



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Measurement in electric power engineering

Course

Field of study

Electrical power engineering

Area of study (specialization)

Common courses

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

1/1

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

Krzysztof Siodła, Ph. D., Eng., prof. PUT

Responsible for the course/lecturer:

Faculty of Environmental Engineering and
Energy

Institute of Electric Power Engineering

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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:

Lecture:

Assessment of the knowledge and skills shown in the final problem-based 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 factory and operational voltage tests - acceptance, 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 partial discharges and corona discharges in high-voltage insulation 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, preparation of exercise 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. Podstawy teoretyczne i laboratorium, Wydawnictwa AGH, Kraków, 2017
4. Gulski E., Jongen R., Rakowska A., Siodła 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 al., 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	55	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes, preparation of reports, preparation for test) ¹	25	1,0

¹ delete or add other activities as appropriate