

Subject name and code	The EMC measurement methods						
Field of study	Electrical Engineering						
Level of studies	postgraduate studies	Type of subject	elective				
Mode of study	Full-time studies	Mode of delivery	at the university				
Year of study	1	Language of instruction	English				
Semester of study	2	ECTS credits					
Learning profile	general academic profile	Assessment form	assessment				
Conducting unit	Department 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 type and method of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15	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	15		2.0	15.0	32	
Subject objectives	Introduce students with the methods and tools for EMC measurements						
Learning outcomes	Course outcome	Subject outcome			Method of verification		

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. The methodology of EMC measurements for small electrical and electronic equipment. The alternative EMC measurement method using the GTEM cell – testing and measurement techniques.</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
	Final test	60.0%	50.0%
	Project		
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Clayton R. Paul, Introduction to Electromagnetic Compatibility, Wiley, 2005 2. Więckowski T. W., Badania kompatybilności elektromagnetycznej urządzeń elektrycznych i elektronicznych. Wydawnictwo Politechniki Wrocławskiej. Wrocław 2013 3. Charoy A.: Kompatybilność elektromagnetyczna. Zakłócenia w urządzeniach elektronicznych. t.1-4. WNT, 1999. 	
	Supplementary literature	<ol style="list-style-type: none"> 1. Hasse L., Kołodziejki J., Konczakowska A., Spiralski L., Zakłócenia w aparaturze elektronicznej, Radioelektronika Sp.z o.o., Warszawa, 	
	eResources addresses		
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		