GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of Computer Control, PG_00047702		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2022/2023
Education level	first-cycle studies	Subject group	Optional subject group 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	3	Language of instruction	Polish
Semester of study	6	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		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mariusz Domżalski	
	Teachers	dr inż. Mariusz Domżalski dr inż. Marek Tatara	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	0.0	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	4.0	51.0	100

Subject objectives	Mastering the engineering knowledge of computer control of real-time processes.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W01] Knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	Student knows the characteristics of discrete systems	[SW1] Assessment of factual knowledge
[K6_U10] can individually plan their own lifelong education, also by means of advanced information and communication technologies (ICT), and communicate with people from their environment, firmly justify their point of view, participate in debates, present, assess and discuss different opinions and points of view, as well as use specialist terminology related to the field of study in communication	Student uses matrix calculus, vector calculus, differential and integral calculus, uses fast Fourier transform, performs operations on complex numbers	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information
[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	The student knows the descriptions of control systems and their modern concepts	[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	Student has the knowledge of the basic problems of industrial computer control systems.	[SW1] Assessment of factual knowledge
[K6_W04] Knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	Knows methods for testing stability and synthesis of control systems (linear and nonlinear).	[SW1] Assessment of factual knowledge

Subject contents

Basics of processing and digital control: General characteristics of discrete signals and systems; Methods for the analysis of discrete systems; Description methods of discrete and digital systems; Discrete systems: Basic properties of discrete systems; Description of discrete systems using difference equations; Other ways of describing the discrete systems. Z transformation: Introduction: deterministic signals; bilateral transformation; One-sided transformation; Multidimensional Transformation; Modified Z transformation; The inverse Z transform; Applications: transfer function based on differential equations, state equations, and graphs. Stability of discrete systems: Necessary conditions and criteria for stability; Method of the 'w' plane; Frequency methods; Nyquist criterion; Marden-Yury criteria. Spectral analysis of signals: simple and inverse transformations; Sampling theorem ; Discrete Fourier Transform. The theory of discrete linear systems: Reachability and controllability; Reproducibility and observability; The theory of discrete linear systems: Stabilizability and the complete description of systems; Identity transformations. The canonical structure of discrete linear systems: diagonal form, Vandermonde matrix: Determining the transformation matrix; Canonical structure of discrete linear systems: Determining the transformation matrix; Normal forms and their transformation matrices for the regulator, observer, controllable, and observable forms.

Prerequisites and co-requisites

There are no additional requirements

Assessment methods and criteria

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

Recommended reading

Basic literature	T. Kaczorek: "Teoria układów regulacji automatycznej" WNT 1977
Supplementary literature	A.V. Oppenheim, R.W. Schafer: "Discrete-time Signal Processing" Prentice Hall 1975
eResources addresses	

Example issues/ example questions/ tasks being completed	
Work placement	Not applicable