GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00053424		
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_U03] can prepare and present a presentation on the problems and results of an engineering task	prepare presentations of engineering research results	[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	acquires information from literature sources and knowledge bases	[SU2] Assessment of ability to analyse information
[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	complete simple engineering tasks in the field of microprocessor technology and IT networks	[SW3] Assessment of knowledge contained in written work and projects

Subject contents

Course content – lecture
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)

Labaratory:
Testing conducted and radiated emissions of electrical devices.
Testing the effectiveness of anti-interference filtration.
Shielding effectiveness test.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3"></td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Lecture reports</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Task report</td><td>50.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">Spiralski L., Kołodziejski J., Konczakowska A., Hasse L. Zakłócenia w aparaturze elektronicznej. Warszawa: Radioelektronik 1995.
Charoy A.: Kompatybilność elektromagnetyczna : zakłócenia w urządzeniach elektronicznych. T. 1, Źródła, sprzężenia, skutki : zasady i porady instalacyjne. Warszawa: WNT 1999.
Charoy A.: Kompatybilność elektromagnetyczna: zakłócenia w urządzeniach elektronicznycha T. 2, Uziemienia, masy, oprzewodowanie: zasady i porady instalacyjne. Warszawa: WNT 2000.
Charoy A.: Kompatybilność elektromagnetyczna: zakłócenia w urządzeniach elektronicznych. T. 3, Ekrany, filtry, kable i przewody ekranowane: zasady i porady instalacyjne. Warszawa: WNT 2000.
Charoy A.: Kompatybilność elektromagnetyczna: zakłócenia w urządzeniach elektronicznych. T. 4, Zasilanie, ochrona odgromowa, środki zaradcze: zasady i porady instalacyjne. Warszawa: WNT 2000.
Bogatin E.: Signal and Power Integrity - Simplified. Prentice Hall 2018.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">Ott H. W. Metody redukcji zakłóceń i szumów w układach elektronicznych. Warszawa: WNT 1979.
Howard W. Johnson, Martin Graham: High-speed Signal Propagation: Advanced Black Magic. Pearson 2003.</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Analysis of digital signal transmission interference in serial interfaces.
Analysis of the transmission interference of 20 mA analog signals.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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