GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	High Voltage Technique, PG_00055963		
Field of study	Power Engineering, Power Engineering, Power Engineering		
Date of commencement of studies	October 2023	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	3	Language of instruction	Polish
Semester of study	6	ECTS credits	2.0
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	dr hab. inż. Marek Olesz	
	Teachers		

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

Knowledge of phenomena occurring in high-voltage insulation systems using gaseous, liquid and solid dielectrics. Introduction to lightning and surge protection. Mastering measurement procedures related to performing voltage tests on insulation systems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W03] knows the basics of automation and automatic regulation, knows the principles of the selection of electrical devices, drive systems and their control	determines the electrical and thermal conditions of operation of insulating systems and takes them into account in automatic protection systems	[SW3] Assessment of knowledge contained in written work and projects
[K6_W05] has structured knowledge in the field of electrical engineering and electronics, necessary to understand the basics of operation and selection of electrical machines, electricity transmission systems and power electronic devices	performs basic measurements confirming the electrical strength of the insulating system; selects safe insulation distances; performs diagnostics of insulation systems	[SW1] Assessment of factual knowledge

Subject contents

LECTURE Dielectrics, ionisation processes in gases, forms of dischargs, corona, impuls air strength, effect of field distribution, polarity, symmetry, dimensions, time and frequency on electric strength of gases. Compressed gases. Liquid dielectrics, effect of pressure, temperature, humidity, time and frequency, field distribution and electrode dimension on electric strength, applications. Solid dielectrics, mechanisms of breakdown, partial discharges, degradation, dielectric strength of composed insulation systems, surface and gliding discharges. Insulators, application, design, effect of field distribution, pollution and humidity, design of HV power cables and terminations. Lightning, basic parameters, overvoltages, propagation of waves in power lines and windings, principles and methods of lightning protection, co-ordination of insulation. Principles of diagnostics of insulation. LABORATORY Measurement of AC, DC and impuls high voltages. Effect of voltage distribution on discharge form in air at AC, DC and impuls voltages. Effect of ambient conditions on electric strength of air. Insulator testing in dry conditions and under rain. Oil evaluation, Model investigations of wave phenomena in long lines.

Prerequisites and co-requisites	knowledge of the basics: ordinary and partial differential equations, integral calculus, electromagnetic field theory, kinetic-molecular theory of gases, thermodynamics, atomic structure

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
laboratory	60.0%	40.0%
lecture	60.0%	60.0%

Recommended reading

Basic literature	1. Z. Flisowski: "Technika Wysokich Napięć" , PWN Warszawa 2017. 2. Z. Gacek: "Wysokonapięciowa technika izolacyjna" , Wydawnictwo Politechniki Gliwickiej, Gliwice 2006. 3. H. Boryń, A. Rynkowski, S. Wojtas: Laboratorium Techniki Wysokich Napięć. Wydawnictwo Politechniki Gdańskiej, 2007. 4. B. Florkowska, J. Furgał, "Technika wysokich napięć", Wydawnictwa AGH, 2017 5. S. Szpor i inni, "Technika wysokich napięć" WNT, Warszawa, 1978. 6. Ravindra Arora and Wolfgang Mosch, High Voltage and Electrical Insulation Engineering IEEE Press , 2011
Supplementary literature	1. H. Mościcka-Grzesiak: Inżynieria wysokich napięć w elektroenergetyce, tom I, Wydawnictwo Politechniki Poznańskiej, Poznań 1996.2. S. Szpor: Ochrona odgromowa. WNT 1978
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

The streamer mechanism of spark

Dielectric loss coefficient

Breakdown mechanism of solid materials

Breakdown mechanism of liquid dielectrics

Measurement of DC high voltages

Measurement of AC high voltages

Measurement of impulse high voltages

The lightning protection of buildings

Principles of overvoltage protection for power systems and devices

Diagnostics and operation of transformers

Work placement	Not applicable

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