



COURSE DESCRIPTION CARD - SYLLABUS

Course name

High voltage insulation systems [S1Eltech1>A-WUI]

Course

Field of study

Electrical Engineering

Year/Semester

3/6

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

15

Laboratory classes

30

Other

0

Tutorials

0

Projects/seminars

15

Number of credit points

4,00

Coordinators

dr hab. inż. Hubert Morańda prof. PP
hubert.moranda@put.poznan.pl

Lecturers

Prerequisites

Student starting this course: 1. Has knowledge in frame of electrical engineering material science and knows fundamental principles related to electrical circuits theory, and has fundamental knowledge in the area of high voltage engineering. 2. Can build simple electrical system and make measurements of physical properties related to insulation systems. He/she can make measurements of high voltage using various methods. 3. Can work and cooperate in group. He/she knows influence of high voltage insulation systems on natural environment.

Course objective

The aim of the course is getting knowledge about fundamental problems related to high voltage insulation systems used in electric power devices such as insulators, transformers, capacitors, cables and GIS substations, and discussion of issues related to the electrical strength of materials and insulation systems.

Course-related learning outcomes

Knowledge:

1. Has knowledge of the impact of individual material properties on the reliability of high-voltage insulation systems.

2. Knows and understands physical phenomena occurring in high voltage insulation systems and has basic knowledge about the electrical strength of materials and insulation systems.

Skills:

1. Is able to design and test basic high voltage insulation systems.

Social competences:

1. He/she understands role of their own work, work in team, and responsibility of team tasks carried out in the frame of high voltage engineering.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

Lectures:

1) Assessment of knowledge and skills proved on written exam

Laboratories:

1) Assessment of knowledge and skills related to performed laboratory classes - assessment of laboratory report

2) Continuous checking of the preparation for the laboratory classes

Project:

1) Assessment of the project task

Programme content

In the frame of lectures the following topics are presented:

high voltage laboratory systems, high voltage insulation systems used in electric power devices such as insulators, transformers, capacitors, cables and GIS substations, selected issues related to the electrical strength of insulation materials and systems, properties of selected electrical insulation materials.

In the frame of laboratory classes the problems related to high voltage

insulation systems, used in electric power systems, such as insulators, transformers, cables, capacitors, GIS substations.

As part of the project, students have to design a capacitor to improve the power factor.

Course topics

Laboratories are related to following problems: the influence of contaminants on electric strength of insulators; voltage breakdown of spare gap; the influence of barriers on electric strength; test of high voltage cable; estimation of work voltage of insulators on the basis of voltage breakdown; capacitors test; analysis of electric field distribution on model of cable.

In frame of laboratory classes, students design chosen high voltage insulation system (insulator, transformer, capacitor etc.).

Teaching methods

The theory presented during lectures is closely related to practice. During the lecture a discussion is initiated. Lectures with multimedia presentation (including: figures, photos, videos) complemented by the information on the board.

Laboratory classes are done in teams. Laboratory reports are reviewed by the instructor and discussed in the presence of the author.

Project classes are supplemented by multimedia presentations, a detailed review of the project documentation is carried out by the project leader. The use of tools enabling students to perform tasks at home (e.g. open source software) is foreseen.

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., Pomiar rezystywności i przenikalności elektrycznej dielektryków stałych, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2004

5. Morańda H., Przybyłek P., Mościcka-Grzesiak H., Rezystywność powierzchniowa preszpanu zanurzonego w oleju mineralnym lub estrze syntetycznym, Przegląd Elektrotechniczny, 2016, R. 92, nr 10, s. 84-87

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	75	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00