University of Gdańsk

Subject card

Subject name and code	Optimization Theory I, PG_00206872		
Field of study	Mathematics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Master's studies	Subject group	Obligatory subject group in the field of study Optional 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	2	ECTS credits	5.0
Learning profile	academic	Assessment form	exam
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr Danuta Jaruszewska-Walczak	
	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	3.0	62.0	125

Subject objectives

To knowing students with the theory and main applications of optimization problems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MATMU2_U04] is able to apply the scientific method in solving advanced problems in a selected branch of mathematics or its applications, and appropriately selects methods and tools - mathematical or computer - needed to solve such problems	The student is able to solve optimization problems using selected methods and advanced tools of modern mathematics in the field of mathematical analysis, linear algebra and functional analysis.	[SU4] test/exam - oral or written
[MATMU2_W03] knows and understands to a deep degree a selected field of theoretical or applied mathematics and is able to understand the formulations of issues in this field that are still at the research stage and knows the connections between issues in this field and other areas of mathematics	The student knows and understands proofs of theorems and understands the role of reasoning construction in formulating and solving optimization problems in Banach spaces and Hilbert spaces; knows the connections between these issues and various branches of mathematics, including advanced mathematical analysis and algebra, and functional analysis.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion

Subject contents

Classification of optimization tasks. Application examples.
The problem of linear programming. Dual task. Transport task. The simplex method.
Representation of functionals.
The problem of minimizing functionals defined on subsets of normalized vector spaces. Separation of convex sets.
Approximation and optimization in Hilbert spaces. Optimization in cones. Normal equations.
Orthogonal polynomials and their extreme properties.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Knowledge of the basics of mathematical analysis and linear algebra</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>test</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>exam</td><td>51.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">D. G. Luenberger, Teoria optymalizacji. BNI,1974.
E. Pollak, Metody obliczeniowe optymalizacji. MIR, 1974.
M. M. Syslo, N. Deo, J. S. Kowalik, Algorytmy optymalizacji dyskretnej. PWN, 1995.
I. Nykowski, Z.Galas, Zbiór zadań z programowania matematycznego I II PWN 1986.
M. Brdyś, A. Ruszczyński, Metody optymalizacji w zadaniach, WNT 1985.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">Not required</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Not required</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
</table>

Document generated electronically. Does not require a seal or signature.