



## Subject card

Subject name and code	Electromagnetic Interference in Printed Circuit Boards, PG_00057620						
Field of study	Electrical Engineering						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2024/2025		
Education level	second-cycle studies		Subject group				
Mode of study	Part-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jarosław Łuszcz				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	10.0	0.0	10.0	0.0	0.0	20
	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	20		5.0		25.0	50
Subject objectives	The aim of the course is to provide knowledge about the causes of electromagnetic interference in printed circuits and methods of reducing it.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_U02] is able to prepare and deliver a short oral presentation on a selected technical topic		printed circuit boards. presents the results of engineering research.		[SU5] Assessment of ability to present the results of task		
	[K7_W02] has an in-depth and structured knowledge of electrical measurements electrical measurements, the methods and equipment used for electrical measurements of non-electrical quantities, he/she knows the principles of testing operation tests of electrical equipment, has a structured knowledge of electricity quality issues		applies knowledge of EMC requirements when designing printed circuit boards.		[SW1] Assessment of factual knowledge		
	[K7_W06] has in-depth knowledge of industrial electronics, microprocessor control systems, programmable logic systems and printed circuit design and prototyping computer-aided prototyping		applies knowledge of EMC requirements when designing printed circuit boards.		[SW1] Assessment of factual knowledge		
	[K7_U03] is able to obtain information from literature, databases and other sources, also in English, draw conclusions, formulate and fully justify opinions. substantiate opinions; is able to identify directions for further learning and implement the process of self-education		applies knowledge of EMC requirements when designing printed circuit boards.		[SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	LECTURE Sources and propagation of conducted and radiated electromagnetic disturbances. Electromagnetic emission and immunity of electrical devices. Typical causes of interference in printed circuits. Selected methods of reducing electromagnetic interference in printed circuits.		
	LABORATORY Measurements of conducted and radiated electromagnetic disturbance levels. Testing the immunity of devices to electromagnetic interference. Presentation of the effectiveness of selected methods of reducing interference in printed circuits.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	task completion	50.0%	50.0%
	colloquium to pass	50.0%	50.0%
Recommended reading	Basic literature	Charoy, Alain i in. Kompatybilność elektromagnetyczna: Zakłócenia w urządzeniach elektronicznych. Tom 1, 2, 3 i 4. Warszawa: Wydawnictwa Naukowo-Techniczne, 1999. L. Hasse, J. Kołodziejski, Z. Karkowski, A. Konczakowska, L. Spiralski: Zakłócenia w aparaturze elektronicznej. Warszawa: "Radioelektronik ", 1995.	
	Supplementary literature	Ott, Henry W. Electromagnetic Compatibility Engineering. Rev. ed. Hoboken, N.J: John Wiley & Sons, 2009. Bogatin, Eric. <i>Signal and Power Integrity Simplified</i> . 2nd ed. Pearson Prentice Hall, 2009. Bogatin, Eric. <i>Bogatins Practical Guide to Prototype Breadboard and PCB Design</i> . 1st ed. Norwood, MA: Artech House, 2022. Caniggia, Spartaco, and Francescaromana Maradei. <i>Signal Integrity and Radiated Emission of High-Speed Digital Systems</i> . 1st ed. Newark: John Wiley & Sons, Incorporated, 2008. Howard W. Johnson, Martin Graham: High-speed Signal Propagation: Advanced Black Magic. Prentice Hall Professional, 2003.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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