COURSE DESCRIPTION CARD - SYLLABUS

Course name
Design of high-voltage insulation systems [S2Eltech2-IWN>PWUI]

Course

Field of study
Electrical Engineering

Year/Semester
1/2

Area of study (specialization)
High Voltage Engineering

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
0

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
30

Number of credit points

3,00

Coordinators

dr inż. Andrzej Graczkowski

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Lecturers

Prerequisites

Student starting this course: 1. Has knowledge of electrotechnical materials science and knows the basic laws of the theory of electrical circuits. Has a basic understanding of the high voltage technique. 2. Can build a simple electric circuit. Can carry out measurements of physical quantities of insulation systems. He can carry out high voltage measurements using various methods. 3. Can work and interact in a group. Is aware of the impact of high voltage insulation systems on the natural environment.

Course objective

The aim of the course is to learn the design of high voltage insulation systems used in electrical power devices such as insulators, transformers, capacitors, cables and GIS / GIL devices, with particular emphasis on the electric and magnetic field in these devices.

Course-related learning outcomes

Knowledge:
1. Has knowledge of designing high voltage insulation systems.

2. Has extended knowledge of numerical calculations of electromagnetic field distributions in high voltage devices.

Skills:
1. Can design high-voltage insulation systems.
2. On the basis of computer simulations of electromagnetic field distribution, is able to propose improvements to the existing solutions of high voltage insulation systems.

Social competences:
1. Knows the importance of knowledge in solving practical problems, is aware of the need for continuous self-education

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Laboratory exercises:
1) assessment of knowledge and skills related to the implementation of the exercise task - assessment of the report on the performed exercise.
2) Continuous checking of preparation for exercises. Rewarding the knowledge necessary to carry out laboratory exercises.
Project:
1) assessment of involvement when discussing design engineering problems.
2) evaluation of the completed project.

Programme content

Applicable regulations, programs, standards and good practices in the design of high-voltage insulation systems in terms of their electrical and thermal parameters as well as mechanical strength. The principles of designing cable and overhead lines, power transformers, bushing insulators and capacitors will be discussed.

Course topics

Lab
The laboratory covers issues related to numerical calculations of electromagnetic field distributions in the insulation systems of devices such as insulators, power transformers, high-voltage cables, capacitors, GIS stations and GIL lines.
Project
As part of the project, students design a selected insulation system of power devices (bushing insulator, power transformer, cable).

Teaching methods

The introduction to the project classes is a lecture in which the discussed theoretical issues are presented in terms of practice. A discussion is initiated during the lecture. Lecture with a multimedia presentation (including: drawings, photos, films, selected examples of design solutions for high-voltage systems) supplemented with information provided on the board.
Laboratory exercises:
Students work in teams. Reports from exercises are reviewed by the teacher and discussed / explained by the author

Bibliography

Basic:
1. Flisowski Z., Technika wysokich napięć, Wydawnictwo Naukowo-Techniczne, Warszawa 2017
2. Furgał J., Układy izolacyjne urządzeń stacji wysokiego napięcia, Wydawnictwo AGH, Kraków 1995
3. Gacek Z., Wysokonapięciowa technika izolacyjna, Wydawnictwo Politechniki Śląskiej, Gliwice 2006
4. Mościcka-Grzesiak H., Ćwiczenia laboratoryjne z materiałoznawstwa elektrotechnicznego i techniki wysokich napięć, Wydawnictwo Politechniki Poznańskiej, Poznań 2002
5. Gielniak J., Ćwiczenia laboratoryjne z inżynierii materiałowej w elektrotechnice, Wydawnictwo

Politechniki Poznańskiej, Poznań 2009

Additional:
1. Mościcka-Grzesiak H., Inżynieria wysokich napięć w elektroenergetyce, Wydawnictwo Politechniki Poznańskiej, tom I – 1996
2. Mościcka-Grzesiak H., Inżynieria wysokich napięć w elektroenergetyce, Wydawnictwo Politechniki Poznańskiej, tom II – 1999
3. Celiński Z., Materiałoznawstwo elektrotechniczne, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2005
4. Lisowski M., Pomiary rezystywności i przenikalności elektrycznej dielektryków stałych, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2004

Breakdown of average student's workload

	Hours	ECTS
Total workload	85	3,00
Classes requiring direct contact with the teacher	45	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50