

## FACULTY OF MANAGEMENT

**SUBJECT CARD****Name of subject in Polish: Gry i decyzje w zarządzaniu****Name of subject in English: Games and decisions in management****Main field of study (if applicable): Business Engineering****Specialization (if applicable): Business Intelligence****Profile: academic****Level and form of studies: 2nd level, full-time****Kind of subject: obligatory****Subject code: W08IZZ-SM8012****Group of courses: NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	<b>30</b>		<b>30</b>		
Number of hours of total student workload (CNPS)	<b>50</b>		<b>50</b>		
Form of crediting	<b>Crediting with grade</b>		<b>Crediting with grade</b>		
For group of courses mark (X) final course					
Number of ECTS points	<b>2</b>		<b>2</b>		
including number of ECTS points for practical classes (P)			<b>2</b>		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	<b>1,28</b>		<b>1,28</b>		

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. Basic knowledge of probability calculus
2. Basic skills in computer programming

**SUBJECT OBJECTIVES**

- C1 Presenting various decision-making models, involving one or more persons, under risk or uncertainty.
- C2 Showing applications of decision theory and game theory in management.
- C3 Presenting methods of computing solutions to various decision-making models.

**SUBJECT EDUCATIONAL EFFECTS**

relating to knowledge:

PEU\_W01 Students have in-depth knowledge of various decision-making models, involving game-theory models and robust/stochastic optimization.

relating to skills:

PEU\_U01 Student can apply decision-making models to practical situations.

PEU\_U02 Student can compute and interpret a solution to basic decision-making models.

**PROGRAMME CONTENT**

Lecture		Number of hours
Lec 1	Classification of decision problems.	2

Lec 2	Modeling of risk and uncertainty in optimization problems.	2
Lec 3	Elements of stochastic and robust optimization with application to portfolio selection problem.	2
Lec 4	Games in extensive and normal form.	2
Lec 5	Equilibria in non-cooperative games.	2
Lec 6	Zero-sum games. Solving zero-sum games by using linear programming.	2
Lec 7	Applications on noncooperative $n$ -person games.	2
Lec 8	Games with communications. Correlated equilibria.	2
Lec 9	Two-person bargaining problem. Nash solution concept.	2
Lec 10	Games in coalitional form. The concept of the core.	2
Lec 11	The Shapley value.	2
Lec 12	Decision making under risk – von Neumann and Morgenstern utility theory.	2
Lec 13	Decision making under uncertainty.	2
Lec 14	Group decision making. The Arrow's paradox.	2
Lec 15	Written test	2
	<b>Total hours</b>	<b>30</b>

<b>Laboratory</b>		<b>Number of hours</b>
Lab 1-2	Solving deterministic optimization problems using AMPL language.	4
Lab 3-5	Solving stochastic and robust optimization problems using AMPL language.	6
Lab 6	Solving zero-sum games using AMPL language.	2
Lab 7-10	Solving non-cooperative games.	8
Lab 11-12	Solving cooperative games.	4
Lab 13-14	Solving decision problems under risk and uncertainty.	4
Lab 15	Written test.	2
	<b>Total hours</b>	<b>30</b>

<b>TEACHING TOOLS USED</b>
N1. Presentation N2. List of tasks N3. Mathematical programming languages and software tools for game theory

#### EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

<b>Evaluation</b> (F – forming during semester), P – concluding (at semester end)	<b>Learning outcomes</b>	<b>Way of evaluating learning outcomes achievement</b>
F1	PEU_W01	Written test
F2	PEU_U01 PEU_U02	Solving tasks during classes (activity during classes)

F3	PEU_U01 PEU_U02	Written test using computer software.
P (Lecture) = F1 P (Laboratory) = 0.2 F2 + 0.8 F3		

PRIMARY AND SECONDARY LITERATURE	
<b><u>PRIMARY LITERATURE:</u></b>	
<ol style="list-style-type: none"> <li>1. R. D. Luce, H. Raiffa. Games and decisions. Introduction and critical survey. Dover Publication Inc. 1957.</li> <li>2. E. Prisner. Game theory through examples. MAA 2014.</li> <li>3. P. Kall, J. Mayer. Stochastic linear programming. Models, theory and computation. International Series in Operations Research and Management Science. Springer 2011</li> </ol>	
<b><u>SECONDARY LITERATURE:</u></b>	
<ol style="list-style-type: none"> <li>1. R. Myerson. Game Theory: Analysis of conflict, Harvard University Press, 1997</li> <li>2. H. Peters. Game Theory. A multi-level approach. Springer 2008</li> <li>3. N. Nisan, T. Roughgarden, E. Tardos, V. Vazirani (eds.). Algorithmic game theory. Cambridge University Press 2007</li> </ol>	
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