University of Gdańsk

Subject card

Subject name and code	Methods of Decision Analysis, PG_00174271		
Field of study	Mathematical Modeling and Data Analysis		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
Education level	Bachelor's studies	Subject group	
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	6.0
Learning profile	academic	Assessment form	credit
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Tomasz Człapiński	
	Teachers		

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	0.0	0.0	60

Subject objectives

The aim of the course is to familiarize students with methods of analyzing decisions made in various conditions, the effects of which can be expressed numerically.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MMiADL3_U08] is able to plan a way to solve a given problem and make a correct record of this solution, providing accurate and precise justifications for the correctness of their reasoning	The student is able to solve selected tasks concerning decision analysis under deterministic and uncertainty conditions.	[SU4] test/exam - oral or written
[MMiADL3_U07] can comprehensively, in speech and in writing, formulate definitions and theorems and present correct mathematical reasoning regarding the issues learned	The student is able to formulate definitions and theorems and present correct mathematical reasoning regarding decision analysis.	[SU4] test/exam - oral or written
[MMiADL3_W08] knows and understands well the role and importance of proof in mathematics, as well as the concept of the significance of assumptions	The student knows selected proofs in the analysis of convex sets and functions and derives selected probability formulas.	[SW4] test/exam - oral or written
[MMiADL3_K02] is ready to precisely formulate questions to deepen his/her own understanding of a given topic or to find missing elements of reasoning	The student is ready to precisely formulate questions that serve to compare intuition with the results of mathematical calculations when analyzing decisions.	[SK1] oral statement/conversation/ discussion

<table>
<tr><td>Subject contents</td><td>1. Decision models elements, construction stages, examples.
2. Standard and canonical form of linear programming problems. Solving linear programming problems using the geometric method and the simplex algorithm. Dual problem of linear programming. Transport problem.
3. Nonlinear programming problem Lagrange method, Kuhn-Tucker conditions.
4. Elements of game theory and decision support two-person games, decision rules, admissible strategies.
5. Games against nature. Decision-making under uncertainty application of various criteria and decision rules (Hurwicz, Wald, Savage, Bayes criteria).
6. Decision-making under conditions of incomplete information single and multi-stage decision trees.
7. The problem of queues. Systems with single and multiple service channels.
8. Elements of dynamic programming, Bellman's optimality principle, the problem of financing an investment project, the stagecoach problem.
9. Network analysis of projects solving practical decision-making problems using critical path algorithms (CPM and Pert methods).</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>activity in the discussion</td><td>51.0%</td><td>0.0%</td></tr>
<tr><td>test</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>egzam</td><td>51.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. D.G. Luenberger, Y. Ye, Linear and Nonlinear Programming, Springer 2015.
2. I. Nykowski, Programowanie liniowe, Warszawa 1980.
3. B. Martos, Programowanie nieliniowe. Teoria i metody, Warszawa 1983.
4. P.D. Straffin, Teoria gier, Warszawa 2004.
5. Badania operacyjne w przykładach i zadaniach, pod red. K. Kukuły, Warszawa 1996.
6. Zbiór zadan z programowania matematycznego cz. I i II, pod red. Z. Galasa i I. Nykowskiego, Warszawa 1986.</td></tr>
<tr><td>Supplementary literature</td><td>none</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>not incuded</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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