

Subject card

Subject name and code	Operations Research, PG_00178114						
Field of study	Informatics and Econometrics						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2027/2028		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study 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	3		Language of instruction		Polish Polish		
Semester of study	6		ECTS credits		5.0		
Learning profile	academic		Assessment form		exam		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. Paweł Miłobędzki				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	15.0	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		4.0		61.0	125
Subject objectives	The focus will be on understanding decision-making processes as conditional ones, as well as the mathematical basis for describing them. We will also cover algorithms for optimising such processes, identifying their assumptions, and evaluating their practical usefulness.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[IiEL3_U03] Students can obtain data from appropriately selected sources, use these data to solve economic and social problems, and process and interpret them using econometrics, informatics or statistics tools.		The student is able to gather information about the behaviour of economic institutions and their environment through direct observation, planned experiments, or querying databases, and then process and interpret the collected data using econometric, IT or statistical tools.		[SU2] presentation/project/paper/report [SU6] demonstration of practical skills		
	[IiEL3_U02] Students can select or construct econometrics, informatics or statistics tools and apply them to describe and solve economic and social problems.		The student is able to select or construct econometric, IT, or statistical tools enabling the acquisition, processing, and analysis of data reflecting the dynamics of economic organizations and the phenomena and processes occurring in their environment.		[SU2] presentation/project/paper/report [SU4] test/exam - oral or written		
	[IiEL3_U06] The student can use and integrate knowledge of management and quality sciences, economics, and finance to resolve dilemmas and complex problems that arise in professional work.		The student is able to specify a model of an economic institution, based on knowledge of management, economics and finance, to optimise its behaviour.		[SU2] presentation/project/paper/report [SU4] test/exam - oral or written		

Subject contents	1. Introduction to operations research: fundamental concepts and practical applications. 2. Linear decision models for optimal production plan, diet, cutting stock, and investment portfolio. 3. Duality in linear decision models. 4. Simplex method. 5. Sensitivity analysis in linear decision models. 6. Work-scheduling problem - Hungarian algorithm. 7. Transportation problems: algorithms for identifying feasible and optimal transportation plans. 8. Zero-sum two-person games (market competition as an example). 9. Non-cooperative games and Nash equilibrium (prisoner's dilemma, monopolistic competition). 10. More applications of game theory: tragedy of the commons, fishing limits in the Baltic Sea, Arctic resources exploitation, missile attack problems, and optimal candidate assignment to schools. 11. Dynamic programming: optimal path selection and resource allocation. 12. Non-dynamic programming and greedy algorithms: knapsack problems and optimal loading problems. 13. Project management using network models. 14. Advanced applications of operations research methods (selecting a football club for sponsorship and optimising lost profits in the hotel industry).		
Prerequisites and co-requisites	Basic understanding of management theory related to management processes, along with fundamentals of algebra, probability theory, and statistics, including concepts concerning random variables and their primary distributions.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Tutorial - written test or project assessing the ability to develop a model demonstrating the dynamics of economic organisation and its environment.	51.0%	25.0%
	Laboratory - written test or project demonstrating the ability to use suitable software for modelling the dynamics of economic organisation and its environment.	51.0%	25.0%
	Written or oral examination assessing understanding of theoretical foundations.	51.0%	50.0%
Recommended reading	Basic literature	1. Gajda J., Jadczak R. (2016), Badania operacyjne. Przykłady zastosowań, Wyd. Uniwersytetu Łódzkiego, Łódź. 2. Kozubski, J.J. (2004), Wprowadzenie do badań operacyjnych, Wyd. Uniwersytetu Gdańskiego, Gdańsk. 3. Kukuła K. (red.) (2007), Badania operacyjne w przykładach i zadaniach, PWN, Warszawa. 4. Sikora W. (red.) (2018), Badania operacyjne, PWE, Warszawa. 5. Straffin P. D. (2004), Teoria gier, Wyd. Naukowe Scholar, Warszawa.	
	Supplementary literature	1. Cormen T.H., Leiserson Ch.E., Rivest R.L., Stein C. (2012), Wprowadzenie do algorytmów, Wyd. Naukowe PWN, Warszawa. 2. Laraki R., Renault J., Sorin S. (2022), Teoria gier. Podstawy matematyczne, Wyd. Naukowe PWN, Warszawa. 3. Lipiec-Zajchowska M. (red.) (2003), Wspomaganie procesów decyzyjnych, tom III. Badania operacyjne, C.H. Beck, Warszawa. 4. Trocki M., Grucza B., Ogonek K. (2003), Zarządzanie projektami, PWE, Warszawa.	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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