GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	The EMC measurement methods, PG_00044108		
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	English
Semester of study	3	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	partment of Metrology and Information Systems -> Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Beata Pałczyńska	
	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 student acquires knowledge about EMC measurement methods and tools

Learning outcomes

Course outcome	Subject outcome	Method of verification
K7_U07	defines the basic types of EMC testing. Explains the measurement methods on basic at present obligatory norms and standards.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
K7_W06	configures the measurement system to carry out EMC research in the field of emission and immunity tests.	[SW3] Assessment of knowledge contained in written work and projects
K7_U04	interprets the issues presented in the EMC standards.	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
K7_W11	carries out measurement procedures in the field of emission and immunity testing using software supporting their operation.	[SW3] Assessment of knowledge contained in written work and projects
K7_U03	selects tools and methodology to counteract electromagnetic disturbances.	[SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information

Subject contents

Lectures: The overview of EMC standards. Types of EMC testing. The measurement environment: an OATS, an anechoic chamber, a TEM cell, a GTEM cell.The instrumentation for emission testing: EMI receivers, spectrum analyses, preselectors and filters, digital storage oscilloscopes. The instrumentation for immunity testing: signal sources, RF power amplifiers, signal modulators. Measurement devices for conducted EMI; measurements by direct connection; inductively coupled devices. Standard conducted emission measurement. Standard conducted immunity testing.Antennas for EMC measurement. Standard radiated emission measurement. Standard radiated immunity testing. The EMC measurement uncertainty.

Laboratory: EMC measurement methodology for small electrical and electronic equipment. Standard method for measuring conducted and radiated emissions. Standard tests for immunity to conducted and radiated interference. Alternative EMC measurement method using the GTEM chamber, test and measurement technique.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Basic knowledge on physics, mathematics, metrology and electronics. Knowledge on electrical metrology. Ability to use the standards and norms.</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 - Final test</td><td>60.0%</td><td>20.0%</td></tr>
<tr><td>Laboratory - completed exercises</td><td>100.0%</td><td>80.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. Clayton R. Paul, Introduction to Electromagnetic Compatibility, 2nd Edition, Wiley, 2009
2. Charoy, A. Electromagnetic Compatibility of Power Converters. (2016): n. pag. Web.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. Henry W. Ott, Electromagnetic Compatibility Engineering, Wiley, 2009.

2. Hasse L., Kołodziejski J., Konczakowska A., Spiralski L., Zakłócenia w aparaturze elektronicznej, Radioelektronika Sp.z o.o., Warszawa,</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">1. The requirements of standard measuring of a conduced emission.
2. The requirements of standard measuring of a radiated emission.
3. The measurement requirements of conduced immunity testing.
4. The measurement requirements of radiated immunity testing.
5. The identification of uncertainty sources in EMC measurement.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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