Approved by the Academic council
of the Education program

_____

Protocol No. ___ from __. __. 20

MICROECONOMICS: APPLICATIONS

Master: 1 year, 3 and 4 modules
5 ECTS credits
Instructors:

Part 1: Marina Sandomirskaia
msandomirskaya@hse.ru
https://www.hse.ru/staff/sandomirskaia
Part 2: Tatiana Mayskaya
tmayskaya@gmail.com
https://www.tmayskaya.com/

COURSE DESCRIPTION: This course has two parts. The **first** part is devoted to the advanced topics in Game Theory and its applications. The issues in non-cooperative theory cover some modern approaches to dynamic games, including games with incomplete information, and its essential applications, such as the model of job market signaling. The special attention will be paid to cooperative game theory, basic solution concepts, bargaining solution and the connection and open problems between cooperative and non-cooperative modeling. The course will include discussions on evolutionary games, bounded rationality behavior, hierarchical games, and some other related topics. The **second** part of the course introduces Contract Theory, Matching Theory, and Social Choice. The theory of contracts studies situations when a principal (e.g. manager) offers a contract to an agent (e.g. worker). The agent either has some private knowledge relevant for the principal (screening model) or can take a hidden action (moral hazard model). The theory of matching seeks to design mechanisms to match one side of a market (e.g. men) to the other side of the market (e.g. women). The social choice theory that studies preference aggregation rules and their normative appeal.

PRE-REQUISITES: Undergraduate level mathematics that includes: Calculus, Linear Algebra, Ordinary Differential Equations, Probability Theory, Constrained Optimization (Lagrangian function); Bachelor Game Theory course (non-cooperative games).

LEARNING OBJECTIVES: The course is designed to equip students with both the foundations and the modern game-theoretical tools for economic modeling. A special attention will be paid to popular solution concepts, relation between a cooperative and non-cooperative approaches and modern trends in game-theoretical applications.

LEARNING OUTCOMES: After successful passing the course, a student will:

- know mathematical models and concepts of game theory;
- be able to construct adequate model for economic interactive situation and analyze it;
- understand the area and limitations of game-theoretical method.

READING LIST

Required:

1. Fudenberg, Drew and Jean Tirole. *Game theory*. MIT Press, 1991.
2. Maschler, Michael, Eilon Solan, and Shmuel Zamir. *Game theory*. Cambridge University Press, 2013.
3. Osborne, Martin J. *An introduction to game theory*. New York: Oxford University Press, 2004.
4. Mas-Colell, Andreu, Michael D. Whinston, Jerry R. Green. *Microeconomic theory*. Oxford University Press, 1995.
5. Bolton, Patrick and Mathias Dewatripont. *Contract theory*. MIT Press, 2005.
6. Roth, Alvin E. and Marilda A. Oliveira Sotomayor. *Two-sided matching: A study in game-theoretic modeling and analysis.* Cambridge University Press, 1992.
7. Goeree, Jacob K. and Charles A. Holt. "Ten little treasures of game theory and ten intuitive contradictions." *American Economic Review*, 2001, 91(5), 1402-1422.
8. Camerer, Colin F., Teck-Hua Ho, and Juin-Kuan Chong. "A cognitive hierarchy model of games." *Quarterly Journal of Economics*, 2004, 119(3), 861-898.
9. Crawford, Vincent P., Miguel A. Costa-Gomes, and Nagore Iriberri. "Structural models of nonequilibrium strategic thinking: Theory, evidence, and applications." *Journal of Economic Literature*, 2013, 51(1), 5-62.
10. Crawford, Vincent P. "Boundedly rational versus optimization-based models of strategic thinking and learning in games." Journal of Economic Literature, 2013, 51(2), 512-527.

