

关。GDAŃSK UNIVERSITY 创 OF TECHNOLOGY

Subject card

Subject name and code	Modern Control Engineering and Robotics, PG_00061798								
Field of study	Automation, Robotics	and Control S	ystems						
Date of commencement of studies	October 2021		Academic year of realisation of subject			2024/2025			
Education level	first-cycle studies		Subject group						
Mode of study	Full-time studies		Mode of delivery			at the university			
Year of study	4		Language of instruction			Polish			
Semester of study	7		ECTS credits			3.0			
Learning profile	general academic profile		Assessment form			assessment			
Conducting unit	Katedra Inteligentnych Systemów Sterowania i Wspomagania Decyzji -> Faculty of E Engineering				of Electrical ar	nd Control			
Name and surname	Subject supervisor		dr hab. inż. Michał Grochowski						
of lecturer (lecturers)	Teachers								
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory Project		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 classes includ plan	n didactic ed in study	Participation in consultation h	articipation in onsultation hours		udy	SUM	
	Number of study hours	30		5.0		40.0		75	
Subject objectives	The aim of the course is to present modern technologies and tools currently operating in the field of automation, control and decision support systems and robotics. The course will also present the latest trends in this field and the prospects for its development, with particular emphasis on intelligent and digital technologies.								
Learning outcomes	Course outcome Subject outcome Method of verification				fication				
Subject contents	 Following the initial delivery of knowledge on a given topic, they will take the form of a focused and Instructor-inspired discussion with Students on the engineering problem undertaken, as well as important, current and forward-looking issues for automation, decision support and robotics professionals. Topics covered in Lectures:- Methods of obtaining the best quality and efficiency of control of complex objects - intelligent control methods, technologies of optimal, predictive, adaptive, hierarchical control; - Application of intelligent data analysis methods in modern decision-making systems - methods of artificial intelligence and machine learning (including deep learning technologies, evolutionary algorithms, computer vision algorithms) - e.g. analysis and exploration of knowledge from big data sets (Big data), object detection and classification, black box modelling;- Use of decision support methods in distributed, hierarchical, discrete systems and multi-criteria issues - multi-agent control, group decisions (e.g. decentralised control of extensive control objects, e.g. IT, energy, water supply networks);- Methods of determining the optimal trajectory of movement and its realisation (control) of dynamic objects in a known or unknown environment - e.g. control of autonomous vehicles, control of process anomalies using methods based on measurement data. 								
Prerequisites and co-requisites									
Assessment methods and criteria	Subject passing	Subject passing criteria Passing threshold		ing threshold		Percentage of the final grade			
	Colloquium	olloquium 50.0% 50.0%							
	Laboratory		60.0%			50.0%			

Recommended reading	Basic literature	 Bonaccorso, G. Algorytmy uczenia maszynowego. Zaawansowane techniki implementacji. Helion, 2019; Szeliga, M. Data Science i uczenie maszynowe. Wydawnictwo Naukowe PWN, 2017. Grus, J. Data science od podstaw. Analiza danych w Pythonie. Helion, 2019. Rawlings J.B., D.Q. Mayne (2009). Model Predictive Control: Theory and Design. Nob-Hill Publishing. Grega W. (2004). Metody i algorytmy sterowania cyfrowego w układach scentralizowanych i rozproszonych. Wydawnictwa AGH, Kraków. Michalewicz Z. (1996). Genetic Algorithms + Data Structures = Evolution Programs. Springer-Verlag, Berlin, third edition. 			
	Supplementary literature	 Bengio, Y., Courville A., Goodfellow I. Deep Learning. Systemy uczące się. Wydawnictwo Naukowe PWN, 2018. Tatjewski T (2002). Sterowanie zaawansowane obiektów przemysłowych. Akademicka Oficyna Wydawnicza EXIT, Warszawa. ROS, Robot Operating System (2024): https://www.ros.org/blog/ getting-started/ Matlab/Simulink ROS Toolbox (2024): https://www.mathworks.com/ products/ros.html Slotine JJ. E., Li W. (1991). Applied Nonlinear Control. Prentice Hall, Englewood Cliffs, New Jersey, US. Maciejowski J. M. (1989). Multivariable Feedback Design. Addison Wesley. Byrski W. (2007). Obserwacja i Sterowanie w Systemach Dynamicznych. Uczelniane Wydawnictwa Naukowo Dydaktyczne Akademii Górniczo Hutniczej w Krakowie. 			
	eResources addresses	Adresy na platformie eNauczanie:			
Example issues/ example questions/ tasks being completed	 Choose measurement and control algorithms for an autonomous vehicle to navigate in an unknown environment - implementation in ROS (Robot Operating System) - Gazebo simulator Analyse the measurement data set for patterns of interest Determine the parameters of the optimal control system for the selected object (INTECO family objects) 				
Work placement	Not applicable				