GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Disturbances in Electrical Power Systems, PG_00038347		
Field of study	Electrical Engineering		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
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	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Mechatronics and High Voltage Engineering -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marek Olesz	
	Teachers	dr inż. Daniel Kowalak dr inż. Jacek Katarzyński dr hab. inż. Marek Olesz	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	20.0	0.0	10.0	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	5.0	65.0	100

Subject objectives

The aim of the teaching subject is to train highly qualified specialists with expertise in the effect and reduce the effects of noises, as well as electrical equipment research.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W02] has an in-depth and structured knowledge of electrical measurements electrical measurements, the methods and equipment used for electrical measurements of non-electrical quantities, he/she knows the principles of testing operation tests of electrical equipment, has a structured knowledge of electricity quality issues	student recognizes the basic types of interference and their source in the power system	[SW1] Assessment of factual knowledge
[K7_U08] be able to carry out tests on electrical power equipment, analyse disturbances in electrical power systems, record and assess the quality of electricity in the power network	It combines knowledge of diagnostic measurements of devices and power quality analyzers	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
[K7_K02] is aware of the impact of engineering activities on the environment, understands the the non-technical effects of those activities	student calculates the levels of overvoltages and short-circuit currents and on this basis selects the appropriate parameters of the power equipment	[SK5] Assessment of ability to solve problems that arise in practice

<table>
<tr><td>Subject contents</td><td>Course content – lecture
Lecture Short-circuits in low- and high voltage network. Currents of metallic and fault arc short-circuits, nearby and distant short-circuits . Parameters of fault arc. Influence of arc resistance on short-circuit currents. Fault arc resistance of transformer station and switchboards (aerial isolation and GIS). Fault arc effects limitation. Short-circuits in specific systems and electric objects, e.g. marine installations, high-voltage power electronics systems. Behaviour of switches and apparatuses under disturbance conditions. Changes of voltage (voltage dip). Solid state, hybrid and limiting switches. Influence of disturbances on control and monitoring systems. Overvoltages and its influence on electric system. Lightning surges and switching overvoltages. Lim-iting the effects of overvoltages - surge and overvoltage protection. Operation of apparatus and devices under overvoltage conditions. Monitoring of disturbances. Devices used to registration of disturbances. Analysis of disturbances. Operation of electrical transducers under disturbances. Testing devices immunity to disturbances. Disturbances modelling.
Laboratory 1. Hybrid limiters 2. Devices for detection and fault arc switching 3. Models of earthing 4. Overvoltage varistor limiters 5. Measurement methods of disturbances in electrical network 6. Analysis of electrical energy quality in electrical power engineering systems</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<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>60.0%</td></tr>
<tr><td>Practical exercise</td><td>60.0%</td><td>40.0%</td></tr>
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</td></tr>
<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. Maksymiuk J.: Aparaty elektryczne. WNT, Warszawa, 1992.
2. Ciok Z., Maksymiuk J., Pochanke Z., Zdanowicz L.: Badanie urządzeń energoelektrycznych. WNT, Warszawa 1992.
3. Markiewicz H.: Urządzenia elektroenergetyczne. WNT, Warszawa 2008.</td></tr>
<tr><td>Supplementary literature</td><td>1. Mrówka Z.: Kierunki rozwoju komputerowych sieci przemysłowych, przegląd rozwiązań, porównanie parametrów. P.P.H.W. PROLOG Sp. z o.o., Warszawa, 2001.
2. Germanek D.: Sieci przemysłowe PROFIBUS. Standard światowy. SIEMENS A.G., 2002.
3. Kacejko P., Machowski J.: Zwarcia w systemach elektroenergetycznych. WNT, 2013.
4. Wyłącznik SENTRON. Komunikacja. SIEMENS A.G., 2004.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table>
</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>1.Characteristics of short-circuit current Ik" for different cable cross-sections. 2. Characteristics of the ground fault current Id depending on the grounding resistor. Influence of the line parameters on the shape of short-circuit current. 3. Characteristics of the surge current as a function of the angle of switching on the transformer.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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