GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Control Systems Design, PG_00048426		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2026/2027
Education level	second-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	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department Of Decision Systems And Robotics -> Faculty Of Electronics Telecommunications And Informatics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Zdzisław Kowalczuk	
	Teachers	prof. dr hab. inż. Zdzisław Kowalczuk	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	15.0	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	8.0	47.0	100

Subject objectives	The aim of the course is to master the knowledge about the design of computer control systems and the use of various types of mathematical models of objects, regulators and auxiliary processes for real real continuous-time process control.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W08] knows and understands, to an increased extent, the fundamental dilemmas of modern civilisation, the main development trends of scientific disciplines relevant to the field of education	Student understands the fundamental dilemmas of modern civilization, development trends of scientific disciplines relevant to the field of education.	[SW1] Assessment of factual knowledge
[K7_W03] knows and understands, to an increased 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	The student understands the principles of operation of automation components and systems, including theories and methods, and selected specific issues - specific to the automation training program	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
[K7_W11] knows and understands, to an increased extent, the general principles of creation and development of forms of individual entrepreneurship and the economic, legal and other conditions of various types of activities related to the awarded qualification, including the principles of protection of industrial property and copyright law	The student understands the fundamental principles of organizing individual entrepreneurship in terms of the main production process, i.e. designing control systems, taking into account the principles of industrial property protection and copyright.	[SW2] Assessment of knowledge contained in presentation
[K7_K01] is ready to create and develop models of proper behaviour in the work and life environment; undertake initiatives; critically evaluate actions of their own, teams and organisations they are part of; lead a group and take responsibility for its actions; responsibly perform professional roles taking into account changing social needs, including: - developing the achievements of the profession, - observing and developing rules of professional ethics and acting to comply to these rules	The student controls the process of creating and developing patterns of proper conduct in the design of control systems, initiative and team leadership, taking into account social needs and the principles of professional ethics.	[SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness

Subject contents

Design of digital control systems; Digital implementation of proper designs; Digital filters; Linear models of dynamic systems; State equations and signal flow graphs; Diagnosis and industrial facilities; Detection and isolation of instrumentation errors; Vehicle diagnostics systems; Example of the use of dynamic graphs in an automotive on-board diagnostic system; The effects of quantization in digital realizations: Typical structure of digital systems; The effects of parameters quantization; Reducing the length of registers; The effects of quantization noise; Discrete approximation of continuous-time systems; Direct method of invariant discretizing transformations; Other methods of direct discretizing transformations: convolution approximation, stochastic matching; Simple discretization methods of indirect transformations; Developed discretization methods of indirect transformations; Discretization in the state space; Methods of analysis of computer implementation of control systems; The effects of quantization in closed systems; Digital PID control algorithms; The structures of digital controllers; Analytical methods for the assessment of rounding errors; Simulation testing of closed-loop DDC digital control systems; Self-tuning control; Discretization and modeling of the control object; Recursive identification of non-stationary processes; Adaptive control - examples; Simulation study of self-tuning control systems; Summary - design guidelines.

Prerequisites and co-requisites

Methods of mathematical modeling. Computer systems for discrete-time control. Digital control.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
project	50.0%	40.0%
exam	50.0%	60.0%

Recommended reading

Basic literature	Z. Kowalczuk: Discrete-time models in control systems design. ZNPG, Gdańsk 1992.
Supplementary literature	B.C. Kuo: Automatic Control Systems. Prentice-Hall, Englewood Cliffs 1987.
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

Work placement

Not applicable

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