GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	High Voltage Engineering, PG_00038405		
Field of study	Electrical Engineering		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2021/2022
Education level	first-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	2	Language of instruction	Polish
Semester of study	4	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marek Olesz	
	Teachers	dr hab. inż. Marek Olesz dr inż. Piotr Leśniak dr inż. Leszek Litzbarski	

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

Adresy na platformie eNauczanie:

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	7.0	73.0	100

Subject objectives

Understanding of phenomena in high voltage insulation systems

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W02	The student understands the determinants of the occurrence of electrical discharges in gas, solid and liquid insulation, the mechanism of discharge development, the mechanisms of insulation degradation and the principles of diagnostics. The student understands the basics of overvoltage protection, requirements for basic elements and insulation systems, the principles of their operation, taking into account the influence of the surrounding environment, allowing for the interpretation of regulations and standards.	[SW1] Assessment of factual knowledge
K6_U05	The student has basic skills enabling the selection of measuring equipment and carrying out basic measurements of high-voltage devices	[SU4] Assessment of ability to use methods and tools
K6_K01	Student appreciates the importance of self-expanding knowledge in the field of high voltage engineering	[SK2] Assessment of progress of work

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, their electrical strength, mechanisms of breakdown and 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 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.
Prerequisites and co-requisites	Acquaintance with principles of differencial ordinary and partial equations, integral calculus, theory of electric fields, kinetic-molecular theory of gases, principles of thermodynamics, and structure of atom

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written exam	60.0%	60.0%
Laboratory passing test	60.0%	40.0%

Recommended reading

Basic literature	Z. Flisowski: "Technika Wysokich Napięć" (HV engineering), WNT Warszawa 1988. Z. Gacek: "Wysokonapięciowa technika izolacyjna" (HV insulation technique), Wydawnictwo Politechniki Gliwickiej, Gliwice 2006 H. Boryń, A. Rynkowski, S. Wojtas: Laboratorium Techniki Wysokich Napięć. Wydawnictwo Politechniki Gdańskiej, 2007. S. Szpor i inni, "Technika wysokich napięć" (HV engineering) WNT, Warszawa, 1978
Supplementary literature	H. Mo cicka-Grzesiak: Inżynieria wysokich napięć w elektroenergetyce , tom I, Wydawnictwo Politechniki Poznańskiej, Poznań 1996. S. Szpor: Ochrona odgromowa. WNT 1978
eResources addresses	

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

Work placement	Not applicable