GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00071493		
Field of study	Automation, Robotics and Control Systems		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
Education level	first-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	4	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Intelligent and Decision Support Systems -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Rafał Łangowski	
	Teachers	dr inż. Rafał Łangowski dr hab. inż. Robert Piotrowski	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	15.0	0.0	0.0	0.0	25

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	25	0.0	0.0	25

Subject objectives

The aim of this course is to complete a task that involves developing a mathematical model of a controlled object, analysing its properties, and then creating a classical control system for that object.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U07] can build and analyze models of systems and systems in the field related to control systems and automation	The student knows the principles of modelling and analysing control systems, as well as the principles of selected controllers and actuators.	[SU1] Assessment of task fulfilment
[K6_W08] knows the basics of equipment selection and control of electrical machines and servos	The student analyses the stability of control systems using algebraic (Routh–Hurwitz) and graphical (Nyquist) methods, and interprets the results of these analyses. The student selects the structure of a classical control system and determines the PID controller settings, taking into account stability requirements, steady-state control quality and transient response quality.	[SW1] Assessment of factual knowledge
[K6_U02] can work individually and in a team, can communicate using various techniques in a professional environment, as well as document and analyze the results of their work, can estimate the time needed to perform the entrusted task can prepare and present a presentation on the problems and results of an engineering task	The student works effectively both independently and as part of a team on a project task, communicating using a variety of techniques, planning the stages of the work and estimating the time required to complete the assigned tasks.	[SU2] Assessment of ability to analyse information

<table>
<tr><td>Subject contents</td><td>Course content – lecture

Course include:
mathematical modelling of dynamic systems;
analysis of system responses in the time and frequency domains;
stability analysis (stability assessment methods, including algebraic criteria such as Routh and Hurwitz, and graphical criteria such as Nyquist);
control system synthesis preparation for synthesis and selection of the control system structure;
control system synthesis tuning of controllers (control systems with PIDtype controllers): stability requirements and steadystate quality (using different tuning methods);
control system synthesis tuning of controllers (control systems with PIDtype controllers): transient response quality (using different tuning methods).

Course content – exercises

Course include:
stability analysis (methods for assessing stability, including algebraic criteria such as Routh and Hurwitz, and graphical criteria such as Nyquist);
control system synthesis preparation for synthesis and selection of the control system structure;
control system synthesis tuning of controllers (control systems with PID-family controllers): stability requirements and steadystate performance (using different tuning methods);
control system synthesis tuning of controllers (control systems with PID-family controllers): transientstate performance (using different tuning methods);
project summary.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></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>project</td><td>60.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>1. Dorf C.D., Bishop R. H.: Modern control systems. Eleventh Edition. Pearson Prentice Hall, Upper Saddle River, NI 07458, 2008.
2. Kaczorek T. Teoria układów regulacji automatycznej, Wydawnictwa Naukowo-Techniczne, Warszawa, 1974.
3. Kabziński J. Teoria sterowania Projektowanie układów regulacji, Wydawnictwo Naukowe PWN, Warszawa, 2021.
4. Ogata K.: Modern Control Engineering. Fifth Edition, Pearson Prentice Hall, Upper Saddle River, NI 07458, 2010.
5. Nise N.S. Control System Engineering. 3th edition. John Wiley & Sons, 2000.
6. Ljung L., Glad T.: Modelling of Dynamic Systems, Prentice Hall, 1994</td></tr><tr><td>Supplementary literature</td><td>1. Ogata K. Designing Linear Control Systems with MATLAB. Prentice Hall, 2002.
2. Franklin G.E., Powell J.D., Emami-Naeini E. Feedback Control of Dynamic Systems. Addison Wesley Publishing Company, 1994.
3. Dutton K., Thompson S., Barraclough B. The Art of Control Engineering. Pearson, Prentice Hall, 1997</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>System stability: the Hurwitz, Routh and Nyquist criteria;
Selection of control parameters for PID controllers</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
</table>

Document generated electronically. Does not require a seal or signature.