GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Electrical Equipment, PG_00038445		
Field of study	Hydrogen Technologies and Electromobility		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
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	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
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	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	39.0	75

Subject objectives: Obtaining knowledge and skills in the selection of electrical devices

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W09] knows the principles of designing electrical installations, controlling electrical devices in hydrogen installations, making technical drawings and documentation	The student knows the principles of selecting protection devices, cables and preparing diagrams.	[SW1] Assessment of factual knowledge
[K6_K01] is aware of the need for continuous education and self-improvement in the field of the profession of an electrician and knows the possibilities of further education	The student knows the regulations related to further education.	[SK5] Assessment of ability to solve problems that arise in practice
[K6_U04] can apply the learned methods to the analysis and design of electrical elements, devices and systems	The student is able to design an electrical system.	[SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

LECTURE Current-carrying capacity. Insulation loss-of-life evaluation. Life expectancy curve. Hot-spot temperature, temperature rise. Dynamic behaviour. Rapid heating, continuous heating, heating and cooling cycles. Sustained rating, short-time and cyclic ratings, short-circuit rating. Characteristics of short-circuit currents (scc). Far-from-generator and near-to-generator short-circuit. Initial symmetrical scc, peak scc, breaking scc, thermal equivalent scc. Short-circuit impedances of electrical equipment. Limitation of scc, reactors, current-limiting breaking devices. Selection of equipment according to scc. Electrical switches. Contact configurations, switching arc and quenching technique (vacuum, gas, air). Transient recovery voltage. Selection and operation. Cased switchboards. Fault arc and immunity to fault arc. Limiting of short-circuits effects. Operation. Current and voltage transducers. Current and voltage (inductive) measurement transformers, coreless transducers (capacitive and optical included). Components, equivalent diagrams, operation in normal and overcurrent conditions. Accuracy. Connection systems. Selection and operation. Overvoltage protection devices. Valve, expulsion and varistor arresters. Components, operation, selection principles.

LABORATORY Contacts in electric devices. Arc switching. Arcless switching. Low voltage switches. Low voltage fuses. Fault arc in cased switchboards. High voltage switches.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">No requirements</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Written exam</td><td>50.0%</td><td>67.0%</td></tr>
<tr><td>Practical exercise</td><td>100.0%</td><td>33.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. Kacejko P., Machowski J.: Zwarcia w systemach elektroenergetycznych. WNT, Warszawa 2013.
2. Markiewicz H.: Urządzenia elektroenergetyczne. WNT, Warszawa 2016.
3. Musiał E.: Instalacje i urządzenia elektroenergetyczne, WSP, Warszawa 2008.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. Maksymiuk J.: Aparaty elektryczne. WNT, Warszawa 1995.
2. Wiszniewski A.: Przekładniki w elektroenergetyce. WNT, Warszawa 1992.</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Task: Calculate peak short-circuit current (i_p) for selection the switch in power system.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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