COURSE DESCRIPTION CARD - SYLLABUS

Course name
Disturbances in electric power systems

Course

Field of study
Electrical engineering

Year/Semester
1/2

Area of study (specialization)

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

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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Responsible for the course/lecturer:
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Prerequisites

Student has a basic knowledge of electrical engineering, power engineering and metrology. Student can assemble the measurement system, can carry out measurements of basic physical quantities and elaborate obtained results. Student is able to work in a group and understands the importance of teamwork.

Course objective

Knowledge of both theoretical and practical problems associated with interference in electric power networks. Understanding the causes and effects of transients in power systems. Knowledge of standards of conduct consistent with the protection and coordination of power systems under disruptions.

Course-related learning outcomes

Knowledge

1. Student can name and describe basic types of disturbances occurring in the power system.

2. Student is able to characterize and evaluate the resistance against disturbance of typical devices operating in the power grid.

3. Student can determine the rules of procedure for reducing the impact of disturbances on devices operating in the power grid.

Skills

1. Student can identify the cause of the disturbances and evaluate the risks resulting from for the proper operation of the power grid.

2. Student can examine and analyze the signals generated by various types of interferences, and assess the level of resistance to interference of selected electrical equipment.

3. Student can choose elements of overvoltage protection for selected electrical devices.

Social competences

1. Student is aware of the need to disseminate knowledge about the dangers of electric shock as a result of disruption or failure of the power system components.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:

- assess the knowledge and skills demonstrated during written or oral tests.

Laboratory:

- tests and rewarding knowledge necessary for the accomplishment of problems in the area of laboratory tasks,

- continuous evaluation, on each course - rewarding skills gain in the range of use of the principles and methods have met during the course,

- assessment of knowledge and skills related to the implementation of the exercise, the assessment of the report from performed exercise.

Programme content

Lecture:

Lecture covers the following topics: classification of disturbance sources - intentional and unintended, the definitions, the basis of analysis of interfering signals occurring in power networks; transients, electromagnetic interferences, short-circuit disturbances, internal and external surges, resistance to disturbance exposure, overvoltage protection, coordination of power systems in terms of interferences.

Laboratory:

Laboratory exercises include: measurement and evaluation of disturbances levels, study of electrical devices susceptibility an levels of resistance to electromagnetic interference, ways to reduce the impact of disturbances on the power grid.

Teaching methods

Lecture: multimedia presentation, illustrated with examples on the board

Laboratory: laboratory exercises, work in groups

Bibliography

Basic

1. Hoppel W., Sieci średnich napięć: automatyka zabezpieczeniowa i ochrona od porażeń, Wydawnictwo Naukowe PWN, 2017.

2. Lorenc J., Admitancyjne zabezpieczenia ziemnozwarciowe, Wydawnictwo Politechniki Poznańskiej, Poznań, 2007.

3. Machczyński W., Wprowadzenie do kompatybilności elektromagnetycznej, Wydawnictwo Politechniki Poznańskiej, Poznań, 2004.

4. Normy PN-EN 61000-6-1/2/3/4, Kompatybilność elektromagnetyczna (EMC) - Wymagania dot. odporności i emisyjności.

5. Flisowski Z., Technika wysokich napięć, WNT, Warszawa, 2005.

Additional

1. Charoy A., Kompatybilność elektromagnetyczna. Zakłócenia w urządzeniach elektronicznych, t. I-IV,WNT, Warszawa, 1999.

2. Boolen M. H., Gu I., Signal Processing of Power Quality Disturbances, John Wiley & Sons, 2006

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory, preparation for tests) [1]	25	1,0

[1] delete or add other activities as appropriate