



## Subject card

Subject name and code	Control System Structures, PG_00038290						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Part-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Controlled Electric Drives -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Elżbieta Bogalecka					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	10.0	0.0	10.0	0.0	0.0	20
	E-learning hours included: 0.0						
	Adresy na platformie eNauczanie:						
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	20	9.0		71.0	100	
Subject objectives	goal is to be able to choose the structure of the control system depending of the requirements for control quality, design and study of the control system properties						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K7_U07	The student can determine the requirements for the quality of control for a given object and control purpose. The student can propose a control structure that will meet the requirements			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information		
	K7_W14	Student is able to build a model of a given control object in the form of transmittance or a system of differential equations and build a simulation model and implement the structure of a complex control system, taking into account constraints and parametric uncertainty			[SW3] Assessment of knowledge contained in written work and projects		
	K7_K06	Based on the theoretical knowledge and simulation studies acquired, the student is able to assess the quality of the control system and evaluate the implementation possibilities on the physical object.			[SK5] Assessment of ability to solve problems that arise in practice		
Subject contents	Classification of control systems. Formulating control problem. Modeling of control systems including actuator, sensors and restrictions. Structures of control systems: multiloop, open vs. closed control, with feedback from the output and from the state variables, with reference model, with disturbance compensation, sliding control. Robust control, design rules, parametric sensitivity. Principles for design of complex control structures. Selected unconventional controllers. Digital implementation of control algorithm. Control systems of selected objects: with important delay and weak damped.						
Prerequisites and co-requisites	Basic knowledge of control theory, metrology, microprocessor technology, mathematics						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory reports	60.0%	50.0%
	Exam	50.0%	50.0%
Recommended reading	Basic literature	1. Kaczorek T., Dzieliński, Dąbrowski, Łopatka: Podstawy teorii sterowania, PWN 2009. 2. Tatjewski P.: Sterowanie zaawansowane obiektów przemysłowych. Struktury i Algorytmy. Warszawa. 3. Bubnicki: Teoria i algorytmy sterowania, PWN, 2005.	
	Supplementary literature	1. Bogdan Wilamowski; J. David Irwin: Control and mechatronics, CRC Press, Taylor&Francis Group, 2011. 2. Bogdan M. Wilamowski; J. David Irwin: Intelligent systems, CRC Press, Taylor&Francis Group, 2011.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. Explain the control system structure based on MRAS method,  2 . Applications of the sliding control method.  3. How is the open loop control system based on "input shaping" designed		
Work placement	Not applicable		