



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 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	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	The aim of the course is to provide knowledge about causes of electromagnetic interference in automation systems and methods for its mitigation.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K7_U07	uses analytical and simulation methods to solve engineering tasks.			[SU3] Assessment of ability to use knowledge gained from the subject		
	K7_W06	acquires knowledge from available sources in the field of electromagnetic interference			[SW1] Assessment of factual knowledge		
	K7_U03	prepares a presentation on a selected topic related to disturbances in automation systems			[SU5] Assessment of ability to present the results of task		
	K7_U04	acquires knowledge from available sources in the field of electromagnetic interference			[SU2] Assessment of ability to analyse information		
	K7_W11	uses computer tools to design automation systems.			[SW1] Assessment of factual knowledge		
Subject contents	<p>LECTURE</p> <p>Sources and propagation of conducted and radiated electromagnetic disturbances. Electromagnetic emission and immunity of electrical devices. Typical causes of interference in control and automation systems. Selected methods of reducing electromagnetic interference in automation systems. Analysis of typical problems related to interference with electrical devices.</p> <p>LABORATORY</p> <p>Measurements of conducted and radiated electromagnetic interference levels. Testing the immunity of devices to electromagnetic interference. Presentation of the effectiveness of selected interference reduction methods. Presentation of examples of interference in analog and digital systems. Presentation of examples of mutual interference between electronic devices.</p>						

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	<p>Charoy, Alain i in. Kompatybilność elektromagnetyczna: Zakłócenia w urządzeniach elektronicznych. Tom 1, 2, 3 i 4. Warszawa: Wydawnictwa Naukowo-Techniczne, 1999.</p> <p>Kempski, Adam Józef, Elektromagnetyczne zaburzenia przewodzone w układach napędów przekształtnikowych. Zielona Góra: Oficyna Wydawnicza Uniwersytetu Zielonogórskiego, 2005.</p> <p>L. Hasse, J. Kołodziejewski, Z. Karkowski, A. Konczakowska, L. Spiralski: Zakłócenia w aparaturze elektronicznej. Warszawa: "Radioelektronik", 1995.</p> <p>Łuszcz, Jarosław. High Frequency Conducted Emission in AC Motor Drives Fed By Frequency Converters: Sources and Propagation Paths. John Wiley and Sons, Inc., Hoboken, N.J.: 2018.</p>	
	Supplementary literature	<p>Smolenski, Robert. Conducted Electromagnetic Interference (EMI) in Smart Grids. 1st ed. 2012. London: Springer, 2012.</p> <p>Sroka, Jan, Compendium on Electromagnetic Compatibility. First edition. Warszawa, Oficyna Wydawnicza Politechniki Warszawskiej, 2021.</p> <p>Łuszcz, Jarosław, Motor Cable Influence on the Conducted EMI Emission of the Converter Fed AC Motor Drive. p. 77-95. (Book chapter 4) - Queensland University of Technology, Bentham Science Publisher, Australia 2011.</p> <p>Ott, Henry W. Electromagnetic Compatibility Engineering. Rev. ed. Hoboken, N.J.: John Wiley & Sons, 2009.</p> <p>Zare Firuz Ed., Electromagnetic Interference Issues in Power Electronics and Power Systems. Editor. 1st ed. Sharjah, United Arab Emirates: Bentham Science Publishers, 2011.</p> <p>Sevgi, Levent. A Practical Guide to EMC Engineering / Levent Sevgi. Boston: Artech House, 2017.</p> <p>Keller, Reto B. Design for Electromagnetic Compatibility--In a Nutshell: Theory and Practice / by Reto B. Keller. 1st ed. 2023. Cham: Springer Nature, 2023.</p>	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<p>Analysis of digital signal transmission interference in serial interfaces.</p> <p>Analysis of the transmission interference of 20 mA analog signals.</p>		
Work placement	Not applicable		

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