COURSE DESCRIPTION CARD - SYLLABUS

Course name
Diagnostics of power equipment

Course

Field of study
Power Engineering

Year/Semester
1/2

Area of study (specialization)
-

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
Polisch

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	15	0
Tutorials	**Projects/seminars**	
0	0	

Number of credit points

1

Lecturers

Responsible for the course/lecturer:
Dr hab. inż. Jarosław Gielniak
email: jaroslaw.gielniak@put.poznan.pl
tel. 61 665 2024
Faculty of Environmental Engineering and Energy
Piotrowo 5, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

The student has expanded and deep knowledge in the field of mathematics, including knowledge of the elements of discrete and applied mathematics, differential calculus and probability and optimization methods, including numerical methods. The student has expanded and ordered knowledge in the field of analysis and synthesis of electrical and electronic circuits. Is able to assess the usefulness and choose the calculation method, use or implement the appropriate software to solve a particular issue, taking into account new achievements of technology. Is ready to critically evaluate and analyze issues and recognizes the importance of knowledge in solving cognitive and practical problems in the field of energy

Course objective

Knowledge of diagnostic methods related to energy devices such as transformers, insulators, cables, capacitors, GIS stations.

Course-related learning outcomes

Knowledge

1. Student has extensive knowledge in the field of energy equipment diagnostics, based on electrical measurement and modern measurement systems
2. Student has extended knowledge in the field of analysis of measurement results in the aspect of assessing the technical condition of power equipment

Skills

1. The student is able to use known diagnostic methods - if necessary to modify them - to analyze the state of energy devices
2. The student can assess the usefulness of diagnostic methods in relation to energy devices
3. The student is prepared to work in an industrial environment and knows the rules of work safety

Social competences

Is ready to critically evaluate and analyze issues and recognizes the importance of knowledge in solving cognitive and practical problems in the field of energy

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

Assessment of knowledge and skills on the final test (multiple choice test consisting of 10 tasks, 10 points can be obtained - passing the exam from 5.5 points)

Laboratory classes:

- continuous assessment, during each class - rewarding the increase in the ability to use known principles and methods,
- assessment of knowledge and skills related to the implementation of the exercise task, evaluation of the report of the exercise.

Programme content

Lectures:

1. Transformer diagnostic methods: dielectric spectroscopy method (RVM, DFR, PDC), method of measurement of partial discharges (electric, acoustic, UHF), winding deformation evaluation method, Karl-Fisher method
2. Cable diagnostic methods: reflected wave method, cable insulation measurement method
3. Diagnostic methods of capacitors: thermovision, method of measurement of electrical capacitance
4. Diagnostic methods of insulators: thermovision method, measurement of partial discharges
5. GIS diagnostic methods: measurement of partial discharges (UHF method)

Laboratory classes:

1. Detection of transformer winding deformations using Sweep Frequency Response method
2. Investigation of transformer winding resistance
3.Investigation of magnetizing currents

4. Measurement of a three-phase power transformer ratio
5. Measurement of the degree of polymerization of cellulose
6. Partial discharge measurements in transformer insulation using the IEC 60-270 method

Teaching methods

lectures - lecture with multimedia presentation (including: drawings, pictures) supplemented with examples given on the board and presentation of damaged parts of devices . Theory presented in close connection with practice

Laboratory classes:
laboratory exercises carried out in teams of several, assembling of measuring systems in practice, measurements and analysis of the results obtained carried out with the teacher

Bibliography

Basic

1. Flisowski Z., Technika wysokich napięć, WNT, Warszawa, 1988.
2. Kosztaluk R. i inni, Technika badań wysokonapięciowych, tom I i II, WNT, Warszawa, 1985.
3. Florkowska B., Diagnostyka wysokonapięciowych układów izolacyjnych urządzeń elektroenergetycznych, Wydawnictwo AGH, Kraków 2009

Additional

1. Gielniak J., Zawilgocenie izolacji papierowo-olejowej transformatorów wysokiego napięcia, Wydawnictwo Politechniki Poznańskiej, Poznań 2012
2. Florkowska B., Wytrzymałość elektryczna gazowych układów izolacyjnych wysokiego napięcia, Uczelniane Wydawnictwo AGH, Kraków, 2003
3. Gielniak J., Przybyłek P., Mościcka-Grzesiak H.,Wytrzymałość elektryczna nanomodyfikowanych dielektryków ciekłych, Przegląd Elektrotechniczny, ISSN 0033-2097, R. 91 NR 2/2015
4. Gielniak J., Dombek G., Wróblewski R., Fire Safety and Electrical Properties of Mineral Oil/Synthetic Ester Mixtures, 8th International Symposium on Electrical Insulating Materials, September 12-15, 2017, Toyohashi Chamber of Commerce &Industry, Toyohashi City, Japan, Conference Proceedings of ISEIM 2017, V1-10, p. 227-230

Breakdown of average student's workload

	Hours	ECTS
Total workload	39	1,0
Classes requiring direct contact with the teacher	31	1,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests, preparation of laboratory exercise reports) [1]	8	1,0

[1] delete or add other activities as appropriate