

SYLLABUS OF A MODULE

Polish name of a module	Teoria gier i decyzji
English name of a module	Theory of games and decisions
ISCED classification - Code	0542
ISCED classification - Field of study	<i>Statistics</i>
Languages of instruction	<i>English</i>
Level of qualification:	<i>2 – MSc (EQF 7)</i>
Number of ECTS credit points	6
Examination:	<i>EW – exam written</i>
Available in semester:	<i>S – Spring only</i>

Number of hours per semester:

Lecture	Tutorial	Laboratory	Seminar	Project	Others
30 E	30	0	0	0	0

MODULE DESCRIPTION

Module objectives

- O1. To provide students with a foundation to normative decision theory, especially the theory of games, and equip them with basic mathematical concepts and tools that are used to analyze and solve decision problems.
- O2. To present various and sometimes unexpected real-world applications of this abstract mathematical theory.
- O3. To equip students with knowledge which is sufficient to recognize and assess archetypal decision-making situations in complicated real-world settings.

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic probability theory, linear programming, basic linear algebra, general mathematical maturity.

LEARNING OUTCOMES

- LO 1 – The student characterizes the theoretical and practical importance of the axioms, definitions and theorems occurring in the normative decision theory .
- LO 2 – Student lists the most important classes of models appearing in the theory, and makes appropriate and varied interpretations. He/she recognizes archetypal decision-making situations in exemplary real-world decision problem settings.
- LO 3 – Student explains different key concepts of solutions to the game problems. He/she explains the practical consequences of using particular concept of a solution. Student

applies the theory to solve basic/classical problems in exemplary real-world settings.

MODULE CONTENT

Type of classes – Lectures		Number of hours
Lect. 1	Overview of decision theory - introduction. Behavioral vs. normative theory. Classification of decision problems.	2
Lect. 2,3	Linear programming tasks as problems of decision making under certainty. Decision making under risk: stochastic programming.	3
Lect. 3,4	Fundamentals of the utility theory. Axioms of the preference relation. Utility function: basic concept and theorems	3
Lect. 5	Extensive-form games. The notion of a strategy.	2
Lect. 6	Normal-form games. Matrix games. Various concepts of solutions.	2
Lect. 7,8	Zero-sum two-person games. Von Neumann minimax theorem.	4
Lect. 9	Cooperative vs. non-cooperative games. "Prisoner dilemma" problem and its various interpretations.	2
Lect. 10	Two-person cooperative games. Nash bargaining axioms and bargaining–problem solution.	2
Lect. 11-12	Duopoly analysis. Stackelberg games and repeatable games	4
Lect. 13-15	Selected problems in contemporary decision-making theory.	6
Type of classes– Tutorial		Number of hours
Ex. 1	Matrices and vectors. Discrete probability distributions.	2
Ex. 2	Convex sets, functions and operations. Global extrema on bounded regions	2
Ex. 3	Mathematical programming vs. stochastic programming	2
Ex. 4	Preferences and utility function.	2
Ex. 5	Games in the extensive-form. Strategies.	2
Ex. 6	Matrix games - various concepts of solutions.	2
Ex. 7	achievement test	2
Ex. 8	Zero-sum matrix games. Examples. Saddle points.	2
Ex. 9	Mixed strategies - the concept and the payoff.	2
Ex. 10	The Solution of a zero-sum game in mixed strategies.	2
Ex. 11	Cooperative games - exemplary analysis.	2
Ex. 12	Computing arbitration pairs.	2
Ex. 13	Duopoly analysis	2
Ex. 14	Contemporary decision-making problems	2
Ex. 15	achievement test	2

TEACHING TOOLS

1. multimedia presentations
2. electronic lecture notes
3. problem sets for students
4. traditional face-to-face, blackboard supported tutorials

WAYS OF ASSESSMENT (F – FORMATIVE, S – SUMMATIVE

F1. – assessment of student's activity (during all types of classes)
F2. – assessment of the correctness of solutions to given problems (during tutorials)
F3. – assessment of the quality of presentation of acquired knowledge and skills (during tutorials and seminars)

S1. – assessment of problem-solving skills - a report containing complete solutions to problems from Problem Sets given during classes plus achievement test
S2. – assessment of the degree to which the teaching material is known and understood by student – open-book exam

*) in order to receive a credit for the module, the student is obliged to attain a passing grade in all laboratory classes as well as in achievement tests.

STUDENT'S WORKLOAD

L.p.	Forms of activity	Average number of hours required for realization of activity
1. Contact hours with teacher		
1.1	Lectures	30
1.2	Tutorials	30
1.3	Laboratory	0
1.4	Seminar	0
1.5	Project	0
1.7	Examination	3
Total number of contact hours with teacher:		63
2. Student's individual work		
2.1	Preparation for tutorials and tests	24
2.2	Preparation for laboratory exercises, writing reports on laboratories	0
2.3	Preparation of project	0
2.4	Preparation for final lecture assessment	0
2.5	Preparation for examination	15
2.6	Individual study of literature	38
Total number of hours of student's individual work:		72
Overall student's workload:		140
Overall number of ECTS credits for the module		6
Number of ECTS points that student receives in classes requiring teacher's supervision:		2,5
Number of ECTS credits acquired during practical classes including laboratory exercises and projects :		1

BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

RECOMMENDED readings (all available at various internet book-shops and libraries):
Morris P. , Introduction to game theory, Spriger-Verlag 1994
Webb J. N., Game Theory: Decisions, Interaction and Evolution, Springer Verlag, London, 2007
Lindgren B.W., Elements of decision theory, Macmillan, London, 1971
Luce D. R., Raiffa H. , Games and decisions; introduction and critical survey, Wiley, New York, 1957.
ADDITIONAL readings:
Rasmusen E., Games And Information, An Introduction To Game Theory, Blackwell Publishers Inc.,

Oxford,UK,, 2007

Geçkil İl. K. Anderson, P.L , Applied game theory and strategic behavior, Taylor and Francis Group, 2010
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Osborne M.J., Rubinstein A., A Course in Game Theory, MIT Press, 1994.
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Hargreaves-Heap S.P. , Varoufakis Y. , Game Theory-A Critical Introduction, Taylor & Francis e-Library, London, New York 2003

Journal-papers devoted to various aspects of contemporary decision-making theory - provided for students during classes

MODULE COORDINATOR (NAME, SURNAME, INSTITUTE, E-MAIL ADDRESS)

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