

Subject card

Subject name and code	Robotic manipulators, PG_00053663								
Field of study	Mechanical Engineering								
Date of commencement of studies	October 2022		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	3		Language of instruction			English			
Semester of study	6		ECTS credits			2.0			
Learning profile	general academic profile		Assessment form			assessment			
Conducting unit	Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology						chnology		
Name and surname	Subject supervisor		dr inż. Wiktor Sieklicki						
of lecturer (lecturers)	Teachers								
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Projec			SUM	
	Number of study hours	0.0	0.0	30.0 0.0			0.0	30	
	E-learning hours included: 0.0								
Learning activity and number of study hours	Learning activity Participation ir classes include plan			Participation in consultation hours		Self-study SUM		SUM	
	Number of study hours 30			0.0		0.0 30		30	
Subject objectives	Provide knowledge about manipulators, their classification, design, control and applications.								
Learning outcomes	Course out	come	Subj		Method of verification				
	K6_U01		Student is able to design simple subsystems of manipulators			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information			
	K6_U07		Student has a knowledge about subsystems utilized in robotics and understands their composition and design.			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment			
	K6_W12		Student is able to program simple control units of robots and understands the design of the programs used in controlling manipulators.			[SW2] Assessment of knowledge contained in presentation			
	K6_W06		chosen manipulators design			[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge			
Subject contents	Introduction to robotics, construction of robots and manipulators. Kinematics of robots and manipulators. Denavit-Hartenberg notation, direct and inverse kinematics. The manipulator's work space. Singularities of the manipulator. Programming the movement paths of an industrial manipulators.								
Prerequisites and co-requisites	basic knowledge in: mathematics, physics, mechanics, strength of the materials, machine design, informatics								
Assessment methods	Subject passing criteria		Passing threshold			Percentage of the final grade			
and criteria written repor			56.0%			100.0%			

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Recommended reading	Basic literature	Craig J., J., Wprowadzenie do robotyki. Mechanika i sterowanie, WNT, Warszawa 1993Jazar Reza, Theory of Applied Robotics, Kinematics, Dynamics and Control, Springer Press, 2010Giralt G., Hirzinger G., Robotic Research, Springer Press, 1996Honczarenko J., Roboty przemysłowe. Budowa i zastosowanie, WNT, Warszawa 2002Bishop R.,The Mechatronics Handbook. CRC Press 2002Siciliano B., Khatib O.: Springer Handbook of Robotics. Berlin: Springer 2008Morecki A., Knapczyk J., Kędzior K., Teoria mechanizmów i manipulatorów, WNT, Warszawa 2002Jarzębowska E.: Mechanika analityczna. Warszawa: Oficyna Wydawnicza Politechniki Warszawskiej 2003K. Kozłowski, P. Dutkiewicz, W. Wróblewskim, Modelowanie i sterowanie robotów. PWN Warszawa, 2003Węgrzyn S.: Podstawy automatyki. PWN Warszawa, 1978,				
	Supplementary literature	Holejko D., Kościelny W.J.: Automatyka procesów ciągłych, Oficyna Wydawnicza Politechniki Warszawskiej, 2012,Żelazny M.: Podstaw automatyki, Państwowe Wydawnictwo Naukowe, 1976,Perycz S.: Podstawy automatyki. Skrypt PG, Gdańsk 1983,Jarzębowska E., Podstawy dynamiki mechanizmów i manipulatorów, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1998Arkin R., Behavior-Bassed Robotics. MIT Press, 1998				
	eResources addresses	Adresy na platformie eNauczanie:				
Example issues/ example questions/ tasks being completed	 Written report on: Design the kinematics of the manipulator using the RobotAnalyzer program and prepare an analysis of the movements and dynamics of the proposed manipulator. Select the Nachi MZ04 manipulator model available in the RobotDK software libraries and develop the movement path of this manipulator for the purpose of implementing a predefined task in the simulation. Prepare an analysis of the kinematics and dynamics of this manipulator while executing the movement path. Write a control program for the Nachi MZ04 manipulator for the implementation of a movement-spatial task using the Nachi MZ04 robot controller and present the results of comparing the operation of the robot in real conditions and in a previously developed simulation. For the ABB IRB360 manipulator available in the RobotDK program libraries and develop a path for the manipulator to perform a predefined task. Prepare an analysis of the kinematics and dynamics of the manipulator while performing the task. Using the RobotStudio program, prepare the manipulator's movement path for the implementation of a predefined task of the ABB IRB360 robot and perform the task in simulation and in reality. 					
Work placement	Not applicable					

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