



## Subject card

Subject name and code	Robotic manipulators, PG_00053663						
Field of study	Mechanical Engineering						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2026/2027		
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 -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Wiktor Sieklicki					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	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 in didactic classes included in study plan	Participation in consultation hours		Self-study		SUM
	Number of study hours	30	0.0		0.0		30
Subject objectives	Provide knowledge about manipulators, their classification, design, control and applications.						
Learning outcomes	Course outcome	Subject outcome			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] possesses basic knowledge necessary to understand the ex-technical conditions of engineering activity, possesses basic knowledge on management, including quality management and running commercial enterprise, within the range of protection of intellectual property and patent law; knows general principles of creating and developing forms of individual entrepreneurship and basic HSE rules applicable to machine industry	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	Student has the knowledge of chosen manipulators design			[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge			
Subject contents	Course content – laboratory 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 and criteria	Subject passing criteria	Passing threshold			Percentage of the final grade		
	written report	56.0%			100.0%		

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. Wróblewski, 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.: Podstawy 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-Based Robotics. MIT Press, 1998
	eResources addresses	
Example issues/ example questions/ tasks being completed	Written report on:	<ol style="list-style-type: none"> <li>1. Design the kinematics of the manipulator using the RobotAnalyzer program and prepare an analysis of the movements and dynamics of the proposed manipulator.</li> <li>2. 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.</li> <li>3. 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.</li> <li>4. 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.</li> <li>5. 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.</li> </ol>
Practical activities within the subject	Not applicable	

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