

TOBB UNIVERSITY OF ECONOMICS AND TECHNOLOGY
Department Economics

ECON 415 Game Theory

2016-2017 SUMMER SEMESTER

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Class Hours: Tuesday 8.30-10.30, Friday 14.30-16.30

Office Hours: TBA

If the above office hours do not fit to your schedule, you can come to office hours via appointment. The best way to contact me is through email. I will try to respond to emails within 24 hours. I will be sending emails occasionally to inform you about the announcements, homework assignments and quizzes. Important information will be sent to students' university email accounts, as well as posted on my webpage. It is YOUR responsibility to check your emails and/or the website at least once a week.

PREREQUISITES

In the course we are going to read and write some proofs of selected theorems. You are not required to have taken a mathematical analysis course. However, the students are expected to be familiar with mathematical notation and formal reasoning. Even though the level of mathematical abilities will not be low, the mathematics I will be using involves only elementary operations, calculus and basic probability theory. Also, it will be assumed and recommended that students have taken ECON 214.

COURSE DESCRIPTION AND CONTENT

In making decisions, one cannot ignore the actions of others in most of the situations. The fact remains that most real-world decisions are not made in isolation, but involve interaction with others. Hence, in deciding how to act optimally in a given situation, each agent needs to consider how others are likely to act as well. Game theory is a discipline that provides a mathematical methodology and set of concepts for modeling and analyzing interactive decisions among multiple agents. We will learn how to use game theory to *formally* study situations of potential conflict and cooperation: situations where the eventual outcome depends not just on your decision and chance, but the actions of others as well. Game theory has a wide range of applications in economics, political science, computer science, law, international relations, sports, politics etc.

The language of game theory is mathematical. The approach of this course will be somewhere between a typical mathematics class and a typical economics class. Definitions will be stated formally and arguments will be developed rigorously as in a math class. At the same time, much of the course will be devoted using game theory to understand applications in economics, political science and other fields. Taking these applications as a starting point, we will develop an understanding of what constitutes a good mathematical model for addressing an economic question.

TEXTBOOK

Main textbook

Osborne, Martin J. *An Introduction to Game Theory*, Oxford University Press (2004) (O)

Recommended books

Gibbons, *Game Theory for Applied Economists*, Princeton University Press (1992)

Kreps, *Game Theory and Economic Modeling*, Oxford University Press (1991)

Dixit, Skeath and Reiley *Games of Strategy*. 4th Edition, W.W Norton (2015)

Tadelis, *Game Theory: An Introduction*, Princeton University Press (2013)

Dutta, *Strategies and Games: Theory and Practice*, MIT Press (1999)

Watson, *Strategy An Introduction to Game Theory*, Second Edition, W.W. Norton (2008)

Additional resources

TÜBA Open Course Materials: <http://www.acikders.org.tr/>

MIT Open Courseware: <https://ocw.mit.edu/courses/economics/>

<http://www.gametheorysociety.org/resources.html>

<http://www.gametheory.net/>

Lecture notes of Prof. Levent Koçkesen:

<http://home.ku.edu.tr/~lkockesen/teaching/econ333/lectnotes/uggame.pdf>

COURSE REQUIREMENTS AND GRADING

There will be 3 announced and several pop-quizzes, 3 homework assignments, 1 midterm exam and a final exam. The weights of these in your final grade are as follows:

A-Quiz (%20) + Homework (%15) + P-Quiz (%5) + Midterm (%25) + Final (%35)

A-Quiz (%20)

The quizzes will be announced at least one week before. There won't be any make-ups for the quizzes. The lowest quiz will be dropped.

Homework (%15)

The late homework scores will be discounted with 0.75. No homework assignments will be accepted **2 business days** after the due date. You can cooperate and work together with your classmates for the homework assignments. While students are permitted to discuss the assignments, you must acknowledge any such discussions. However, everyone has to write his/her own assignment **independently** and **cite** the names of the people whom they work with.

Pop-Quiz (%5)

You are expected to attend and participate to the lectures as you will have a random number of random quizzes.

Midterm (%25)

If you cannot take the midterm and have a valid *documented* excuse, you have two options: (1) the weight of the missed midterm exam will be added to that of the final, (2) you will take a make-up exam potentially **harder** than the actual exam. If a student knows he/she will be absent on the day of the exam for legitimate reasons (such as participation in activities sponsored by the university etc.), it is his/her responsibility to notify the instructor as far in advance as possible (again, with documentation).

Final (%35): The final is cumulative. The make-up will be granted only in case of a valid and documented reason. Absence without any valid documentation will result in a grade of 0 from that exam. In case of an illness, you are required to bring a formal doctor's note from a hospital. You have to bring or fax the doctor's note to me within 5 business days after the exam.

The final score will be computed based on your absolute performance throughout the course. Below are the grading cut-off points:

AA: 92-100, BA: 85-91, BB: 78-84, CB: 70-77, CC: 65-69, DC: 56-64, DD: 50-55.

NOTES ON ACADEMIC HONESTY

All the work submitted must be that of student. You are encouraged to work with others in understanding the concepts and problems. However, each student must hand in their own homework assignment and all the sources of information and references used including a classmate (except for the textbook, lecture and recitation notes) must be **cited**. Identical answers will receive a score of zero. If the academic dishonesty occurs on a final or midterm, a grade of F or N will be received. Cheating and plagiarism will be penalized according to the disciplinary rules of the university and YÖK.

TENTATIVE COURSE PLAN

The following is a list of topics to be covered. You will be responsible for all the lecture material and hence the attendance is essential. The lecture material will be in the same line as Osborne and Gibbons, sometimes skipping some topics and other times adding more material and examples in greater detail.

0. Introduction, Ch 1 (O)

- What is game theory? (Rationality, common knowledge)
- Cooperative vs non-cooperative game theory
- Normal form games vs. extensive form games (Observability, timing)
- Games with complete information vs incomplete information

I. Non-cooperative Games

1. Games with Complete Information

A. Static (normal form) games, Ch.2-4 (O) and Ch.1 (G)

- Basic notions and definitions
- Dominant Strategy equilibrium and IEDS
- Nash equilibrium: Theory.
- Mixed Strategies and Mixed Strategy Nash equilibrium: Theory
- Nash equilibrium: Applications (Market competition, electoral competition, auctions...)

B. Sequential (extensive form) games, Ch.5-7 (O) and Ch.2 (G)

- Perfect information games and backward induction
- Imperfect information games and subgame perfect equilibrium
- Applications (Stackelberg duopoly and bargaining)

- 2. Games with Incomplete Information
 - A. Static games with incomplete information, **Ch.9 (O) and Ch.3 (G)**
Bayesian equilibrium: Theory and applications (auctions)
 - B. Dynamic games with incomplete information, **Ch.10 (O) and Ch.4 (G)**
Perfect Bayesian equilibrium
Sequential equilibrium
Signaling games
- II. Repeated games (if time permits) **Ch.14-15 (O) and Ch.2.3 (G)**
Repeated Prisoners' Dilemma
Minmax theorem, Folk theorem
- III. Economics of information (if time permits)