University of Gdańsk

Subject card

Subject name and code	Operations Research, PG_00178114		
Field of study	Informatics and Econometrics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2028/2029
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
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 can 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 [SU3] text preparation/written work [SU6] demonstration of practical skills
[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 can specify a model of an economic institution, based on knowledge of management, economics and finance, to optimise its behaviour.	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU4] test/exam - oral or written
[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 familiar with econometric, IT, and statistical methods and tools for acquiring, processing, and analysing data that demonstrate the behaviour of economic institutions and the underlying processes.	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [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
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%
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%
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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