האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

GAME THEORY - 54106

Last update 31-08-2017

HU Credits: *4*

Degree/Cycle: *1st degree (Bachelor)*

Responsible Department: *prog.in philosophy, economics &political science*

Academic year: *0*

Semester: *Yearly*

Teaching Languages: *Hebrew*

Campus: *Mt. Scopus*

Course/Module Coordinator: *Dr. Uri Resnick*

Coordinator Email: *uri.resnick@mail.huji.ac.il*

Coordinator Office Hours: *Monday 15:30-16:30*

Teaching Staff:

Dr. Uri Resnick

Course/Module description:

The course is intended to present basic game theory concepts and to relate these to applications in political science and in the social sciences and humanities in general. Throughout the course, an emphasis will be placed on examples from different fields and on practical implications of the formal insights. The goal of the course is to give a panoramic view of game theory and to focus on its generic insights. The course does not require prior mathematical knowledge beyond an acquaintance with high school level algebra and probability. Nevertheless, the students will be required to make use of formal notation.

Course/Module aims:

The aims of the course are to expose the students to core concepts in game theory and to demonstrate the way in which game theory can contribute to the understanding of different phenomena in the social sciences and humanities.

Learning outcomes - On successful completion of this module, students should be able to:

The students will be able to carry out expected utility calculations and derive preferred actions therefrom. They will be able to calculate Nash equilibrium points in non-cooperative games and to find the value in two-person zero-sum games. They will learn to find subgame perfect equilibria, trembling hand perfect equilibria and admissible equilibria. They will be acquainted with Bayes' Theorem and will be able to find perfect Bayesian equilibria. They will become acquainted with the Core in cooperative games and be able to calculate the Shapley-Shubik Index in voting games. They will also become acquainted with the logic of equilibrium in repeated games.

Attendance requirements(%):

100%

Teaching arrangement and method of instruction: Lectures and exercises.

Course/Module Content:

Introduction + Rationality and Utility Theory

Describing Conflict Situations (games in extensive and strategic form)

Prediction in Strategic Situations (‘value’ and equilibrium)

Randomization (mixed strategies)

Interaction between Groups

Uncertainty (games with incomplete information)

The Emergence of Cooperation Under Anarchy (repeated games)

The Emergence and Behavior of Coalitions (cooperative game theory)

Quantifying the Power of Committee Members (Shapley-Shubik Index)

The Limits of Democracy: Social Choice Theory (Arrow's Theorem)

The Emergence of Norms (evolutionary games)

Bargaining (The Nash Solution and Rubinstein's Alternating Offers Game)

Truth-Inducing Mechanisms (Auction Theory)

Game Theory and Philosophy (political theory and ethics)

Review class

<u>Required Reading:</u>

1. Introduction + Rationality and Utility Theory (2 classes)

• James Morrow, Game Theory for Political Scientists (Princeton: Princeton Univ. Press, 1994), Chapter 1: Overview, pages 1-8; Chapter 2: Utility Theory, pages 16-43.

• Robert Aumann, "What is game theory trying to accomplish?" in Frontiers of Economics (Oxford: Basil Blackwell, 1985), pages 28-76.

2. Describing Conflict Situations (games in extensive and strategic form) (2 classes)

• James Morrow, Game Theory for Political Scientists (Princeton: Princeton Univ. Press, 1994), Chapter 3: Specifying a Game, pages 51-71.

3. Prediction in Strategic Situations ('value' and equilibrium) (3 classes)

• James Morrow, Game Theory for Political Scientists (Princeton: Princeton Univ. Press, 1994), Chapter 4: Classical Game Theory, pages 73-81; 91-92; 188-211

• Andrew Colman, Game Theory & Its Applications in the Social and Biological Sciences (London: Routledge, 1995), Chapter 4: Two-person zero-sum games, pages

53-61.
• Martin Osborne, An Introduction to Game Theory (NY: Oxford Univ. Press, 2004), Chapter 2: Nash Equilibrium: Theory, pages 21-31.

4. Randomization (mixed strategies) (2 classes)
• James Morrow, Game Theory for Political Scientists (Princeton: Princeton Univ. Press, 1994), Chapter 4: Classical Game Theory, pages 81-91.
• Andrew Colman, Game Theory & Its Applications in the Social and Biological Sciences (London: Routledge, 1995), Chapter 4: Two-person zero-sum games, pages 62-69.

