COURSE DESCRIPTION CARD - SYLLABUS

Course name
Measurement in electric power engineering [N2Elenerg1>MwE]

Course

Field of study
Electrical Power Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
10

Laboratory classes
10

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

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Prerequisites

Student has the knowledge of physics, electrical engineering, electric power engineering, materials engineering, high voltage techniques, basics of high voltage measurement. Has the ability to effectively self-educate in the field related to the selected field of study. Is aware of the need to expand his knowledge, skills, competences, readiness to cooperate within a team and work independently.

Course objective

Understanding how to measure the parameters of electricity in the power system - operating and diagnostic voltages and currents, such as: alternating voltage, direct and impulse voltage as well as alternating and impulse currents. Learning modern research techniques for devices operating in a high- voltage power system.

Course-related learning outcomes

Knowledge:
student has in-depth knowledge in the field of measurements of electrical quantities used in the operation of power system devices.

Skills:
student can plan and perform post-assembly and periodical diagnostic tests of the condition of devices working in the power system and analyze the results of these tests, issue appropriate operational recommendations and prepare documentation of the performed measurements.
student can use his knowledge for the independent and group design of power equipment, measurement and diagnostic systems used in the power industry.

Social competences:
student is aware of the importance of the power industry for the country and society and its impact on the country"s energy security, as well as for development that is compatible with the requirements of respect for the natural environment; is ready to design, operate and diagnose the condition of devices working in the power system.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture:
Assessment of the knowledge and skills shown in the final problem-based written test.
Laboratories:
Checking the preparation for each laboratory class, evaluation of the report prepared after the completed laboratory.

Programme content

Lecture:
Quantities describing the quality of electricity. Classification of terms describing the parameters of working and test voltages and currents, such as: alternating voltage, direct voltage, lightning impulse, switching impulse, current surges. Test equipment for the generation of alternating, direct and impulse voltage, as well as high current. Methods of measuring high voltage and high current in laboratory tests and in the power system: voltage and current transformers and methods of their operation in the power system. Electrical and non-electrical methods of high voltage and high current measurement. Systems for partial discharge testing by electrical, chemical, optical and acoustic methods. Methodology of performing laboratory, factory and operational voltage tests - acceptance, routine, service and post-failure.
Laboratory:
Generation and measurement of alternating, direct and impulse test voltages in laboratory conditions and in the power system. Testing of partial discharges and corona discharges in high-voltage insulating systems.

Teaching methods

Lecture:
Lecture with a multimedia presentation supplemented with examples given on the blackboard. An interactive lecture with the formulation of problems to be solved and questions for students.
Laboratory:
Checking the preparation for laboratories before each laboratory class, preparation of the reports, final colloquium.

Bibliography

Basic
1. Flisowski Z., Technika wysokich napięć, WNT, Warszawa, 2017
2. Wodziński J., Wysokonapięciowa technika prób i pomiarów, PWN, Warszawa, 1997
3. Mościcka-Grzesiak H., Inżynieria wysokich napięć w elektroenergetyce, tom I/II, Wydawnictwo Politechniki Poznańskiej, Poznań, 1996/99
4. Florkowska B., Włodek R., Florkowski M., Kuniewski M., Wysokie napięcie w elektroenergetyce. Wybrane zagadnienia i obliczenia, Wydawnictwa AGH, Kraków, 2020
Additional
1. Florkowska B., Diagnostyka wysokonapięciowych układów izolacyjnych urządzeń elektroenergetycznych, Wydawnictwa AGH, Kraków, 2016

2. Kuffel E., Zaengl W., Kuffel J., High Voltage Engineering. Fundamentals, Butterworth-Heineman, 2001
3. Florkowska B., Furgał J., Technika wysokich napięć. Podstway teoretyczne i laboratorium, Wydawnictwa AGH, Kraków, 2017
4. Gulski E., Jongen R., Rakowska A., Siodla K., Offshore Wind Farms On-Site Sub-marine Cable Testing and Diagnosis with Damped AC, Energies 2019 vol. 12, no. 19, DOI: 10.3390/en12193703
5. Atanasova-Hoehlein I., Przybyłek P., Siodła K., et all., Experience with Capacitive On-Line Sensors for Moisture Evaluation in Transformer Insulation, IEEE Electrical Insulation Magazine, DEIS, ISSN 0883-7554, DOI: 10.1109/MEI.2019.8636102, Vol. 35, 2/2019, 18-26

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	20	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00