COURSE DESCRIPTION CARD - SYLLABUS

Course name

Control and automatics in electric power system

Course

Field of study

Power Engineering

Year/Semester

2/3

Area of study (specialization)

Electrical Power Engineering

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

30

Laboratory classes

30

Other (e.g. online)

0

Tutorials

0

Projects/seminars

15

Number of credit points

6

Lecturers

Responsible for the course/lecturer:

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Wydział Elektryczny

ul. Piotrowo 3A 60-965 Poznań

Responsible for the course/lecturer:

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Wydział Inżynierii Środowiska i Energetyki

ul. Piotrowo 3A, 60-965 Poznań

Prerequisites

Has basic knowledge of electric circuits theory, electrical machines, electric power engineering and electric power generation. Has ability to study, individually and effectively, the domain related to the chosen specific field, to combine the knowledge acquired in the courses completed up to now. Is aware of the necessity to extend his knowledge and competencies, is ready to undertake the cooperation and act as a team member.

Course objective

Getting familiar with tasks and functions of the automatic protections and control systems in the electric power system's operation as well as with design fundamentals of the protection and control elements.

Course-related learning outcomes

Knowledge

1. Has knowledge of the power system operation states and needs in the field of control and protection of its components using information technology.

2. Has knowledge in the field of information management in the power system and the use of telemechanics systems.

Skills

1. Is aware of the continuous expansion of knowledge along with the development of the needs and new possibilities of controlling the power system.

2. Is able to analyze the work of power system components and conduct simulation research in this field.

Social competences

Understands the need to deepen and disseminate knowledge in the field of energy security.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: assessment of knowledge and skills demonstrated during the written test of a problem nature (student can use any teaching materials), current assessment in each class (rewarding activity and quality of perception).

Laboratory exercises: checking and rewarding the knowledge necessary to implement the problems posed in a given area of laboratory tasks, 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, assessment of the report of the exercise , taking into account the laboratory task in team performance assessment.

Design: assessment of the ability to carry out design tasks, assessment of the use of computer-aided design tools.

Programme content

Lectures. Purposes, functions and criterions of the automatic electric power protections? operation (EAZ). Protection systems for generators, lines and transformers. Functions and algorithms of the SPZ and SCO automatic systems and anti-swing systems (APKO). Structure of the Electric power system control systems. Frequency and interchange power control system (ARCM) - primary, secondary and tertiary control. Arrangement and requirements for control. Control-accompanying transients, non-intervention rule in secondary control.. Group secondary control of voltage and passive power - ARNE and ARST systems. Perspectives for the voltage and passive power tertiary control implementation. Wind power station operation under the power control conditions.

Lab: Lab investigations of the short- circuit phenomena in electric power networks. The EAZ system - based experiments. DAKAR program applications to develop the control and automatic systems in the electric power system.

Project: Design of the chosen automatic and control systems in the electric power systems.

Teaching methods

Lecture:

- lecture with multimedia presentation (drawings, photos, videos) supplemented by entries on the board,

- lecture conducted in an interactive way with the formulation of questions to a group of students or to specific students indicated,

- theory presented in close connection with practice.

Laboratory exercises:

- work in teams,

- demonstrations,

- detailed review of reports by the laboratory leader and discussions on comments.

Design:

- demonstrations,

- classes conducted in an interactive way, with significant participation of students,

- theory presented in close connection with practice.

Bibliography

Basic

1. Żydanowicz J. Elektroenergetyczna automatyka zabezpieczeniowa. WNT -Warszawa, tom I (1979), tom II (1985), tom III (1989)

2. Winkler W., Wiszniewski A. Automatyka zabezpieczeniowa w systemach elektroenergetycznych. WNT Warszawa 1999

3. Machowski J.: Regulacja i stabilność systemu elektroenergetycznego. OWPW, Warszawa 2007..

4. Hellmann W., Szczerba Z.: Regulacja częstotliwości i napięcia w systemie elektroenergetycznym. Warszawa, WNT 1978.

Additional

1. Kacejko P., Machowski J. : Zwarcia w sieciach elektroenergetycznych, WNT, Warszawa, 2003

2. Machowski J. : Regulacja i stabilność systemu elektroenergetycznego. OW PW 2017, ISBN 978-83-7207-689-2

2. Machowski J., Białek J., Bumby J. Power System Dynamics: Stability and Control. IEEE Wiley, 2008.

3. Artykuły czasopism: "Wiadomości Elektrotechniczne", "Acta Energetica"

4. Józef Lorenc, Anrzej Demenko - edytorzy: Safety of the Polish power system, edycja 2016, Scientific Publishers, ISBN 978-83-7712-096-5

Breakdown of average student's workload

	Hours	ECTS
Total workload	162	6,0
Classes requiring direct contact with the teacher	95	4,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	67	2,0

[1] delete or add other activities as appropriate