Course Description

At its core, this course is about the interplay between information and incentives among multiple agents across a wide variety of settings. Such situations are best understood using the tools of noncooperative game theory. Thus, the first part of this course is structured to provide students with a comprehensive understanding of the fundamental concepts in game theory. With this foundation, students will not only be able to determine the equilibria of prespecified games but will also be able to use these tools to define the parameters of new games. Thus, the second part of this course is geared toward the analysis and design of markets. By the end of the course, students will have developed a broadly applicable methodology for analyzing, critiquing, and optimizing decision-making processes.

Learning Objectives

Our program has 7 general learning outcomes for students:

1. Ability to understand, evaluate and analyze economic data
2. Ability to understand and interpret statistical evidence from economic data
3. Ability to apply empirical evidence to assessing economic arguments
4. Ability to apply macroeconomic theories to policy discussions
5. Ability to apply microeconomic theories to policy discussions
6. Ability to communicate economic ideas to a broader audience
7. Ability to evaluate the effectiveness of policy programs using sound economic techniques

The learning outcomes that pertain to this course are: 5, 6, and 7.

Upon completing this course, students should also be able to:

- Comprehend the fundamental language, principles, and solution concepts of game theory. Students will be able to define the components of both normal-form and extensive form games.
- Explain the connections between the various components of a game and how a change to one aspect of a game would impact its other elements.
- Determine the stable outcomes of a game by applying solution concepts (such as Subgame Perfection) and the logic by which they are determined (e.g. backward induction).
- Apply the principles of Mechanism Design to develop a game whose equilibria satisfy specified criteria.
- Analyze a non-technical description of a multi-party decision process and formally diagram it as a game.
- Critique voting mechanisms according to the principles of welfare economics.
- Identify the gap between first-best and second-best outcomes caused by informational asymmetries.
- Evaluate the efficacy and limitations of matching mechanisms.
- Frame the outcomes they observe in current events and critically interpret non-academic news articles, such as those found in *The Economist*, through the lens of game theory.
- Communicate the usefulness and applicability of game theory to other areas of economics and related fields such as social psychology and political science.

Prerequisites

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

Required Text

Game Theory for Applied Economists by Robert Gibbons. I will also provide my own notes and lecture slides.

Course Structure

Lectures

Lectures will be held on Monday nights from 6:30PM to 9:15PM. There will be a 15-minute break sometime between 7:30PM and 8:15PM.

Problem Sets

Problem sets will be posted on Monday nights, following the lecture, and they will be due two weeks later at the beginning of the ensuing lecture. Problem set submissions must be either typed or scanned and submitted electronically. You are welcome and encouraged to work in groups on the problem sets, but please keep the group size at four or fewer students. Only one problem set needs to be turned in per group. A total of 5 problem sets will be assigned.

Tests

There will be two tests: a midterm examination and a final examination. Both tests will be administered during regular lecture hours. The midterm examination will take place during lecture 7 (12 March) and it will last 90 minutes (to be followed by the usual 15-minute break and a 60 minute lecture introducing the second half of the course). The final examination will take place during lecture 15 (14 May) and it will last two and a half hours (there will be no 15-minute break during the final).

Diagnostic Test

At the beginning of the first lecture a short diagnostic test will be administered. This test will be scored so that I can get a sense of the students' prior knowledge, but the test will not count toward students' grades for the quarter. This test will be given again during the penultimate lecture so that I can measure the change in students' knowledge from the beginning of the course to the end. As is the case with the initial diagnostic, the end-of-term diagnostic will not count toward students' final grades.

Oral Presentations

Every student will be required to deliver an oral presentation at some point in the quarter. If the class is sufficiently large, I will allow students to work in groups of two or three on the presentations. I will post a list of topics (and the lecture during which they will be presented) following the second lecture, and these topics will be assigned (and scheduled) at the beginning of the third lecture. The earliest presentations will take place during lecture 9 and the latest presentations will take place during lecture 14. Each presentation will last approximately 15 minutes: 12 minutes for the prepared portion and 3 minutes for questions. Students will be required to put together PowerPoint slides to accompany their presentation. Completed slides must be emailed to me by 5PM on the Friday before the presentation. I will provide feedback by 5PM on Sunday, and students will need to email final versions of the slides to me by 6PM on Monday. Details on the structure and grading rubric of the presentations will be discussed during the second lecture.

Grading

The above components will comprise the overall grade as follows:

- Problem sets: 25%
- Midterm exam: 25%
- Oral presentation: 25%
- Final exam: 25%

Problem Sets

The problem sets will be graded on a four point scale as follows:

- 3 – Complete answers with few if any errors
- 2 – Complete or nearly complete answers with some minor errors
- 1 – Incomplete answers that show basic understanding but suffer from substantial errors
- 0 – A submission that shows little understanding or little effort, or no submission at all

Since there will be a total of 5 problem sets throughout the quarter, a maximum of 15 raw points may be earned for the problem sets. Each student's problem set raw point total will then be multiplied by $5/3$, and this new amount will be the student's problem set score (maximum score of 25).

