GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Engineering of Dynamic Systems, PG_00047902		
Field of study	Electronics and Telecommunications		
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	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Automatic Control -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Kaczmarek	
	Teachers	dr inż. Artur Gańcza dr inż. Piotr Kaczmarek	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	15.0	0.0	0.0	0.0	30

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	30	2.0	18.0	50

Subject objectives

Introduction to the methods of dynamic systems analysis and synthesis of basic control systems using feedback.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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	The student knows the methods of dynamic systems modeling	[SW1] Assessment of factual knowledge
[K6_W05] Knows and understands, to an advanced extent, methods of supporting processes and functions, specific to the field of study	Student can design feedback systems.	[SW1] Assessment of factual knowledge
[K6_U06] can analyse the operation of components, circuits and systems related to the field of study, measure their parameters and examine technical specifications	Student can model electronic and mechanical systems	[SU1] Assessment of task fulfilment
[K6_U07] can apply methods of process and function support, specific to the field of study	The student is able to use computer software for analysis and synthesis of control systems	[SU1] Assessment of task fulfilment
[K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	The student is able to use computer software for designing automation systems	[SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>1. Introduction to automatic control. Feedback systems. Basic components of closed-loop control systems.
2. Mathematical modelling of continuous-time dynamic systems. Linearisation of non-linear models of physical systems.
3. Linear models: transfer functions and state-space representations.
4. Stability of linear feedback control systems. Algebraic criteria of stability (Hurwitz and Routh-Hurwitz criterion).
5. Transient-response and steady-state error analysis for control systems. First order and second order models.
6. Control system design specifications in time domain.
7. Fundamental limitations in control system design. Effects of feedback on control systems.
8. Introduction to control system design. Model matching method for prototype transfer functions of closed-loop systems.
9. Root-locus analysis of control systems.
10. Preliminary design proportional regulation, lead, lag and lead-lag compensation.
11. Frequency-response analysis of control systems. Nyquist stability criterion. Frequency-domain properties of feedback control systems.
12. Frequency-domain methods for control system design. Principles of open-loop compensation.
13. Preliminary design – proportional regulation, lead, lag and lead-lag compensation.
14. Tuning rules for PID controllers.
15. Computer aided control system design</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Advanced mathematics and physics</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Calculation test</td><td>55.0%</td><td>60.0%</td></tr>
<tr><td>Theory test</td><td>55.0%</td><td>40.0%</td></tr>
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<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>J. Nowakowski "Podstawy Automatyki" tom 1, Skrypt PG</td></tr>
<tr><td>Supplementary literature</td><td>F. Golnaraghi, B. C. Kuo "Automatic Control Systems" Willey 2010</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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