



Subject card

Subject name and code	EMC of Integrated Devices, PG_00048670						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Microwave and Antenna Engineering -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Włodzimierz Zieniutycz					
	Teachers	prof. dr hab. inż. Włodzimierz Zieniutycz					
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		2.0		18.0	50
Subject objectives	Presentation of phenomena related to electromagnetic compatibility: coupling, crosstalk, electrostatic discharge, their description, methods of measurement and influence on design of high frequency network.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U06] can analyse the operation of components, circuits and systems related to the field of study; measure their parameters; examine technical specifications; interpret obtained results and draw conclusions	student has mastered measurements of RF & Microwave digital signals using digital oscilloscope and spectrum analyzer; measurement of crosstalk in transmission lines using digital oscilloscope and network analyser; em field spectrum of near field of lines using the near field probes and spectrum analyser and became acquainted with methods allowing to reduce unwanted radiation.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	[K7_W03] Knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum.	student has mastered knowledge of parasitic radiation phenomena in RF & Microwave integrated circuits and systems as well as the methods of their measurements and prevention.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
	[K7_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	student has mastered the planning and methods of RF & Microwave digital signals measurements as well as measurements of crosstalks in waveguiding structures and near field of lines.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	[K7_W02] Knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	student has mastered the knowledge concerning radiated and conducted emissions, radiated and conducted susceptibilities, the sources of interferences, coupling, shielding methods and transmission of pulse in line including the effects of mismatching.	[SW1] Assessment of factual knowledge
[K7_U02] can perform tasks related to the field of study as well as formulate and solve problems applying recent knowledge of physics and other areas of science	Student has skills in determining the sources of interferences and in formulating the proposals of the prevention.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools	
Subject contents	Aspects and requirements for electromagnetic compatibility, conducted and radiated emissions and susceptibility, source of noise and interference, common and differential signals, method their separation and suppression, coupling in the wave structures and radiation sources, electric, magnetic and electromagnetic shielding effectiveness of the electronic components and cables, transmission lines and signal integrity, digital transmission in the coupled lines, matching effects influence the digital transmission, crosstalk, system design for PCB, chamber for EMC measurements		
Prerequisites and co-requisites	Basic on electrodymanics, theory of waveguiding structures, basic of RF & Microwaves		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	laboratory	50.0%	30.0%
	written test	50.0%	70.0%
Recommended reading	Basic literature	Clayton R.Paul Electromagnetic Compability, Willey 2006	
	Supplementary literature	powerpoint presentation of the lecture	

	eResources addresses	Adresy na platformie eNauczenie: Kompatybilność EM urządzeń zintegrowanych 23/24 - Moodle ID: 36739 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36739
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Fundamental EMC phenomena which are subject to norms. 2. Describe the mechanism of EDS for example of the computer hardware operator. 3. How to measure common mode? 4. Describe the rules of the connection of coaxial cable to chassis. 5. Fundamental problems of magnetic field shielding for low frequencies 	
Work placement	Not applicable	