



Subject card

Subject name and code	Game theory, PG_00069466						
Field of study	Mathematics						
Date of commencement of studies	October 2026	Academic year of realisation of subject				2026/2027	
Education level	second-cycle studies	Subject group				Specialty subject group Subject group related to scientific research in the field of study	
Mode of study	Full-time studies	Mode of delivery				at the university	
Year of study	1	Language of instruction				Polish	
Semester of study	1	ECTS credits				4.0	
Learning profile	general academic profile	Assessment form				assessment	
Conducting unit	Department of Nonlinear Analysis and Statistics -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Zdzisław Dzedzej				
	Teachers		dr hab. Zdzisław Dzedzej				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	60		5.0		35.0	100
Subject objectives	<p>The aim of the subject is to familiarize students with different aspects of game theory and their applications to different fields of science, for example, to economics (insurance, bargaining, negotiations) or biology (population dynamics). Among others students should master such notions like equilibrium, optimal strategy and different techniques of game solving.</p> <p>During seminars additional applications aspects like combinatorial games will be touched and basic effects as game solving will be trained</p>						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W02] has enhanced knowledge of a selected branch of mathematics, theoretical or applied, knows classical definitions and theorems and their proofs and connections with other fields, understands problems being examined		Solving of small games, linear programming		[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge		
[K7_U09] constructs mathematical models used in specific advanced applications of mathematics, can use stochastic processes as a tool for modeling phenomena and analyzing their evolution, constructs mathematical models used in specific advanced applications of mathematics, uses stochastic processes as a tool for modeling phenomena and analyzing their evolution, recognizes mathematical structures in physical theories		Presentation of some application of game theory		[SU5] Assessment of ability to present the results of task [SU3] Assessment of ability to use knowledge gained from the subject			

Subject contents	Course content – lecture 1. Uncertainty and chance, decision making under uncertainty, two-person matrix games. 2. Strategic form games, applications, Nash equilibrium, zero sum matrix game, saddle points. 3. Solving matrix games with mixed strategies. 4. Graphs and trees, single-person decisions. 5. Sequential games, the structure of sequential games. 6. Sequential games with perfect information. 7. Sequential games with imperfect information. 8. Coalitional games- Shapley value. 9. Games with more than two strategies, equilibria and stability. 10. Combinatorial games 11. Linear programming			
Prerequisites and co-requisites	Calculus I and II, linear algebra, elements of probability theory and statistics			
Assessment methods and criteria	Subject passing criteria		Passing threshold	Percentage of the final grade
	Test		50.0%	60.0%
	seminar presentation		0.0%	30.0%
	general activity		0.0%	10.0%
Recommended reading	Basic literature		1. M. DeVoss, D. Kent, Game Theory, AMS 2016 2. Philip Straffin, Teoria gier, Scholar 2001. 3. James N. Webb, Game Theory. Decisions, Interaction and Evolution, Springer 2007 4. Tadeusz Płatkowski, Wstęp do teorii gier, Uniwersytet Warszawski, 2012. 5. G. Owen, Teoria gier, PWN 1975.	
	Supplementary literature		1. J. Hofbauer, K. Sigmund, Evolutionary Games and Population Dynamics, Cambridge UP 2002. 2. J. Watson, Strategia. Wprowadzenie do teorii gier, WNT 2005. 3. S. Stahl, A gentle introduction to game theory, AMS 1998. 4. M. J. Osborne, A. Rubinstein, A course in game theory, MIT Press 1998. 5. A. Karlin, Y. Peres, Game Theory, Alive, AMS 2017	
	eResources addresses			
Example issues/ example questions/ tasks being completed	1. Write the following game as a bi-matrix game and solve it: Two firms (A and B) decide whether to design the devise they sell to use K1 or K2 extensions. Both players will sell more devises if their their products are compatible. If they both choose for K1 extension the payoffs will be 2 for each. If they both choose for K2 extension the payoffs will be 1 for each. If they choose different extensions the payoffs will be 1 for each. 2. Finding Nash equilibria: A man has two sons. When he dies, the value of his estate (after tax) is 100000 zł. In his will it states that the two sons must each specify a sum of money s_i that they are willing to accept. If $s_1 + s_2 > 100000$, then each gets the sum he asked for and the remainder (if there is any) goes to the local home for spoilt cats. If $s_1 + s_2 < 100000$, then neither son receives any money and the entire sum of 100000 zł goes to the cats home. Assume that (i) the two men care only about the amount of money they will inherit, and (ii) they can only ask for whole zlotys. Find all the pure strategy Nash equilibria of this game..			
Practical activities within the subject	Not applicable			

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