GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of Robotics and Mechatronics, PG_00038092		
Field of study	Automation, Robotics and Control Systems		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study 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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Mechatronics and High Voltage Engineering -> Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Grzegorz Redlarski	
	Teachers	dr inż. Mariusz Dąbkowski prof. dr hab. inż. Grzegorz Redlarski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	15.0	0.0	0.0	45

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	45	4.0	76.0	125

Subject objectives

The aim of the course is introduction into the basic issues concerning stationary industrial robots such as: various divisions of robots, their tasks, construction, safety issues, methods of their study, tasks of control systems, Denavit-Hartenberg notation, and basic information about robot power supplies and mechatronic design.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K04] can react in abnormal and emergency situations, threats to health and life when using automation and robotics components and systems	The student has the knowledge and skills of safe use of automation and robotics elements and systems	[SK2] Assessment of progress of work
[K6_U07] can build and analyze models of systems and systems in the field related to control systems and automation	The student has knowledge and skills in the field of modeling and designing of professional automation and robotics systems	[SU1] Assessment of task fulfilment
[K6_W08] knows the basics of equipment selection and control of electrical machines and servos	The student knows the rules of selecting and configuring basic control systems used in automation and robotics	[SW1] Assessment of factual knowledge

Subject contents	Introduction to robotics: robotics and its scope, basic concepts, sectionsof robotics, systematization, robotics in the twenty-first century, historical development of robotics and the current situation, the scope and problems of robotics research, laws of robotics. Industrial robots as a tool: the interpretation of different forms of human work, technical examples, reasons and stages of development of robots, definitions and classification of industrial robots. Introduction to the theory of machines and mechanisms: 2D mechanisms and manipulators. Construction of industrial robots: the basic units of industrial robots and systems, monolithic robots with serial kinematic structure, modular construction and a serial kinematic structure, robots and manipulators of parallel structures, robots and manipulators of hybrid structures, mobile robots. Drives of industrial robots: hydraulic actuators, pneumatic actuators, electric actuators, mechanisms of motion transfer used in robots. Grippers and heads of industrial robots: general characteristics, design, examples of grippers and tools. Control and programming of robots: manipulator trajectory planning - basic concepts, tasks, control systems, computer numerical control, programming of robots by learning. Some aspects of the introduction of industrial robots to the industry: an overview of the methodology of introduction robots to industry. The characteristics of industrial robots and their study: movement, accuracy and repeatability, durability and resistance to environmental exposure - control tests at the factory. Safety on robotic workstations: a threats in robotic workstations, causes of accidents at work , the general principles of safe integration of robots in system, methods of securing robotic systems. Basic knowledge of sensory robots: converters and limiters of robot coordinates and manipulated objects. Examples of the use of robots in industry: robotic workstation - welding, laser and plasma cutting, handling and palletizing, machining, robotics assembly and painting. Future prospects of development of robots: current, present, and the future of robotics. Introduction to mechatronics: what is mechatronics, example of mechatronic construction, the general concept of mechatronic system, trends in the twenty-first century engineering education, current trends in the teaching of mechatronics. Mechatronic Design: mechatronic approach to the design of parallel robots. The birth and development of the mechatronics: mechatronics as a synthesis of scientific disciplines.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory reports	60.0%	40.0%
Lecture reports	60.0%	60.0%

Recommended reading	Basic literature	1. Craig J.: Wprowadzenie do robotyki. Mechanika i sterowanie. Wydawnictwa Naukowo-Techniczne. Warszawa: 1993. 2. Spong. M. W., Vidyasagar M.: Dynamika i sterowanie robotów. Wydawnictwa Naukowo-Techniczne. Warszawa: 1997. 3. Morecki A, Knapczyk J.: Podstawy robotyki. Warszawa: WNT 1999. 4. Niederliński A.: Roboty przemysłowe. Warszawa: WSiP 1981. 5. Honczarenko J.: Roboty przemysłowe. Budowa i zastosowanie. WNT Warszawa, 2004.
	Supplementary literature	1. Grono A: Podstawy Robotyki - Laboratorium. Skrypt Politechniki Gdańskiej: 2001. 2. Morecki A., Knapczyk. J.: Podstawy robotyki. Teoria i elementy manipulatorów i robotów. Wydawnictwa Naukowo-Techniczne. Warszawa: 1999. 2. Dąbkowski M. Podstawy robotyki - Laboratorium. Skrypt Politechniki Gdańskiej: 2012.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. Architecture and organization in mechatronics systems 2. The problem of simple and inverse kinematics 3. The essence of the state detection and control in mechatronics systems 4. The essence of power systems in robotics and mechatronics systems 5. Management in distributed systems - systems and devices of mechatronics and robotics	
Work placement	Not applicable	

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