5. Interaction between Groups (2 classes)
• Gary Bornstein, 2002, "Intergroup Conflict: Individual, Group and Collective Interests." Discussion Paper # 297. Jerusalem: Center for Rationality, Hebrew University.
• Robert Putnam, 1988, "Diplomacy and Domestic Politics: The Logic of Two-Level Games," International Organization 42(3): 427-460.

6. Uncertainty (games with incomplete information) (2 classes)
• James Morrow, Game Theory for Political Scientists (Princeton: Princeton Univ. Press, 1994), Chapter 6: Beliefs and Perfect Bayesian Equilibrium, pages 161-187; Chapter 8: Games of Limited Information, pages 219-222.

7. The Emergence of Cooperation Under Anarchy (repeated games) (2 classes)
• James Morrow, Game Theory for Political Scientists (Princeton: Princeton Univ. Press, 1994), Chapter 9: Repeated Games, pages 260-279.

8. The Emergence and Behavior of Coalitions (cooperative game theory) (2 classes)
• Martin Osborne, An Introduction to Game Theory (NY: Oxford Univ. Press, 2004), Chapter 8: Coalitional Games and the Core, pages 239-247.

9. Quantifying the Power of Committee Members (Shapley-Shubik Index) (1 class)
• Ein-Ya Gura and Michael B. Maschler, Insights into Game Theory: An Alternative Mathematical Experience (Cambridge: Cambridge University Press, 2008), Chapter 3: The Shapley Value in Cooperative Games, pages 97-105; 108-111; 124-128; 148-158.

10. The Limits of Democracy: Social Choice Theory (Arrow's Theorem) (1 class)
• Ein-Ya Gura and Michael B. Maschler, Insights into Game Theory: An Alternative Mathematical Experience (Cambridge: Cambridge University Press, 2008), Chapter 2: Social Justice, pages 59-64, 67-85, 87-92.

• Andrew Colman, Game Theory & Its Applications in the Social and Biological

Sciences (London: Routledge, 1995), Chapter 10: Social Choice and Strategic Voting, pages 229-230, 244-246.

11. The Emergence of Norms (evolutionary games) (2 classes)
• Hans Morgenthau, Politics Among Nations: The Struggle for Power and Peace, Brief Edition (Boston, MA: McGraw Hill, 1993), Chapter 9: Elements of National Power, pages 143-151.
• Andrew Colman, Game Theory & Its Applications in the Social and Biological Sciences (London: Routledge, 1995), Chapter 11: Theory of evolution: strategic aspects, pages 272-293.

12. Bargaining (The Nash Solution and Rubinstein's Alternating Offers Game) (2 classes)
• James Morrow, Game Theory for Political Scientists (Princeton: Princeton Univ. Press, 1994), Chapter 4: Classical Game Theory, pages 111-116.

13. Truth-Inducing Mechanisms (Auction Theory) (1 class)
• Martin Osborne, An Introduction to Game Theory (NY: Oxford Univ. Press, 2004), Chapter 3: Nash Equilibrium: Illustrations, pages 80-85.

14. Game Theory and Philosophy (political theory and ethics) (1 class)
• Andrew Colman, Game Theory & Its Applications in the Social and Biological Sciences (London: Routledge, 1995), Chapter 12: Game Theory and Philosophy, pages 294-316.
• Kenneth Binmore, Game Theory and the Social Contract, Volume 1: Playing Fair (Cambridge: MIT Press, 1994), pages 1-11; 117-119; 145-150; 334-340.
• Kenneth Binmore, Game Theory and the Social Contract, Volume 2: Just Playing (Cambridge: MIT Press, 1998), pages 15-19; 145-166; 422-453.

Additional Reading Material:
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• Martin Osborne, An Introduction to Game Theory (NY: Oxford Univ. Press, 2004), Chapter 8: Coalitional Games and the Core, pages 239-247.

9. Quantifying the Power of Committee Members (Shapley-Shubik Index) (1 class)
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2: Social Justice, pages 59-64, 67-85, 87-92.

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Course/Module evaluation:
End of year written/oral examination 60 %
Presentation 0 %
Participation in Tutorials 0 %
Project work 0 %
Assignments 40 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information:

The lectures will include active problem solving. We will present the solutions in class.

Each semester, the students will submit one exercise, for a total of 40% of the final grade.

At the end of the second semester, there will be a final exam worth 60% of the final grade.