



Subject card

Subject name and code	, PG_00053425						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2026/2027		
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			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jarosław Łuszcz				
	Teachers						
Lesson types	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		40.0	75
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_W10] has basic knowledge related to mechatronics and robotics systems		defines basic engineering issues related to mechatronics and robotics systems		[SW1] Assessment of factual knowledge		
	[K6_W06] knows the structure of computers and microprocessors and the tasks of operating systems, has basic knowledge of the basics of computer software, drivers, microprocessor technology, design of simple algorithms and the operation of information networks		performs simple engineering tasks in the field of microprocessor technology and IT networks		[SW3] Assessment of knowledge contained in written work and projects		
	[K6_U03] can prepare and present a presentation on the problems and results of an engineering task		prepares presentations of results engineering research		[SU5] Assessment of ability to present the results of task		
	[K6_U01] can obtain information from literature, databases and other sources; integrate the information obtained, interpret it and draw conclusions, formulate and justify opinions		obtains information from literature sources and knowledge bases		[SU2] Assessment of ability to analyse information		
Subject contents	<p>Course content – lecture</p> <p>Lecture: 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)</p> <p>Laboratory: Testing conducted and radiated emissions of electrical devices. Testing the effectiveness of anti-interference filtration. Shielding effectiveness test.</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>Spiralski L., Kołodziejcki J., Konczakowska A., Hasse L. Zakłócenia w aparaturze elektronicznej. Warszawa: Radioelektronik 1995.</p> <p>Charoy A.: Kompatybilność elektromagnetyczna : zakłócenia w urządzeniach elektronicznych. T. 1, Źródła, sprzężenia, skutki : zasady i porady instalacyjne. Warszawa: WNT 1999.</p> <p>Charoy A.: Kompatybilność elektromagnetyczna: zakłócenia w urządzeniach elektronicznych. T. 2, Uziemienia, masy, przewodowanie: zasady i porady instalacyjne. Warszawa: WNT 2000.</p> <p>Charoy A.: Kompatybilność elektromagnetyczna: zakłócenia w urządzeniach elektronicznych. T. 3, Ekrany, filtry, kable i przewody ekranowane: zasady i porady instalacyjne. Warszawa: WNT 2000.</p> <p>Charoy A.: Kompatybilność elektromagnetyczna: zakłócenia w urządzeniach elektronicznych. T. 4, Zasilanie, ochrona odgromowa, środki zaradcze: zasady i porady instalacyjne. Warszawa: WNT 2000.</p> <p>Bogatin E.: Signal and Power Integrity - Simplified. Prentice Hall 2018.</p>	
	Supplementary literature	<p>Ott H. W. Metody redukcji zakłóceń i szumów w układach elektronicznych. Warszawa: WNT 1979.</p> <p>Howard W. Johnson, Martin Graham: High-speed Signal Propagation: Advanced Black Magic. Pearson 2003.</p>	
	eResources addresses		
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>		
Practical activities within the subject	Not applicable		

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