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	2022/2023
Education level	second-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	1	Language of instruction	Polish
Semester of study	1	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	assessment
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	mgr inż. Magdalena Madej dr inż. Grzegorz Jasiński	

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
[K7_W02] knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	Knows and understands the basics of automation and robotics. Knows and understands to an advanced degree the construction and principles of components and systems related to the field of study, including theories, methods and complex interrelationships between them and selected specific issues - relevant to the programme of study. Knowledge and understanding of automation blocks, stability criteria, feedback and robotics components.	[SW1] Assessment of factual knowledge
[K7_U08] while identifying and formulating engineering tasks specifications and solving these tasks, can: - apply analytical, simulation and experimental methods, - notice their systemic and non-technical aspects, - make a preliminary economic assessment of suggested solutions and engineering work	Students will be able to operate automation block diagrams, examine the stability of automation systems and examine and correct the properties of automation systems.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools

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
laboratory	50.0%	30.0%
lecture	50.0%	70.0%

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