



## Subject card

Subject name and code	Protection against electrical hazards, PG_00059859						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2024/2025		
Education level	first-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Electrical Power Engineering -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Stanisław Czapp					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	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	45	10.0		45.0		100
Subject objectives	Knowledge of main electrical hazards and principles of protection against them.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W11] knows the hazards arising from devices, installations, systems and technical systems, basic principles of occupational health and safety, taking into account the role of control and security systems in controlling automation and robotics facilities	Explains effects of current on human beings. Specifies and explains the means of protection against electric shock in LV systems and HV systems.			[SW3] Assessment of knowledge contained in written work and projects		
	[K6_U04] has the ability to self-educate, among other things, in order to improve professional qualifications	Uses regulations regarding protection against electric shock..			[SU3] Assessment of ability to use knowledge gained from the subject		
	[K6_K05] can think and act in an entrepreneurial way	Plans and performs electrical measurements related to the assessment of the condition of selected electrical installations			[SK5] Assessment of ability to solve problems that arise in practice		
	[K6_W07] has basic knowledge related to control and automation systems	Defines safety principles in control and automation systems.			[SW1] Assessment of factual knowledge		
[K6_W06] knows the structure of computers and microprocessors and the tasks of operating systems, has basic knowledge of the basics of computer software, drivers, microprocessor technology, design of simple algorithms and the operation of information networks	Defines the specifics of computer installations and microprocessors, as well as the electrical hazards associated with them.			[SW1] Assessment of factual knowledge			

Subject contents	Occupational risk assessment. Electric shocks. Effects of current on human beings and livestock, threshold of perception, of let-go, of ventricular fibrillation. Electrical impedance of the human body. Touch voltage and body current. Earthing. Earth electrodes, soil resistivity, earthing resistance and their measurement. Earthing resistance calculation. Protection in low-voltage installations. Protection in high-voltage installations. Earth fault current calculation. Residual current devices. Measuring of touch voltages. Other hazards. Sources of hazards and protection. Work ergonomics and hygiene. LABORATORY Laboratory model for demonstration of means of protection against electric shock. Earthing in low-voltage systems. Conductivity of floor and wall testing. Effectiveness of protection against electric shock testing in installations with RCDs. Earth loop impedance measurement. Earthing electrode resistance measurement. Conductivity of soil measurement. Insulation resistance measurement.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory - report	100.0%	33.0%
	Test	50.0%	67.0%
Recommended reading	Basic literature	1. Czapp S.: Ochrona przeciwporażeniowa w sieciach i instalacjach niskiego napięcia. PWN, Warszawa 2023.  2. Markiewicz H.: Bezpieczeństwo w elektroenergetyce. WNT, Warszawa, 2017.	
	Supplementary literature	1. Musiał E.: Instalacje i urządzenia elektroenergetyczne, WSP, Warszawa, 2008.	
	eResources addresses	Adresy na platformie eNauczenie:	
Example issues/ example questions/ tasks being completed	<p>1. Threshold of perception for 50 Hz sinusoidal current is:</p> <p>a) 0,05 mA</p> <p>b) 0,5 mA</p> <p>c) 5 mA</p> <p>2. A-type residual current devices detect:</p> <p>a) alternating earth fault current and pulsating direct earth fault current</p> <p>b) only alternating earth fault current</p> <p>c) only pulsating direct earth fault current</p>		
Work placement	Not applicable		

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