



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	<ol style="list-style-type: none"> 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 rozwiazywania zadan optymalizacji, Wydawnictwo Naukowe PWN ,2017. 5. H. A. Eiselt, H.Carl-Louis Sandblom. Nonlinear Optimization Methods and Applications, Springer, 2019. 	
	Supplementary literature	<ol style="list-style-type: none"> 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	<ul style="list-style-type: none"> • 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		