



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

High voltage engineering

### Course

Field of study

Electrical Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/5

Profile of study

practical

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

0

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

2

### Lecturers

Responsible for the course/lecturer:

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Faculty of Environmental Engineering and Energy

Institute of Electric Power Engineering

3A Piotrowo Str.; 60-965 Poznań

Responsible for the course/lecturer:

### Prerequisites

Has knowledge in the field of electrotechnical materials science, material engineering, theoretical electrotechnics, basics of high voltage engineering and physics. Has the ability to effectively self-study in a field related to the chosen field of study. Is aware of the need to expand his knowledge, skills, competences, readiness to cooperate within a team

### Course objective

Knowledge of extended issues related to high voltage engineering. Understanding the values describing



the parameters of insulation systems operating at high voltages. Understanding the mechanisms of electrical breakdown in various insulating materials. Understanding the issues related to the construction of high voltage insulation systems for power equipment.

### Course-related learning outcomes

#### Knowledge

1. Has knowledge of the life cycle, design and operation of power equipment and systems, knows and understands the principle of their operation
2. Has structured and theoretically founded knowledge of construction, principles of operation and operation of transformers, electrical machines and technical systems, knows the processes occurring in their life cycle
3. Knows and understands physical phenomena occurring in high voltage insulation systems as well as in systems for its generation, knows surge protection methods, has basic knowledge about the life cycle of this type of electrical systems

#### Skills

1. Is able to plan and carry out simulation and measurements of basic quantities characteristic for electrical systems; can present the results obtained in numerical and graphic form, interpret them and draw the right conclusions
2. Is able to compare different design solutions and assess them in technical, system and non-technical terms, due to selected utility and economic criteria
3. Is able to properly use electrical equipment in accordance with general requirements and technical documentation

#### Social competences

1. Is aware of the need to initiate actions for the public interest, understands the various aspects and effects of electrical engineer activities, including environmental impact, and the associated responsibility for decisions
2. Is able to think and act in an entrepreneurial manner in the field of electrical engineering
3. Correctly identifies and resolves dilemmas related to the exercise of the profession

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

Assessment of knowledge and skills demonstrated during the written exam of a problem nature

### Programme content

The application of high voltage technology in physical engineering, industrial processes, environmental protection and power engineering. Types of high-voltage insulation systems, overvoltages, high-voltage



measurements. High voltage laboratory equipment. Parameters describing high voltage insulation systems, their physical sense and method of determination - resistivity, dielectric loss factor, electrical permeability coefficient, electrical strength. Electric field strength in various insulation systems. Solid, liquid and gas insulating materials used in high voltage insulation systems. Mechanisms of electric jump in insulating gases, liquids and solids.

### Teaching methods

Lecture

Lecture with multimedia presentation supplemented with examples given on the blackboard. The lecture is conducted in an interactive way with the formulation of questions addressed to the students

### Bibliography

Basic

1. Flisowski Z., Technika wysokich napięć, WNT, Warszawa, 2014
2. Inżynieria wysokich napięć w elektroenergetyce, pod red. H.Mościckiej-Grzesiak, Wydawnictwo Politechniki Poznańskiej, tom 1 1996, tom 2 1999
3. Florkowska B., Diagnostyka wysokonapięciowych układów izolacyjnych urządzeń elektroenergetycznych, Wydawnictwa AGH, Kraków, 2016

Additional

1. Gacek Z., Kształtowanie wysokonapięciowych układów izolacyjnych stosowanych w elektroenergetyce, Wydawnictwo Politechniki Śląskiej, Gliwice, 2002
2. Kuffel E., Zaengl W., Kuffel J., High Voltage Engineering. Fundamentals, Butterworth-Heinemann, 2001
3. Florkowska B. i inni, Mechanizmy, pomiary i analiza wyładowań niezupełnych w diagnostyce układów izolacyjnych wysokiego napięcia, Uczelniane Wydawnictwo Naukowo-Dydaktyczne AGH, Kraków, 2010

### Breakdown of average student's workload

	Hours	ECTS
Total workload	40	2,0
Classes requiring direct contact with the teacher	20	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	20	1,0

<sup>1</sup> delete or add other activities as appropriate