GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Control systems design, PG_00057033		
Field of study	Mechatronics		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Zakład Mechatroniki -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Rafał Hein	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	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	8.0	37.0	75

Subject objectives

The main aim of the course is to provide students the knowledge necessary to design continuous time control systems. During the course students learn the methods of selecting and designing controllers based on the time, frequency and integral performance indices. They get the skills of designing and application a such compensators as lead, lag and lead-lag to correcting dynamic properties of control systems. Course participants will get also general knowledge about root locus technique and its applications to control system design.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W05] has detailed, supported by the theory knowledge in terms of control theory, identification methods, concurrent and real time programing, signal and image processing and Artificial Intelligence	Student has knowledge about the modeling and designing of one dimensional, feedback control systems with single input and single output (SISO) as well as multidimensional feedback control systems with multiple inputs and multiple outputs (MIMO).	[SW1] Assessment of factual knowledge
[K7_U05] is able to formulate and test hypothesis concerning problems of nonstationary systems and processes and simple research problems	Student can apply the acquired theoretical knowledge to formulate and solve practical problems of controlling real mechatronic systems.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K7_U07] has essential background for work in industrial environment and knows safety rules of such work	He can operate and build basic control systems used in industrial practice, in compliance with safety rules.	[SU3] Assessment of ability to use knowledge gained from the subject
[K7_U04] is able to utilise known methods and mathematical models, as well as computer simulations for analysis and evaluation of non-stationary continuous and discrete mechatronic systems and processes	Uses the known methods for modeling the control processes of mechatronic systems. Can use computer programs for analysis, modeling and simulation of control systems.	[SU4] Assessment of ability to use methods and tools

Subject contents	Designing of continuous controllers based on the time, frequency and integral performance indices. Designing of state feedback optimal controller. Designing of lead, lag and lead-lag compensators. Designing of typical controllers by using the root locus technique.	
Prerequisites and co-requisites	Mathematics at the academic level, Fundamentals of control engineering	
Assessment methods and criteria		

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory	50.0%	60.0%
Lecture	50.0%	40.0%

Recommended reading	Basic literature	1. Nagrath I.J, Gopal M.: Control Systems Engineering, Anshan LTD 2008, 2. Dukkipati R.V. : Analysis and design of control systems using Matlab, New Age Science, 2nd edition 200, 3. Kaczorek T.: Teoria układów regulacji automatycznej, WNT, Warszawa 1977, 4. Kaczorek T.: Teoria sterowania, Tom 1, Układy liniowe, ciągłe i dyskretne, PWN, Warszawa 1977, 5. Kaczorek T.: Teoria sterowania, Tom 2, Układy nieliniowe, procesy stochastyczne oraz optymalizacja statyczna i dynamiczna, PWN Warszawa 1981, 6. Orlikowski C., Wittbrodt E.: Podstawy automatyki i sterowania. Laboratorium Tom 1, Gdańsk 1999, 7. Amborski K., Marusak A.: Teoria sterowania w ćwiczeniach, PWN, Warszawa 1978. 8. Mazurek J., Vogt H., Żydanowicz W.: Podstawy automatyki, OWPW, Warszawa 2006, 9. Holejko D., Kościelny W.,J.: Automatyka procesów ciągłych, OWPW, Warszawa2012 10. Próchnicki W., Dzida M.: Podstawy automatyki. Zbiór zadań, WPG, Gdańsk 2004
	Supplementary literature	1. Douglas B.: The fundamentals of control theory
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	