



## Subject card

Subject name and code	Emission and immunity to electromagnetic radiation in biomedical equipment, PG_00053347						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
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			assessment		
Conducting unit	Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Stanisław Galla					
	Teachers	mgr inż. Kamil Osiński dr inż. Stanisław Galla					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	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	3.0		17.0	50	
Subject objectives	The student identifies the sources of electromagnetic disturbances and is able to describe them using the known mathematical apparatus. It defines the ways of penetration of disturbances into given systems. He makes a choice anti-interference elements and is able to simulate their application, preparing the required technical documentation and measures the basic characteristics of the tested person devices in the field of electromagnetic compatibility.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	The student is able to indicate the sources disturbances in systems indicate their ways of penetration. In depending on the occurrences of disorders selects elements anti-interference. Can complete the documentation technical allowing fulfillment of requirements compatibility electromagnetic. The student can identify main circuit parameters. He can carry out basic tests compatibility electromagnetic. Can evaluate the test results obtained compatibility electromagnetic	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
	[K7_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study by:n-appropriate selection of source information and its critical analysis, synthesis, creative interpretation and presentation,n-application of appropriate methods and toolsn	The student is able to describe the occurring electromagnetic disturbances using a mathematical apparatus. He can perform simulations of occurring disturbances and assess their regularity.	[SU1] Assessment of task fulfilment
	[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	The student is able to identify the main parameters of circuits. Can carry out basic electromagnetic compatibility tests. Is able to evaluate the obtained results of electromagnetic compatibility tests.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
Subject contents	1. Introduction to EMC. 2. Basic requirements included in the New Approach Directives. 3. Medical Directives, Electromagnetic Compatibility. 4. Basic EMC research with mathematical description of basic disturbing signals and methods of their simulation. 5. Basic anti-interference elements and protective methods of their selection. 6. Principles of grounding and shielding. 7. Basic design methods using aspects of electromagnetic compatibility.		
Prerequisites and co-requisites	Knowledge of the basics of electromagnetic compatibility (EMC).		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		50.0%	50.0%
		50.0%	50.0%
Recommended reading	Basic literature	Henry W. Ott Electromagnetic Compatibility Engineering ISBN 0470189304David A. Weston Electromagnetic Compatibility: Methods, Analysis, Circuits, and Measurement Yang Zhao, Wei Yan, Jun Sun, Mengxia Zhou, Zhaojuan Meng, Electromagnetic Compatibility: Principles and Applications ISBN 978 981 16	
	Supplementary literature	Henry W. Ott Electromagnetic Compatibility Engineering ISBN 0470189304David A. Weston Electromagnetic Compatibility: Methods, Analysis, Circuits, and Measurement Yang Zhao, Wei Yan, Jun Sun, Mengxia Zhou, Zhaojuan Meng, Electromagnetic Compatibility: Principles and Applications ISBN 978 981 16	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		