



## Subject card

Subject name and code	Electronagnetic Interference in Automation Systems, PG_00036794						
Field of study	Electrical Engineering						
Date of commencement of studies	February 2024		Academic year of realisation of subject		2024/2025		
Education level	second-cycle studies		Subject group				
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		2.0		
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		15.0	50
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		
	K7_W01		has an extended and deepened knowledge of electrical engineering		[SW1] Assessment of factual knowledge		
	K7_W02		has knowledge of electrical measurements,		[SW1] Assessment of factual knowledge		
	K7_U03		can obtain information from literature, databases and other sources,		[SU3] Assessment of ability to use knowledge gained from the subject		
	K7_U02		is able to prepare and present a short oral presentation on a selected technical topic		[SU5] Assessment of ability to present the results of task		
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		
	Lecture reports		50.0%		50.0%		
	Task report		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. Bogtin 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.				
	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