GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of Automatic Control and Robotics, PG_00047758		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical 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
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	exam
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Grzegorz Jasiński	
	Teachers	dr inż. Grzegorz Jasiński mgr inż. Magdalena Madej	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	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	The aim is to acquaint students with the methods of analysis the dynamic systems of automatic control. The basics of linear control systems and static analysis of biomedical control systems are presented. Analysis is presented in the time and frequency domain, including the stability analysis. Presented are also fundamental issues of robotics and robots, including assemblies and systems of robots, sensors and actuators. The aim is to provide students with the knowledge and ability to analyse processes. of automatic control.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U08] while identifying and formulating specifications of engineering tasks related to the field of study and solving these tasks, can:n- apply analytical, simulation and experimental methods,n- notice their systemic and non-technical aspects,n- make a preliminary economic assessment of suggested solutions and engineering work n	Knowledge about automation blocks, stability criteria, feedback and robotics components	[SU3] Assessment of ability to use knowledge gained from the subject
[K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study	Knows and understands the basics of automation and robotics	[SW1] Assessment of factual knowledge
[K6_W03] knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	Knowledge and understanding about automation blocks, stability criteria, feedback and robotics components	[SW1] Assessment of factual knowledge

Subject contents

1 Basic concepts of automation, the basic principles of automatic control, classification of control systems 2 Elements of automatic control systems: measuring devices, controllers, actuators. 3 The concept of control systems for biomedical systems. Examples of physiological regulatory systems. 4 Biomedical Modeling dynamic systems. Linear systems. The principle of superposition. 5 Transfer function operationally. Description of the state into space. 6 Basic linear units of automation systems: proportional, inertial, integrator, differentiator, oscillating delay. 7 Computer analysis and simulation of biomedical systems. Matlab. Simulink. 8 Static analysis of biomedical control systems. 9 Static analysis of biomedical control systems. Examples: regulation of cardiac output, blood glucose regulation, regulation of gas exchange. 10 Analysis of linear control system in the time domain. Systems with open and closed loop. 11 The impulse response. Step response. 12 The impulse response. Step response. Example: description of the dynamics of neuromuscular reflex. 13 Frequency analysis of linear control systems. 14 graphical character frequency response (Bode, Nicholas, Nyquist). 15 Frequency response model of the cardiovascular system and glucose-insulin control. 1916 Stability of linear automatic control systems: the concept and criteria for stability. 17 Analysis of the stability of the pupil reflex to light. Study the stability control system disorder breathing Cheyne-Stokes syndrome (night sleep). 18 Some problems of nonlinear automatic control systems. 19 Elements implementing automation and robotics. 20 sensors in automation and robotics. 21 basic units and systems of industrial robots 22 robots and manipulators. Drives robots. Holding devices 23 24 heads technology 24 Control of robots. 26 Construction and ways of learning educational robots. 27 robots programming education. 28 Examples of the use of robots in industry. 29 submarines and robots working in hazardous conditions. 30 Examples of the use of robots in medicine.

Prerequisites and co-requisites

No requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
lecture	50.0%	70.0%
laboratory	50.0%	30.0%

Recommended reading

Basic literature	1. Script materials „Podstawy automatyki i robotyki” 2. Kwiatkowski W.: Wprowadzenie do Automatyki, Warszawa 2005. 3. Craig J.: Wprowadzenie do robotyki. WNT, Warszawa 1995 4. Morecki A. I in.: Podstawy robotyki, WNT, Warszawa 2002 (wyd. II) 5. Olszewski I in.: Podstawy mechatroniki, REA, Warszawa 2006.
Supplementary literature	1. Khoo M.C.K.: Physiological Control Systems, IEEE Press 2000 2. Bishop H.R.: Mechatronic Systems control, Logic and Data Aquisition, CRC Press 2008 3. Bishop H.R.: Mechatronic Systems, Sensors and Actuators, CRC Press 2008
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

Stability study of linear automatic control systems

Measurements of mechanical vibrations. Units of the second order.

Actuators and sensors in robotics

Work placement

Not applicable