Additional:

1. Osborne, Martin J. and Ariel Rubinstein. *A course in game theory*. MIT Press, 1994.
2. Gibbons, Robert. *Game theory for applied economists*. Princeton University Press, 1992.
3. Myerson, Roger B. *Game theory: Analysis of conflict*. Harvard University Press, 1991.
4. Rubinstein, Ariel. *Economic Fables*. Open Book Publishers, 2012 https://www.openbookpublishers.com/product/136

COURSE PLAN:

	№	Topic	Total hours	Contact hours	Self-study
PART 1	1	Static games of complete information. Nash equilibrium. Iterated strict dominance, rationalizability. Correlated equilibrium.	6	2	4
	2	Dynamic games of complete information. Backward induction and subgame perfection. Critiques and limitations. Repeated games. Folk theorem. Characterization of the equilibrium set. Cartels and price wars.	8	2	6
	3	Static games of incomplete information. Bayesian equilibrium. Application to mechanism design problems.	8	2	6
	4	Dynamic games of incomplete information. Perfect Bayesian equilibrium. Sequential equilibrium.	6	2	4
	5	Trembling hand perfect equilibrium. Proper equilibrium.	8	2	6
	6	Signaling games. Separating and pooling equilibria. Additional refinements and criteria. Applications: job-market signaling.	10	4	6
	7	Reputation effects. Games with a single long-run player. Extensions.	6	2	4
	8	Bargaining problem. Nash bargaining solution and its properties. Relation with Rubinstein sequential bargaining.	12	4	8
	9	Coalitional games with transferable utilities. Characteristic function. Imputation. Special families of games. Solutions: the core, the Shapley value, the nucleolus.	16	6	10
	10	Evolutionary games. Evolutionary stable sets.	6	2	4
	11	Markov perfect equilibrium. Payoff-relevant strategies. A reduction of infinitely repeated games.	10	4	6
	12	Hierarchical games. Bounded-rationality approach. Experimental support.	6	2	4
	13	Discussion on the limitations and contradictions of game theoretical approach.	6	2	4
PART 2	14	Screening model I. Seller-buyer, lender-borrower, employer-employee examples.	14	4	10
	15	Screening model II. Ex-ante contracting. Limited liability. Different outside options. Optimal income taxation.	14	4	10
	16	Moral hazard I. Binary setup. First best: risk-neutral, risk-averse, risk-loving agent. Second best: risk-neutral / risk-averse agent, full/limited liability.	14	4	10
	17	Moral hazard II. Multiple outcomes/actions. Continuum outcomes/actions. Linear contracts.	14	4	10
	18	Matching theory I. Stable matchings. Deferred acceptance algorithm. Stability vs Pareto optimality. Rural Hospital theorem.	13	5	8
	19	Matching theory II. Lattice structure of stable matchings. Strategic behavior. Many-to-one matching.	13	5	8
	20	Social choice theory I. Examples of social choice functions. Arrow impossibility theorem.	13	5	8
	21	Social choice theory II. Gibbard-Satterthwaite theorem. May theorem. Restricted domain: single-peaked preferences and median voter theorem.	13	5	8
Total			216	72	144

GRADING: The final grade is cumulative and based on three elements: homeworks (HW), a midterm test (MT), and a final test (FT). Each assignment is graded out of 100 points. Then the following formula is used to get the final score in 100-point scale:

Grade = 0.1(HW1)+0.15(HW2)+0.25(MT)+0.08(HW3)+0.07(HW4)+0.05(HW5)+0.05(HW6)+0.25(FT)

This score will be converted to the final grade according to the following table:[1]

100-point scale	10-point scale
0-19,99	1
20-29,99	2
30-34,99	3
35-40,99	4
41-47,99	5
48-56,99	6
57-64,99	7
65-71,99	8
72-84,99	9
85-100	10

The midterm test will be based on the first part of the course, while the final test will cover only the second part of the course.

If a student didn't attend the midterm and/or final test and the medical document is provided to the study office in time, then he/she can write the test (a different version of it) on another day (the same for all students missing the test). If a student didn't attend this test for the second time, he/she gets zero score for this test (even if the medical document is provided). If a student doesn't attend the test without the proper reason or doesn't submit a home assignment in time, then he/she gets zero score for the corresponding activity.

If a student fails the course, he/she will get two opportunities for a makeup. The format of both makeups is the same: they consist of the material covered during the whole course (both parts!). The first makeup is graded by the course instructors, and the final grade is determined exclusively based on this makeup. The second one is graded by a committee consisting of three or more members (including both course instructors).

[1] The course instructors leave themselves the right to adjust the conversion scale by up to 15 points on the 100-point scale for each grade on the 10-point scale.