GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Automation and Control, PG_00055387		
Field of study	Mechanical Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2023/2024
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	4	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Mechanics and Mechatronics -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Rafał Hein	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	15.0	0.0	0.0	60

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	60	5.0	60.0	125

Subject objectives

Presentation of the fundamental issues related to automatic control systems, robots and manipulators. Knowing the structure and components of a typical control system. Gaining general information about the methods of designing, analysis and study of the properties of typical control systems. Acquisition of knowledge about the construction of typical, industrial robots and manipulators. Learning of methods for modeling, analysis and control of robots.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W06] possesses elementary knowledge on automatics and robotics of mechanical systems	Student knows the structure of a typical automation system and its components	[SW1] Assessment of factual knowledge
[K6_U03] is able to identify, formulate and develop the documentation of a simple design or technological task, including the description of the results of this task in Polish or in a foreign language and to present the results using computer software or other aiding tools	Student is able to build, design and analyze basic automatic control systems with the typical, universal industrial controllers.	[SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

Definition of basic terms. General structure of control system. Classification and examples of control system elements. Analog and digital control systems. Basic information about digital control systems. Boolean algebra. Combinational logic system. Sequential logic system. Design, synthesis and analysis of digital control systems. Basic information about analog control systems. A typical connections of components. Block diagrams and their transformations. Feedback. Description and classification of signals. Standard signals. Method of description control systems, elements and signals. Application of the Laplace transformation. Concept of transfer function. Static and dynamic characteristics of control systems. Time responses. Frequency characteristics. Nyquist and Bode plots. Controllers. Tuning of PID controller. Classification of robots and manipulators. Construction, modeling and analysis of robot motion. Introduction to robot control systems. The sensors used in industrial robots. Fundamentals of programming robots. Application of robots. Laboratory: Design of combinational and sequential logic circuits.Time and frequency characteristics of selected control system components. Modeling and simulation of control systems and robots.

Prerequisites and co-requisites

Mathematics, Physics, Mechanics

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	56.0%	40.0%
	Laboratory (reports from laboratory exercises)	56.0%	30.0%
	Midterm colloquium	56.0%	30.0%
Recommended reading	Basic literature	1. Holejko D., Kościelny W.J.: Automatyka procesów ciągłych, Oficyna Wydawnicza Politechniki Warszawskiej, 2012, 2. Żelazny M.: Podstawy automatyki, Państwowe Wydawnictwo Naukowe, 1976, 3. Perycz S.: Podstawy automatyki. Skrypt PG, Gdańsk 1983, 4. Węgrzyn S.: Podstawy automatyki. PWN Warszawa, 1978, 5. Jarzębowska E.: Podstawy dynamiki mechanizmów i manipulatorów. Oficyna Wydawnicza PW. Warszawa 2002, 6. Morecki A., Knapczyk J., Kędzior K.:Teoria mechanizmów i manipulatorów. WNT. Warszawa 2002, 7. Graig J.J.: Wprowadzenie do robotyki. Mechanika i sterowanie. WNT. Warszawa 1993.	
	Supplementary literature	1. Kaczorek T.: Teoria układów regulacji automatycznej. WNT Warszawa 1974, 2. Morecki A., Knapczyk J.: Podstawy robotyki. Teoria i elementy manipulatorów i robotów. WNT. Warszawa 1993.	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		