



Subject card

Subject name and code	Electromagnetic Interference in Automation Systems, PG_00036794						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group					
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 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_W11	Getting to know computer tools for designing automation systems.			[SW1] Assessment of factual knowledge		
	K7_U04	Ability to obtain information from literature			[SU2] Assessment of ability to analyse information		
	K7_U03	Ability to prepare and present presentation concerning problems and results of the task implementation engineering			[SU5] Assessment of ability to present the results of task		
	K7_W06	Knowledge of the sources of knowledge specialized expanding scope of program content.			[SW1] Assessment of factual knowledge		
	K7_U07	Ability to use analytical and simulation methods to solve engineering tasks.			[SU3] Assessment of ability to use knowledge gained from the subject		
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., Kołodziejki 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 eNauzanie:
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	