



## Subject card

Subject name and code	Electromagnetic Compatibility of Medical Equipment, PG_00049348						
Field of study	Biomedical Engineering						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2025/2026		
Education level	first-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	4	Language of instruction			Polish		
Semester of study	7	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Adam Bujnowski					
	Teachers	dr inż. Adam Bujnowski					
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	The goal of the subject is to familiarize students with the electromagnetic compatibility issues. There will be shown and categorized typical sources of noise signals and coupling methods. There will be shown basic norms related to the EMC and typical design approaches to improve devices functionality in presence of EMC disturbances.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W06] Knows and understands the basic processes occurring in the life cycle of devices, facilities and systems specific to a given field of study.	Student knows basic issues with distortion sources and coupling methods Student knows basic norm in area of EMC Student knows basic design rules to comply with EMC			[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		
	[K6_U08] while identifying and formulating specifications of engineering tasks related to the field of study and solving these tasks, can:n- apply analytical, simulation and experimental methods,n- notice their systemic and non-technical aspects,n-make a preliminary economic assessment of suggested solutions and engineering work n	Student can analyse and identify EMC problems Student uses analytic tools to evaluate EMC problems			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information		
	[K6_K02] is ready to critically assess possessed knowledge and acknowledge the importance of knowledge in solving cognitive and practical problems	Student knows risk and analyses risk of lack of the EMC			[SK5] Assessment of ability to solve problems that arise in practice		

Subject contents	<p>Principal terms for electromagnetic compatibility</p> <p>Norms and regulations in Poland, EU and worldwide</p> <p>Distribution of electromagnetic waves</p> <p>Interferences in electronic equipment, coupling and methods of coupling</p> <p>Immunity measurement for ESD</p> <p>immunity tests for strong magnetic fields</p> <p>Immunity tests</p> <p>Immunity tests for short electric pulses and electric discharges</p> <p>Immunity tests for short interruptions and fallouts of electric supply</p> <p>Immunity measurements in the EMC. Echoless chambers</p> <p>Instrumentation for the EMC</p> <p>Typical techniques of improving and assuring of the EMC</p>											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 1099 794 1133">Subject passing criteria</th> <th data-bbox="794 1099 1139 1133">Passing threshold</th> <th data-bbox="1139 1099 1485 1133">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 1133 794 1167">laboratory achievements</td> <td data-bbox="794 1133 1139 1167">50.0%</td> <td data-bbox="1139 1133 1485 1167">50.0%</td> </tr> <tr> <td data-bbox="453 1167 794 1200">final writing</td> <td data-bbox="794 1167 1139 1200">50.0%</td> <td data-bbox="1139 1167 1485 1200">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	laboratory achievements	50.0%	50.0%	final writing	50.0%	50.0%
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final writing	50.0%	50.0%										
Recommended reading	Basic literature	<p>Paul C.R.: Electromagnetic Compatibility, John Wiley &amp; Sons, 1992.</p> <p>Perez R.: Handbook of electromagnetic compatibility, Academic Press, 1995.</p>										
	Supplementary literature	<p>Więckowski Tadeusz Wiesław: Badania kompatybilności elektromagnetycznej urządzeń elektrycznych i elektronicznych; Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2001.</p> <p>Więckowski Tadeusz Wiesław: Pomiar emisyjności urządzeń elektrycznych i elektronicznych; Wrocław: Politechnika Wroclawska, 1997</p>										
	eResources addresses	Adresy na platformie eNauczanie:										
Example issues/ example questions/ tasks being completed	<p>Show typical coupling methods</p> <p>Explain selected sources of noise</p> <p>Propose circuit for elimination of surges in the signal line</p> <p>Explain importance of galvanic separation and show typical solution</p> <p>Explain basic shielding techniques</p>											

