GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Automation and process control fundamentals, PG_00062740
Field of study	Technologies for Industry 5.0

Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
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	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	

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 introduce the methods of description and analysis of dynamic control systems. The basic components of linear automatic systems are discussed. Issues of analysis in the time and frequency domain, stability analysis are discussed. Basic issues of practical process control are also presented, including basic sensors and actuators.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U05] interprets phenomena occurring around the technological process and processes occurring in the life cycle of devices and systems, makes a critical assessment of the functioning of existing solutions	Knowledge of automation blocks, stability criteria and feedback	[SU3] Assessment of ability to use knowledge gained from the subject
	[K6_W05] demonstrates practical knowledge related to technological processes, utilized devices and systems, has knowledge regarding selected processes monitoring tools	Knows and understands the basics of automation and control	[SW1] Assessment of factual knowledge
	[K6_K03] effectively, clearly and unambiguously conveys information, describes activities and communicates their results and opinions of a specialist engineer using appropriate communication methods and tools	Can identify automation components. Knows how to design basic feedback control systems.	[SK5] Assessment of ability to solve problems that arise in practice

Subject contents	Introduction. Structure of the automatic control system. Classification of automatic control members. Block diagrams, principles and methods of their transformation. Classification of automatic control systems. Open and feedback systems. Properties of systems with feedback. Signals. Standard signals. Mathematical description of signals and automation systems. Application of the Laplace transform. Concept of operator transmittance. Static characteristics of automation systems. Dynamic time characteristics. Determination of step and impulse responses of automation systems. Analysis in the frequency domain. Dynamic frequency characteristics. Preparation of Nyquist and Bode diagrams. Basic components of automata. Classification, description, characteristics and examples of typical members: proportional, first order inertial, second order, differential, integral, delay. Regulators. PID controller - construction, structure, characteristics. Stability of automation systems. Concept of stability. Stability conditions. Algebraic (Hurwitz, Routh) and graphical (Nyquist) criteria for t-stability testing. Stock of stability.

Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory (reports from laboratory exercises)	50.0%	40.0%
	Exam	50.0%	60.0%
Recommended reading	Basic literature	Holejko D., Kościelny W., J.: Automatyka procesów ciągłych, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2012, Mazurek J., Vogt H., Żydanowicz W.: Podstawy Automatyki, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2006, Perycz S.: Podstawy automatyki. Skrypt PG. Gdańsk 1983, Żelazny M.: Podstawy automatyki, PWN, Warszawa 1976, 7. Próchnicki W., Dzida M.: Podstawy automatyki. Zbiór zadań. Wyd. PG. Gdańsk 2004.	
	Supplementary literature	Kaczorek T.: Teoria układów regulacji automatycznej. WNT Warszawa 1974.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Stability testing of linear automatic control systems Measurements of mechanical oscillations. Second order components. Actuators and sensors.		
Work placement	Not applicable		

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