ECON 673:
Information, Game Theory, and Market Design
Fall 2017 (Washington, DC Campus)
Course Syllabus

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Lectures: Tuesday, 6:45-9:30PM
Office Hours: Tuesday, 5:45-6:15PM, and by appointment
TA: Hidehiko Matsumoto (Hide – "Hee-Day")
TA Email: DCmastersTA@econ.umd.edu
TA Office Hours: One day per week from 3:00-7:00 and by appointment. The scheduled office hours will not be on the same day each week. A schedule will be posted on the program's ELMS/Canvas site. Hide also sends weekly reminders as an ELMS/Canvas announcement.

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 Tuesday nights from 6:45PM to 9:30PM. There will be a 15-minute break starting around 8:15PM.

Online Discussions

Each Tuesday night, following the lecture, I will post a topic of discussion on the class website. Everyone must respond at least once either directly to the prompt or as a follow-up to a classmate's response. You are encouraged to post more than once, but please do not post more than three times per discussion. The discussion will remain open until Thursday at 9:30PM. There will be no online discussion following lectures 6 or 12 due to the take-home exams (see below). Thus, there will be a total of 10 online discussions.

Problem Sets

Problem sets will be posted on Tuesday nights, following the lecture, and they will be due at the beginning of the following 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 8 problem sets will be assigned.

Tests

There will be two tests: a midterm exam and a final exam. Both tests will be take-home exams. The midterm exam will be posted online immediately following lecture 6 (3 October) and it will be due 48 hours later on Thursday night (5 October) at 9:30PM. In similar fashion, the final exam will be posted online immediately following lecture 12 (14 November) and it will be due 48 hours later on Thursday night (16 October) at 9:30PM. As with the problem sets, exam submissions must either be typed or scanned and submitted electronically. There will be no online discussion or problem set during the week of the midterm exam.

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 final 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 on the presentations. I will post a list of topics (and the lecture during which they will be presented) following the first lecture, and these topics will be assigned (and scheduled) at the beginning of the second lecture. The earliest presentations will take place during lecture 4 and the latest presentations will take place during lecture 11. 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 Sunday before the presentation. I will provide feedback by 7PM on Monday, and students will need to email final versions of the slides to me by 6PM on Tuesday. Details on the structure of the presentations will be discussed during the first lecture.

Grading

The above components will comprise the overall grade as follows:

- Online discussions: 10%

- Problem sets: 20%

- Midterm exam: 25%

- Oral presentation: 20%

- Final exam: 25%

Online Discussions

The responses to the online discussions will be graded on a four point scale as follows:

- 3 – Insightful answer that demonstrates a full understanding of the question

- 2 – Satisfactory answer that shows a general understanding of the question in spite of minor errors

- 1 – Minimally acceptable answer that exhibits a rudimentary understanding of the question

- 0 – Answer which lacks understanding of the question or no response at all

Since there will be a total of 10 online discussions throughout the quarter, a maximum of 30 points may be earned for the online discussions. Each student's discussion point total will then be divided by 3, and this new amount will be the student's discussion score (maximum score of 10).

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 8 problem sets throughout the quarter, a maximum of 24 points may be earned for the problem sets. Each student's problem set point total will then be multiplied by 5/6, and this new amount will be the student's problem set score (maximum score of 20).

Tests

A maximum of 100 points may be earned for each exam. There will be no curve applied to the exams. Each student's exam point total will be divided by 4, and this new amount will be the student's exam score (maximum score of 25).

Oral Presentation

The oral presentations will be graded as follows:

- 0-8 points for the delivery of the presentation

- 0-8 points for the quality of the slides

- 0-4 points for the responses to questions

As such, a maximum of 20 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 a lower numerical course grade.

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, I will offer an extra credit opportunity to the whole class if the course evaluation response rate exceeds 80%. I will not be able to see which students have evaluated the course, but I will be able to see the overall response rate. If the response rate exceeds 80%, I will offer an extra credit opportunity worth up to 3 course points (3% of your overall course grade). Partial credit is possible (e.g. 2.5 out of the 3 possible points). Assuming the response rate exceeds 80%, I will post the extra credit question after the lecture on 7 November. To receive the extra credit, students must submit their answer at the beginning of lecture on 14 November. 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.

Schedule

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

Lecture 1 (29 August): Static games, equilibrium concepts, and Nash's Theorem

- In-class diagnostic test

- Problem Set 1 posted

Lecture 2 (5 September): Dynamic Games, Backward Induction, and Subgame Perfection

- Problem Set 1 due

- Problem Set 2 posted

Lecture 3 (12 September): Repeated Games and the Folk Theorem

- Problem Set 2 due
- Problem Set 3 posted

Lecture 4 (19 September): Static Bayesian Games

- Problem Set 3 due
- Problem Set 4 posted

Lecture 5 (26 September): Dynamic Bayesian Games

- Problem Set 4 due
- Practice midterm exam questions posted (Solutions posted on 29 September)

Lecture 6 (3 October): Experiments

- Take-home midterm exam posted (due on 5 October)

Lecture 7 (10 October): Contracts, Principal-Agent Problems, and Signaling

- Problem Set 5 posted

Lecture 8 (17 October): Mechanism Design I

- Problem Set 5 due
- Problem Set 6 posted

Lecture 9 (24 October): Mechanism Design II and Competitive Markets

- Problem Set 6 due
- Problem Set 7 posted

Lecture 10 (31 October): Social Welfare Functions and Voting

- Problem Set 7 due
- Problem Set 8 posted

Lecture 11 (7 November): Matching

- Problem Set 8 due
- Practice final exam questions posted (Solutions posted on 10 November)

Lecture 12 (14 November): Assorted Topics in Market Design

- In-class diagnostic test
- Take-home final exam posted (due on 16 November)

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.

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 universitys contact requirement. The other 20% is satisfied by weekly mandatory and graded online contact. In principle, the contact hours requirement could be satisfied by scheduling 3 additional 150-minute meetings per term, or 6 additional 75-minute meetings, or 10 additional 45-minute meetings. But in practice the contact hours requirement is satisfied by the weekly online discussions. The weekly online discussions are a more flexible way to ensure that our program's courses in DC provide the same level of student-instructor contact as the traditional 15-week, face-to-face, version of the same course when it is taught on campus in College Park.

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 masters 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 per year ($8/6 = 1.33$).

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 Marylands 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 instructors – 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 youre 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). 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 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.

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 is off duty or happens to be away from his or her desk when you arrive, you can go around to the other door at 1616 P Street and pick up the black phone to the right of that door. 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. When you tell them the password, they will be able to unlock the door for you. You can get the password from the program coordinator, the TA, or the program director. Please note: the building security staff are not able to buzz you in at the 1400 16th Street door. You have to go around to the 1616 P Street door to be buzzed in.