



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	<p>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.</p> <p>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.</p>						

Prerequisites and co-requisites	Basic knowledge on physics, mathematics, metrology and electronics. Knowledge on electrical metrology. Ability to use the standards and norms.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture - Final test	60.0%	20.0%
	Laboratory - completed exercises	100.0%	80.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Clayton R. Paul, Introduction to Electromagnetic Compatibility, 2nd Edition, Wiley, 2009 2. Charoy, A. Electromagnetic Compatibility of Power Converters. (2016): n. pag. Web. 	
	Supplementary literature	<ol style="list-style-type: none"> 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, 	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. The requirements of standard measuring of a conducted emission. 2. The requirements of standard measuring of a radiated emission. 3. The measurement requirements of conducted immunity testing. 4. The measurement requirements of radiated immunity testing. 5. The identification of uncertainty sources in EMC measurement. 		
Work placement	Not applicable		

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