GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	OPERATIONAL RESEARCH, PG_00070842
Field of study	Economic Analytics

Date of commencement of studies	October 2026	Academic year of realisation of subject	2028/2029
Education level	first-cycle 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	5	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment

Conducting unit	Department of Management Engineering and Quality -> Faculty of Management and Economics -> Faculties of Gdańsk University of Technology

Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Jolanta Łopatowska
	Teachers	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	30.0	0.0	0.0	0.0	45
	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	45	3.0	27.0	75

Subject objectives	to prepare students to solve complex decision-making problems in organizations through the use of optimization methods and operational research tools, based on knowledge of mathematical modelling, network programming, optimization theory, and principles of result interpretation, as well as shaping attitudes related to responsibility for the quality of analysis and communication of results, in the context of managerial decision-making in an organizational environment

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W01] "demonstrates advanced knowledge and understanding of economic problems, and selects methods for resolving them while taking into account the complex interrelationships among the phenomena being analyzed.	knows and understands operations research methods and their use in analyzing economic problems, taking into account relationships between phenomena and selecting appropriate methods to solve them.	[SW1] Assessment of factual knowledge
	[K6_U05] leverages the knowledge acquired in the field of economic analytics to solve challenging problems, achieving results that are economically and socially valuable.	is able to develop solutions to decision-making problems by applying operations research methods to analyze and optimize economic processes.	[SU4] Assessment of ability to use methods and tools

Subject contents	Course content – lecture
	1. Introduction, definitions, decision situation.
	2. General form of a linear optimization model, interpretation and analysis of the solution.
	3. Linear optimization models application areas.
	4. Integer optimization model
	5. Elements of graph theory.
	6. Planned networks CPM, CPM-Cost, PERT, CCPM methods.
	7. Ford-Fulkerson algorithm. .
	8. Elements of nonlinear programming.
	9. Multi-objective models.
	10. Sequential problem.
	Course content – exercises
	1. Types of optimization models.
	2. Construction of linear optimization models: assortment selection model, cutting model, technological process optimization model, transportation model, and the allocation of mutually substitutable resources.
	3. Graphical method, simplex algorithm, dual model.
	4. Hungarian algorithm, least matrix element method
	5. Planned network - CPM, CPM-Cost, PERT methods.
	6. Application of the Ford-Fulkerson algorithm.
	7. Application of dynamic programming to solve selected optimization problems.
	8. Solving sequential problems.

Prerequisites and co-requisites	mathematics

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
A test consisting of open-ended theoretical questions, true/false (T/F) questions, and problem-solving tasks.	60.0%	50.0%
Problem-solving tasks	60.0%	50.0%

Recommended reading

Basic literature	1. Anholcer M. (2023). Badania operacyjne. Poznań, Wyd. UE w Poznaniu.
	2. Kukuła, K. (red.). (2020). Badania operacyjne w przykładach i zadaniach, Warszawa: Wydawnictwo Naukowe PWN.
	3. Goldratt, E.M. (2023). Łańcuch krytyczny. MINT Books.
Supplementary literature	1. Anholcer M. (2023). Badania operacyjne. Poznań, Wyd. UE w Poznaniu.
	2. Bernardelli M., Decewicz, A.Tomczyk, E. (2022). Ekonometria i badania operacyjne. Warszawa: Wydawnictwo Naukowe PWN.
	3. Gajda, J.B.,Jadczak, R. (2015). Badania operacyjne. Przykłady zastosowań. Łódź: Wydawnictwo Uniwersytetu Łódzkiego.
	4. Gruszczyński M., Kuszewski T. , Podgórska M. (red.) (2017). Ekonometria i badania operacyjne. Warszawa: Wydawnictwo Naukowe PWN.
	5. Zawadzka, L. (1996). Metody ilościowe w organizacji i zarządzaniu, cz.1. Gdańsk: Wydawnictwo Politechniki Gdańskiej.
	6. Zawadzka, L. (1997). Metody ilościowe w organizacji i zarządzaniu, cz.2. Gdańsk: Wydawnictwo Politechniki Gdańskiej.
eResources addresses	

Example issues/ example questions/ tasks being completed	• Application of linear programming to build and solve models of decision situations.
	• Compare CPA and PERT methods.

Practical activites within the subject	Not applicable

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