COURSE DESCRIPTION CARD - SYLLABUS

Course name
Diagnostics of electrical power devices

Course

Field of study
Mathematics in Technology

Year/Semester
3/6

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	15	-
Tutorials	Projects/seminars	
-	-	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
dr inż. Wojciech Sikorski
email: wojciech.sikorski@put.poznan.pl
tel. (61) 665 20 35
Faculty of Environmental Engineering
and Energy
ul. Piotrowo 3A, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Student knows basic theorems and transforms of mathematical analysis and linear algebra. Student has theoretical knowledge in the field of technical sciences, including electrical engineering. Student has a basic knowledge of the properties and applications of electroinsulating materials. Student is able to carry out detailed research using experimental methods, interpret the results obtained and draw conclusions. Student has the ability to use IT tools to process measurement data and is able to work and cooperate within the team and is aware of the need to expand his competence in the area of solving technical problems.

Course objective

Knowledge of electric power equipment design. Learning the parameters and physical quantities useful for diagnostic methods of electric power equipments. Practical ability to apply the chosen measurement technique for diagnostic and comprehensive evaluation of the technical condition of equipments.

Practical ability to processing and proper interpretation of measuring data used for evaluation of the technical condition of electric power equipments. Ability to prepare professional reports from the research.

Course-related learning outcomes

Knowledge

1. Student has knowledge of electric power equipment design.

2. Student has knowledge of physical phenomena in insulation system of electric power devices.

3. Student has knowledge of diagnosis and operation of electric power equipments.

Skills

1. Student can choose and use the proper measurement method for evaluation of the technical condition of equipments.

2. Student is able to process and correctly interpret the obtained results and present them in the form of a report.

Social competences

Student understands the need for continuous training in the field of modern diagnostics of power devices.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:
- assess the knowledge and skills indicated in a written or oral exams.

Laboratory classes:
- tests of the knowledge necessary for the accomplishment of the problems in the area of laboratory tasks,
- continuous assessment for each laboratory class,
- rating the knowledge and skills related to realization of laboratory task; assessment of the written measurement report,
- assess the knowledge and skills indicated in a written or oral test.

Programme content

Design of equipments and high voltage (HV) insulation systems used in power electrical engineering. Parameters and physical quantities used for condition assessment of HV insulation systems. Diagnostic methods of power electrical equipments: conventional and unconventional partial discharge detection and localization methods, physical and chemical methods for evaluation of moisture and aging process of insulation system, diagnostics of transformer winding deformation, infrared electrical inspection. Digital signal processing of measurement signals (frequency and joint time-frequency methods: FFT/STFT transform, continuous and discrete wavelet transform, statistical analysis, automatic signal classification techniques). Mathematical modelling of partial discharge sensors and transducers.

Teaching methods

Lecture: multimedia presentation (including drawings, photos, animations) supplemented with examples given on the board, taking into account various aspects of the issues presented, including: economic, ecological, legal and social issues, presenting a new topic preceded by a reminder of related content known to students in other subjects .

Laboratory: detailed review of reports, demonstrations, teamwork.

Bibliography

Basic

1. Kaźmierski M., Olech W., Diagnostyka techniczna i monitoring transformatorów, ZPBE ENERGOPOMIAR - ELEKTRYKA Sp. z o.o. Gliwice; wyd. 2013r.

2. Florkowska B., Diagnostyka wysokonapięciowych układów izolacyjnych urządzeń elektroenergetycznych, Wydawnictwo AGH Kraków, 2009

3. Gulski E., Diagnozowanie wyładowań niezupełnych w urządzeniach wysokiego napięcia w eksploatacji, Prace Naukowe Politechniki Warszawskiej, 2003

4. Flisowski Z., Technika wysokich napięć, WNT Warszawa, 2009

5. Gacek Z., Wysokonapięciowa technika izolacyjna, Wydawnictwo Politechniki Śląskiej, Gliwice, 2006

6. Mościcka-Grzesiak H., pod red., Inżynieria wysokich napięć w elektroenergetyce, Wydawnictwo Politechniki Poznańskiej, tom I 1996, tom II 1999

7. Fleszyński J., pod red., Laboratorium wysokonapięciowe w dydaktyce i elektroenergetyce, Oficyna Wydawnicza Politechniki Wrocławskiej, 1999

Additional

1. Sivaji Chakravorti,Debangshu Dey,Biswendu Chatterjee , Recent Trends in the Condition Monitoring of Transformers, Spinger-Verlag, 2013

2. S.V. Kulkarni,S.A. Khaparde, Transformer Engineering: Design, Technology, and Diagnostics, Second Edition, CRC Press, 2013

3. Sikorski W., Acoustic emission, InTech, 2012

4. Sikorski W, Acoustic emission: research and applications, InTech 2013

5. Sikorski W., Ultraczułe przetworniki emisji akustycznej zoptymalizowane do monitoringu wyładowań niezupełnych w transformatorach, Przegląd Elektrotechniczny, Tom 92, Wydanie 10, str. 11-16, 2016

6. Szymczak C., Sikorski W., Projektowanie i optymalizacja anten UHF do monitoringu wyładowań niezupełnych w transformatorze energetycznym, Przegląd Elektrotechniczny, Tom 92, Wydanie 10, str. 75-79, 2016

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	50	2,0
Student's own work (literature studies, preparation for laboratory classes, preparation for exam, preparation of laboratory reports) [1]	25	1,0

[1] delete or add other activities as appropriate