

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Applications of Artificial Intelligence in Optimization, PG_00064022							
Field of study	Electronics and Telecommunications							
Date of commencement of studies	February 2025		Academic year of realisation of subject		2024/2025			
Education level	second-cycle studies		Subject group		Optional subject group Specialty 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	1		ECTS credits		2.0			
Learning profile	general academic profile		Assessment form		exam			
Conducting unit	Department of Microelectronic Systems -> Faculty of Electronics, Telecommunications and Informatics							
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Anna Pietrenko-Dąbrowska					
	Teachers		dr hab. inż. Anna Pietrenko-Dąbrowska					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0		0.0	30
	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	30		4.0		16.0		50
Subject objectives	Introduction to the application of Artificial Intelligence methods in optimization, with an emphasis on algorithms used for solving design problems.							

Learning outcomes	ng outcomes Course outcome		Method of verification			
	[K7_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, making assessment and critical analysis of the prepared software as well as a synthesis and creative interpretation of information presented with it	The student is capable of applying specific algorithmic approaches to solve design problems, particularly to select, plan, and implement procedures using the discussed optimization algorithms.	[SU1] Assessment of task fulfilment			
	[K7_W04] knows and understands, to an increased extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or other elements or programmable devices specific to the field of study, and organization of work of systems using computers or such devices	The student is familiar with artificial intelligence methods used for engineering optimization and is able to select appropriate algorithms for solving real-world design problems.	[SW1] Assessment of factual knowledge			
	[K7_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	The student is familiar with the concepts of engineering optimization, understands the basic stages of the design process, and recognizes their impact on the final outcome.	[SW1] Assessment of factual knowledge			
Subject contents	1. Introduction to Matlab programming 2. Basic concepts used in optimization 3. Introduction to engineering optimization 4. Gradient-based optimization 5. Derivative-free optimization 6. Solving optimization problems in Matlab programming envirinment 7. Stochastic search methods 8. Evolutionary algorithms 9. Multi-objective optimization 10. Surrogate modeling. Design of experiments 11. Data-driven models 12. Physical models. Model validation 13. Surrogate-based engineering optimization 14. Solving real-world optimization problems					
Prerequisites and co-requisites	Knowledge of mathematics at the ur	idergraduate level				
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade			
	Attendance	80.0%	20.0%			
	Project tasks	50.0%	60.0%			
	Lecture	50.0%	20.0%			
Recommended reading	Basic literature	 J. Nocedal, S.J. Wright, <i>Numerical Optimization</i>, Springer Science, 2006 S. S. Rao, <i>Engineering optimization: Theory and practice</i>, Wiley, 2019. J. Stadnicki, <i>Teoria i praktyka rozwiązywania zadań optymalizacji</i>, PWN, 2017. Matlab documentation 				

	Supplementary literature	 Z. Michalewicz, Genetic algorithms + data structures = evolution programs, 3rd edn, Springer, New York, 1996. T. Back, D.B. Fogel, and Z. Michalewicz (Editors), Evolutionary computation 1: basic algorithms and operators, Taylor & Francis Group, 2000. D.B. Fogel, Evolutionary computation: toward a new philosophy of machine intelligence, IEEE Press, 2006. C.A. Coello Coello, G.B. Lamont, and D.A Van Veldhuizen, Evolutionary algorithms for solving multi-objective problems, 2nd ed, Springer-Verlag, 2007. K.C. Tan, E.F. Khor, and T.H. Lee, Multiobjective evolutionary algorithms and applications, Springer-Verlag, 2005. K. Palmer and KL. Tsui, A minimum bias Latin hypercube design, IIE Transactions, vol. 33, pp. 793-808, 2001.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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