

# TOPICS IN GAME THEORY

Module 5, 2018–2019

Professor: Andrei Savochkin

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## Course information

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**Course Website:** [my.nes.ru](http://my.nes.ru)

**Instructor's Office Hours:** By appointment

**Class Time:** TBD

**Room Number:** TBD

**TA:** Alexander Tonis

## Course description

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This course covers several advanced topics in game theory that are not studied in the obligatory game theory course. They are selected from several different branches of game theory according to the instructor's taste, and include both classical results that influenced the evolution of the entire discipline and recent developments.

The list of topics planned for this year is given below. Some of them are more utilitarian: they present tools that are used in applied models, and, hence, are helpful for deep understanding of such models, evaluating them critically, and writing own models. Other topics are chosen for their intellectual value. In the end, we will see that game theory is not rigid and unchangeable — it is not something a biologist would want to call “dead.” The discipline has had its own share of controversies and a history of ups and downs and dead ends and and break-throughs that are frequently exciting and always intellectually stimulating.

## Course requirements, grading, and attendance policies

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The prerequisite of this course is a completion of the obligatory Game Theory course at NES.

Student's achievements will be evaluated on the basis of 4 problem sets (16% weight) and the final exam (84% weight). The format of the exam is open book. At least 70% lecture attendance and at least 20 point score in the final exam are required for getting a passing grade.

## Course contents

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This year, we are going to study the following topics.

1. Equilibrium refinements
2. Correlated equilibrium
3. Elements of Epistemic Game Theory
4. Theory of knowledge with applications to no-trade theorems
5. Evolutionary ideas in application to games
6. Elements of Cooperative Game Theory
7. Repeated games: Bargaining

### **Description of course methodology**

This course is based mainly on published research papers. Key material will be presented in class; however, for each topic, it is necessary look into papers that will be suggested for reading.

### **Sample tasks for course evaluation**

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*(From 2015-2016 final exam.)* Suppose that there is a committee of four members that divides the pie of size one. Only the chairperson is allowed to put proposals about how to divide for voting. The decisions are made by the majority voting, and in the case of the split voting (2–2), the new proposal is not accepted (and the previously accepted proposal stands).<sup>1</sup>

1. Formulate this situation as an extended partition structure game.
2. Find the core of this game.
3. Find one von Neumann-Morgenstern stable set for this game (or prove that there is none). Is there such a set that does not coincide with the core? Provide a proof for your answer.

### **Course materials**

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#### **Required textbooks and materials**

There is no book that covers all the topics and includes recent research. Key material will be presented in class, the rest can be found in recommended papers.

#### **Additional materials**

The following books can be used to complement lectures on some of the topics.

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<sup>1</sup>That is, we want to formalize the game in a way so that a state  $y$  cannot block  $x$  if only two players want to move from  $x$  to  $y$ .

- Andreu Mas-Colell, Michael D. Whinston, and Jerry R. Green, *Microeconomic Theory*, Oxford University Press, 1995.
- Drew Fudenberg and Jean Tirole, *Game Theory*, MIT Press, 1991.
- Adam Brandenburger (Ed.), *The Language of Game Theory: Putting Epistemics into the Mathematics of Games*, World Scientific Publishing Company, 2014.

The list of papers to study will be determined as the course unfolds. As an illustration, in previous years, we studied the following papers.

- Aumann, “Agreeing to Disagree,” *Ann. Statist.*, 1976.
- Milgrom and Stokey, “Information, Trade and Common Knowledge,” *JET*, 1982.
- Pearce, “Rational Strategic Behavior and the Problem of Perfection,” *Econometrica*, 1984.
- Brandenburger and Dekel, “Rationalizability and Correlated Equilibria,” *Econometrica*, 1987.
- Brandenburger, Friedenberg, and Keisler, “Admissibility in Games,” *Econometrica*, 2008.
- Brandenburger, “The power of paradox: some recent developments in interactive epistemology,” *Int J Game Theory*, 2007.
- Aumann and Brandenburger, “Epistemic Conditions for Nash Equilibrium,” *Econometrica*, 1995.
- Battigalli and Siniscalchi, “Strong Belief and Forward Induction Reasoning,” *JET*, 2002.
- Cho and Kreps, “Signaling Games and Stable Equilibria,” *QJE*, 1987.
- Cho and Sobel, “Strategic Stability and Uniqueness in Signaling Games,” *JET*, 1990.
- Rubinstein, “Perfect Equilibrium in a Bargaining Model,” *Econometrica*, 1982.
- Abreu and Gul, “Bargaining and Reputation,” *Econometrica*, 2000.
- Abreu and Pearce, “Bargaining, Reputation, and Equilibrium Selection in Repeated Games with Contracts,” *Econometrica*, 2007.

### **Academic integrity policy**

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Cheating, plagiarism, and any other violations of academic ethics at NES are not tolerated.