COURSE DESCRIPTION CARD - SYLLABUS

Course name
Smart distribution grids

Course

Field of study
Electrical power engineering

Year/Semester
2/2

Area of study (specialization)
Smart grids

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

1

Lecturers

Responsible for the course/lecturer:
dr inż. Bartosz Olejnik

Faculty of Environmental Engineering and Energy

Institute of Electric Power Engineering

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tel. 61 665 2581

Responsible for the course/lecturer:

Prerequisites

Fundamental knowladge in electrical power engineering - short-circuit calculations, calculations of power flows, etc. Knowledge about the elements of a traditional power grid and knowladge about principles of operation of power grids. Knowledge about basic control systems and power system protection.

Course objective

Knowledge about principles of operation of the active elements control system and smart switches. Knowledge about distributed measurement techniques, both electrical and nonelectrical meassurands in the context of detection of failures and pre-failures conditions. Knowledge about methods of

improvement of the electrical network in the context of optimized operation and planning of electrical network development. Knowledge about current issues connected with power system operation.

Course-related learning outcomes

Knowledge

The student has knowledge in the field of power system control and the use of power system protection with the use of ICT

The student has well-established knowledge in the field of construction of power grids, the phenomena occurring in them, operating states and methods of analysis in relation to conventional solutions, smart grids and distributed generation

Skills

The student is able to use numerical methods and IT tools to design and analyze the operation of electrical power protection automation systems

Social competences

The student correctly identifies and resolves dilemmas related to the broadly understood energy security; can think and act in a creative and entrepreneurial manner; understands the need for actions to make the society aware of the development of the power industry, but also to reduce the risks it brings

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

-assessment of knowledge and skills shown in the written test; the colloquium consists of 10 questions (test and open-ended questions) with different scores; pass mark 50% of points + 0.5 points;

- continuous assessment in each class (rewarding activity);

Programme content

Lecture

Smart metering and its role in modern power engineering. Wide Area Measurement Systems (WAMS). Wide Area Monitoring, Protection and Control (WAMPAC). Smart-grids devices installed deep in the grid, especially in MV network. Connectors deep in the network and their optimal placement. Fault Detection, Isolation and Restitution (FDIR) automation. Algorithms for controlling the operation of local sources and other modern network elements. Selected issues related to the current problems of the distribution network operation.

Teaching methods

Lecture: multimedia presentation, illustrated with examples given on the board and examples of computer simulations and other tools to support the operation of the power system. Discussion.

Bibliography

Basic

1. Machowski J. "Regulacja systemu elektroenergetycznego", WNT, Warszawa 2017.

2. Machowski J., Lubośny Z. "Stabilność systemu elektroenergetycznego", WNT, Warszawa 2018.

3. Rosołowski E. "Cyfrowe przetwarzanie sygnałów w automatyce elektroenergetycznej". Akademicka Oficyna Wydawnicza EXIT, Warszawa 2002

4. Hoppel W. "Sieci średnich napięć. Automatyka zabezpieczeniowa i ochrona od porażeń". Wydawnictwo Naukowe PWN, Warszawa 2017

5. Bień A. "Systemy pomiarowe w elektroenergetyce". Wydawnictwo AGH, Kraków 2013

6. instructions of transmission grid's operation and maintenance.

Additional

1. Toledo F. "Smart metering handbook". PennWell Corporation, Tulsa 2012

2. Salman K.S. "Introduction to the Smart Grid". Institution of Engineering and Technology, London 2017

3. Momoh J.A. "Smart grid: Fundamentals of design and analysis". Wiley-IEEE Press, 2012

4. Borlase S. "Smart grids: infrastructure, technology and solutions". CRC Press, 2012

5. Olejnik B. "Adaptive Zero-Sequence Overcurrent Criterion for Earth Fault Detection for Fault Current Passage Indicators in Resistor Grounded Medium Voltage Networks". IEEE Access, vol. 9, 2021, s. 63952-63965

6. Olejnik B. "Alternatywne metody pomiaru średniego napięcia w elektroenergetycznej sieci rozdzielczej". Poznan University of Technology Academic Journals. Electrical Engineering. Issue 78, 2014, s. 97-104.

Breakdown of average student's workload

	Hours	ECTS
Total workload	29	1,0
Classes requiring direct contact with the teacher	15	0,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	14	0,5

[1] delete or add other activities as appropriate