



## Subject card

Subject name and code	Engineering of Dynamic Systems, PG_00047902						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2021		Academic year of realisation of subject		2022/2023		
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		mgr 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_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		
	[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_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_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_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		

Subject contents	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		
Prerequisites and co-requisites	Advanced mathematics and physics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Theory test	55.0%	40.0%
	Calculation test	55.0%	60.0%
Recommended reading	Basic literature	J. Nowakowski "Podstawy Automatyki" tom 1, Skrypt PG	
	Supplementary literature	F. Golnaraghi, B. C. Kuo "Automatic Control Systems" Willey 2010	
	eResources addresses	Adresy na platformie eNauczanie: 2022/2023_ZIMA Inżynieria Systemów Dynamicznych - Moodle ID: 26192 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=26192">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=26192</a>	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		