



## Subject card

Subject name and code	High Voltage Engineering, PG_00049616						
Field of study	Electrical Engineering						
Date of commencement of studies	February 2024	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group					
Mode of study	Full-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	Katedra Elektrotechniki i Inżynierii Wysokich Napięć -> 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 dr inż. Piotr Leśniak					
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	6.0		14.0		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	he student accepts the need to obtain knowledge from various sources, also in English, in order to select measurement equipment and standardization guidelines			[SU2] Assessment of ability to analyse information		
	K7_W03	the student analyzes electric field distributions in insulating systems, proposes diagnostic tests of power devices and installations			[SW1] Assessment of factual knowledge		
	K7_K02	the student identifies limitations introduced by power lines			[SK5] Assessment of ability to solve problems that arise in practice		
Subject contents	Types of exposures of insulation systems in operation conditions. Insulating distances in air. Analysis of electric field distributions in the vicinity of HV transmission lines - methods of analysis in field programs of the finite element method. Polluted flashover mechanism and structure of insulators. Designing of supporting and bushing systems. Construction of power cable - types of cables and methods of their laying. Designing power cable lines. 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.						
Prerequisites and co-requisites	Credit a subject "High voltage engineering"						
Assessment methods and criteria	Subject passing criteria	Passing threshold			Percentage of the final grade		
	Written exam	60.0%			60.0%		
	Laboratory exercise	60.0%			40.0%		
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 eNauczanie: INŻYNIERIA WYSOKICH NAPIĘĆ [2023/24] - Moodle ID: 35961 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35961">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35961</a>
Example issues/ example questions/ tasks being completed		<ol style="list-style-type: none"> <li>1. Time -amplitude characteristics of voltage exposure in the power system,</li> <li>2. Static and impulse electric withstand strength of air gaps</li> <li>3. Provide limit values for the electric and magnetic field near construction objects located at the HV lines. Methods for limiting the electric field intensity.</li> <li>4. Discuss the surface contamination sparc mechanism.</li> <li>5. Give exemplary constructions of support and bushing insulators.</li> <li>6. Principles of designing support systems</li> <li>7. Principles of designing bushing systems.</li> <li>8. Give the constructions of modern HV cables and their accessories.</li> <li>9. Provide methods and rules for laying power cable lines</li> <li>10. Provide the rules for designing cable lines.</li> <li>11. Principles of monitoring the state of HV insulation in the power system</li> <li>12. Discuss the method of measuring partial discharges</li> <li>13. Discuss the basic methods of performing voltage tests of insulation systems</li> <li>14. The lifetime of insulation and its forecasting.</li> </ol>
Work placement		Not applicable