GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Optimization Methods, PG_00038273		
Field of study	Automation, Robotics and Control Systems		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
Education level	second-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	Part-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Control Engineering -> Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Anna Witkowska	
	Teachers	dr hab. Anna Witkowska dr inż. Krzysztof Armiński	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	10.0	10.0	0.0	50
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	50	5.0	70.0	125

Subject objectives

The aim of the course is to familiarise with the methods of optimization and preparation for self problem solving in the field of optimization by using various computer tools.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K7_W04	Students gain skills in the formulation of optimization problems, build mathematical models optimized task. Students can evaluate and make correct interpretation of the obtained solutions	[SW1] Assessment of factual knowledge
K7_W14	The student knows the analytical and numerical algorithms for solving optimization; able to define the objective function, decision variables, constraints and boundary conditions.	[SW1] Assessment of factual knowledge
K7_U07	The student knows and is able to select an appropriate method and algorithm optimization for advanced problems in engineering practice	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
K7_K06	The student knows and is able to select an appropriate method and algorithm to solve the optimization problem for advanced problems in engineering practice	[SK5] Assessment of ability to solve problems that arise in practice

Subject contents	Optimization basics, repetytory range of degree studies. Dekomposition problems in linear and nonlinear aspects. Problems of discrete programming: integer, binary and mixed. Dekompsition methods for solving linear programming problems. Algorithms for a large array of issues rare. Gradient directions of the improvement in linear programming. Penalty function method. Dynamic Optimization: Continuous Bellman optimality principle, the principle of maximum Pontriagin. NP-problems: Cycles and Hamiltonian path. Seeking solutions to issues multipurpose optimization. Issues multilevel optimization problem. Problems of scheduling processes. Special modern optimization methods.
Prerequisites and co-requisites	Fundamentals of optimization methods, numerical methods, basics of automation
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
exam	50.0%	40.0%
practical exercises	50.0%	30.0%
project	50.0%	30.0%

Recommended reading	Basic literature	1. A. Stachurski, A. Wierzbicki, Podstawy optymalizacji, Oficyna Wydawnicza PW, Warszawa 1999. 2. Arabas G.: Wyklad z algorytmow ewolucyjnych, PWN, Warszawa 2003. 3. K. Amborski, Podstawy metod optymalizacji, Oficyna Wydawnicza Politechniki Warszawskiej,2009 4. Stadnicki Jacek . Teoria i praktyka rozwiązywania zadań optymalizacji, Wydawnictwo Naukowe PWN ,2017. 5. H. A. Eiselt, H.Carl-Louis Sandblom. Nonlinear Optimization Methods and Applications, Springer, 2019.
	Supplementary literature	1. W. Findeisen, J. Szymanowski, A. Wierzbicki, Teoria i metody obliczeniowe optymalizacji, Państwowe Wydawnictwo Naukowe, Warszawa 1977 2. Marco Cavazzuti. Optimization Methods: From Theory to Design. Springer, 2008
	eResources addresses	Adresy na platformie eNauczanie: METODY OPTYMALIZACJI [Niestacjonarne][2022/23] - Moodle ID: 23762 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=23762
Example issues/ example questions/ tasks being completed	• Determination of the optimal path of graph • Determination of the maximum of unimodal. • Decomposition of optimization tasks • Identyfication of model parameters by using optimisation methods	
Work placement	Not applicable	