



Subject card

Subject name and code	High Voltage Engineering, PG_00038344						
Field of study	Electrical Engineering						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2023/2024		
Education level	second-cycle studies		Subject group		Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Part-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	1		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Mechatronics and High Voltage Engineering -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Marek Olesz				
	Teachers		dr inż. Daniel Kowalak				
			dr hab. inż. Marek Olesz				
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	Understanding the principles of selection and design of high voltage insulation for use in power system						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K7_U03		student accepts the need to acquire knowledge from various sources, also in English		[SU2] Assessment of ability to analyse information		
	K7_W03		Student identifies basic aging phenomena in insulation systems		[SW1] Assessment of factual knowledge		
	K7_K02		student analyzes the distribution of electrical field in insulation systems, proposes diagnostics of electrical equipment and installations		[SK5] Assessment of ability to solve problems that arise in practice		
Subject contents	Types of exposures of insulation systems in operation conditions, voltage - temporary characterization of overvoltages in power systems, insulation coordination and selection of voltage tests. Insulating distances in air, polluted flashover mechanism and structure of insulators, insulated systems in compressed gases and vacuum. Improving the electrical field distribution in insulation systems. Degradation processes and indicators for a state evaluation of insulation systems, forecasting life time of an insulation. Diagnostics and monitoring of high voltage insulation in a power system. Research of AC test sets; measurements of partial discharges in insulation systems; diagnostic indicators of high voltage insulation systems; model investigations of stand insulators and bushings.						
Prerequisites and co-requisites	Credit a subject "High voltage engineering"						
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	Practical exercise		60.0%		40.0%		
	Written exam		60.0%		60.0%		
Recommended reading	Basic literature		1. H. Boryń, M. Olesz, S. Wojtas, Laboratorium TWN II, Skrypt specjalistyczny w wersji elektronicznej, WEiA PG, 2002 2. Mościcka H. (red.): Inżynieria wysokich napięć w elektroenergetyce, Wyd. Pol. Pozn. Tom 1 – 1996, Tom 2 – 1999				

	Supplementary literature	1. Flisowski Z. Technika wysokich napięć, WNT, Warszawa, 1988 2. Kosztaluk R. I inni: Technika badań wysokonapięciowych, WNT, Warszawa, 1985 3. Wodziński J.: Wysokonapięciowa technika prób i pomiarów, PWN, 1997
	eResources addresses	Adresy na platformie eNauczenie: INŻYNIERIA WYSOKICH NAPIĘĆ [Niestacjonarne][2023/24] - Moodle ID: 32265 https://enauczenie.pg.edu.pl/moodle/course/view.php?id=32265
Example issues/ example questions/ tasks being completed	1. Time -amplitude characteristics of voltage exposure in the power system, 2. Coordination principles of voltages characterizing the HV system insulation, 3. Static and impulse electric withstand strength of small and large air gaps, time critical front time of voltage impulses, 4. Examples of electric field distribution control of in HV devices, 5. Influence of pressure on the withstand strength of gas type insulation gaps, 6. Electronegative gases and their electrical withstand strength, 7. Basic principles of design of the enclosed switchgear insulation, 8. The probability calculation of sparc and withstand voltages of gas gaps, 9. Surface contamination sparc mechanism, the effect of moisture on the surface strength and the basic principles of construction of petio coats on insulators, 10. The mechanism of gliding discharges and ways to eliminate such discharges in bushings 11. Paper - oil insulation of power transformers for medium voltages and the principles of impregnating the insulation, 12. Construction of capacitors for power systems, 13. The basic structure of modern high voltage cables, joints and terminations.	
Work placement	Not applicable	