Tests

Each exam will be worth a certain number of raw points. There will be no curve applied to the exams. Each student's raw point total will be scaled so that the maximum possible score is 25. For example, if an exam is worth 100 raw points, each student's raw point total will be divided by 4, and this new amount will be the student's exam score.

Oral Presentation

The oral presentations will be graded as follows:

- 0-10 points for the delivery of the presentation
- 0-10 points for the quality of the slides
- 0-5 points for the responses to questions

As such, a maximum of 25 points may be earned for the oral presentation. This point total will be the student's presentation score.

Final Grade

At the end of the term, every student will have a numerical course grade equal to the sum of the student's scores on the various components described above. The numerical course grade will be between 0 and 100. I will decide upon the numerical cutoffs between various letter grades based on my professional judgment. I will consider students' performance relative to the class. I will also consider absolute standards of professional competence. Highly competent students will get A's. Barely competent students will get B's. Incompetent students will get B-'s or worse. The cutoffs that I use will respect the ordinal ranking of numerical course grades. No student with a given numerical course grade will receive a lower letter grade than someone else with the same or a lower numerical course grade.

Schedule

What follows is a schedule of lecture topics and assignments. While the dates of the assignments are fixed, I may adjust the lecture topics as needed.

Lecture 1 (29 January): Static games and equilibrium concepts

- In-class diagnostic pre-test

Lecture 2 (5 February): Mixed strategies and Nash's Theorem

- Problem Set 1 posted

Lecture 3 (12 February): Dynamic games and backward induction

Lecture 4 (19 February): Subgame perfection

- Problem Set 1 due
- Problem Set 2 posted

Lecture 5 (26 February): Repeated games

Lecture 6 (5 March): Bayesian games I

- Problem Set 2 due
- Practice midterm exam questions posted

Lecture 7 (12 March): Midterm Examination, Bayesian games II

Spring Break (19 March)

Lecture 8 (26 March): Auctions I

- Problem Set 3 posted

Lecture 9 (2 April): Auctions II

Lecture 10 (9 April): Auctions III

- Problem Set 3 due
- Problem Set 4 posted

Lecture 11 (16 April): Competitive markets

Lecture 12 (23 April): Contracts, principal-agent problems, and signaling

- Problem Set 4 due
- Problem Set 5 posted

Lecture 13 (30 April): Social welfare functions and voting

Lecture 14 (7 May): Matching

- Problem Set 5 due
- In-class diagnostic post-test
- Practice final exam questions posted

Lecture 15 (14 May): Final Examination

General Policies of the University of Maryland and the Department of Economics

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 I 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 I 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. I will do my best to respond to email within 36 hours.

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.

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.

Excused Absences: The University of Maryland's policy on excused absences is posted here:
<http://www.president.umd.edu/administration/policies/section-v-student-affairs/v-100g>

Please note:

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. Instructors routinely facilitate things by posting lecture notes, etc.

If you need to miss an exam or other graded course requirement 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". In such cases you must negotiate a plan with your instructor for completing the course requirements. 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). The program director will also 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. If classes need to be cancelled during the semester, it may be necessary to move the final exam back a week so missed classes can be made up.

UMD Counseling Center: Sometimes students experience academic, personal and/or emotional distress. The UMD Counseling Center in Shoemaker Hall provides comprehensive support services that promote personal, social, and academic success. The cost of these services is covered by the fees you already paid when you registered for classes, and there is no additional charge if you use the services. Proactively explore the range of services available, including the Counseling Service, Accessibility and Disability Service, Learning Assistance Service, and the Testing Office, all described at <http://www.counseling.umd.edu/>

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, or national origin. Reasonable accommodations will be arranged for students with documented disabilities. Students who have an accommodations letter from the Accessibility and Disability Service (ADS) should meet with me during the first few weeks of the semester to discuss and plan for the implementation of your accommodations. If you require reasonable accommodations but have not yet registered with ADS, please contact the Accessibility and Disability Service at 301-314-7682 or adsfrontdesk@umd.edu.

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 have their enrollment in the program terminated without having earned the degree. Note: a grade of "B" corresponds to a GPA of 3.0. A grade of "B-" corresponds to a GPA of 2.7.

Access to Morrill Hall and Morrill 1102: Morrill Hall is locked every day from 7:00 p.m. - 7:00 a.m. Your university ID gives you swipe access to the back door of the building.