

# TOPICS IN GAME THEORY

Module 5, 2020–2021

Professor: Andrei Savochkin

[asavochkin@nes.ru](mailto:asavochkin@nes.ru)

## Course information

---

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

**Instructor's Office Hours:** TBD

**Class Time:** TBD

**Room:** TBD

**TA:** Alexander Tonis

## Course description

---

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.

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

## Course requirements, grading, and attendance policies

---

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

Student's achievements is be evaluated on the basis of 4 problem sets (24% weight) and the final exam (76% weight). The format of the final exam is open book. At least 20 point score in the final exam is required for getting a passing grade.

Since the course is based on research papers that chosen mostly for their deep intellectual contribution (and often paradigm-shifting nature), class attendance is extremely important. Signing up for this course is not recommended if you cannot commit to attending class meetings.

## Course contents

---

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

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

## Description of course methodology

This course is based mainly on published research papers. Key material will be presented in class, and then the students are expected to check the suggested papers.

## Sample tasks for course evaluation

---

(From 2019-2020 final exam.) For this problem, assume the setup and terminology of Aumann and Brandenburger's (1995) paper on Nash equilibrium.

Consider the following game.

		Bob	
		<i>L</i>	<i>R</i>
Ann	<i>U</i>	3, 6	0, 0
	<i>D</i>	1, 2	4, 4

Is it possible to find a Nash equilibrium  $(\sigma^a, \sigma^b)$  of this game and a state  $(t^a, t^b)$  such that the following conditions hold simultaneously:

- $\sigma^a$  and  $\sigma^b$  are fully mixing,
- the beliefs of the players are such that the induced conjectures about the actions of their opponents are  $\sigma^b$  and  $\sigma^a$  for players Ann and Bob, respectively,
- both players know that their opponents are rational,
- Ann knows that Bob knows that Ann is not rational and, symmetrically, Bob knows that Ann knows that Bob is not rational?

Either provide an example and show that the conditions hold, or prove the impossibility.

## **Course materials**

---

### **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.

- 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.
- Binmore and Brandenburger, "Common Knowledge and Game Theory," unpublished, 1988.
- Milgrom and Stokey, "Information, Trade and Common Knowledge," *JET*, 1982.
- Kohlberg and Mertens, "On the Strategic Stability of Equilibria," *Econometrica*, 1986.
- 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.

- Binmore and Samuelson, “Muddling Through: Noisy Equilibrium Selection,” JET, 1997
- Blume and Easley, “If you’re so smart, why aren’t you rich? Belief selection in complete and incomplete markets,” Econometrica, 2006
- 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**

---

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