



Subject card

Subject name and code	, PG_00053442						
Field of study	Electrical Engineering						
Date of commencement of studies	October 2021		Academic year of realisation of subject		2024/2025		
Education level	first-cycle studies		Subject group				
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	4		Language of instruction		Polish		
Semester of study	7		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jarosław Łuszcz				
	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		5.0		65.0	100
Subject objectives	Understanding the basic physical phenomena related to the disturbances in the control and automation systems.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_K05		is able to react in emergency situations of disturbances of control systems		[SK5] Assessment of ability to solve problems that arise in practice		
	K6_K01		is aware of the need for continuous training and self-improvement in the profession of an electrician		[SK5] Assessment of ability to solve problems that arise in practice		
	K6_U09		is able to select electrical equipment taking into account the occurrence of disturbances		[SU5] Assessment of ability to present the results of task		
	K6_U10		is able to design simple networks and electrical installations taking into account the occurrence of disturbances		[SU5] Assessment of ability to present the results of task		
	K6_W10						
Subject contents	Sources and propagation of conducted and radiated disturbances. Electromagnetic emission and immunity of automation systems. Inductive and capacitive parasitic couplings. Characteristics of power and signal circuits in the field of EMC. Interference protection in analog, digital and mixed circuits. Typical causes of disturbances in control and automation systems. Interference reduction methods (filtration, decoupling, shielding). The role of grounding, shielding and equipotentialization in reducing interference. Crosstalk in signal transmission paths. Attenuation of interference in analog signal transmission paths (0-10V, 4-20mA). Attenuation of interference in digital signal transmission paths (RS232, RS485, Ethernet)						
Prerequisites and co-requisites							
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	Task report		50.0%		50.0%		
	Lecture reports		50.0%		50.0%		
Recommended reading	Basic literature		Spiralski L., Kołodziejski J., Konczakowska A., Hasse L. Zakłócenia w aparaturze elektronicznej. Charoy A.: Electromagnetic compatibility. Interference in electronic devices. Volume 1-4. Bogtín E.: Signal and Power Integrity - Simplified.				

	Supplementary literature	Ott H. W. Metody redukcji zakłóceń i szumów w układach elektronicznych. Howard W. Johnson, Martin Graham: High-speed Signal Propagation: Advanced Black Magic.ic.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Analysis of digital signal transmission interference in serial interfaces. Analysis of the transmission interference of 20 mA analog signals.	
Work placement	Not applicable	