GDAŃSK UNIVERSITY OF TECHNOLOGY

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		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Wiktor Sieklicki	
	Teachers		

Lesson types and methods of instruction

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	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

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. 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.: 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-Bassed Robotics. MIT Press, 1998
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Written report on: 1. Design the kinematics of the manipulator using the RobotAnalyzer program and prepare an analysis of the movements and dynamics of the proposed manipulator. 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. 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. 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. 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.	
Work placement	Not applicable	