COURSE DESCRIPTION CARD - SYLLABUS

Course name
Power plant in the power system and distributed generation

Course

Field of study
Electric Power Engineering

Year/Semester
1/2

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
30

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
15

Number of credit points

5

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:
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Prerequisites

The student has basic knowledge in the field of technological systems of power plants and combined heat and power plants. The student knows the basic principles of operation of system generation sources and distributed generation sources. The student has the ability to effectively self-educate in the field related to the selected field of study. The student is aware of the need to expand their competences and is ready to cooperate as part of the team.

Course objective

Getting acquainted with the problems of the operation of generating sources in the power system. Getting to know the aspects of the influence of distributed generation on the power system.

Course-related learning outcomes

Knowledge

Student has knowledge of the operation of generating sources in the power system.

Student knows and understands the concept of power system stability.

Student has knowledge of the impact of excessive installation of distributed energy sources on the operation of conventional power plants

Skills

Student can analyze the technological systems of power plants based on simplified mathematical models.

Student can estimate the annual electricity production by unconventional sources based on the annual distribution of insolation and wind speed.

Social competences

The student understands the role of power sources in the power system and is aware of the importance of the role of the power engineer in planning the operation of the power system.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture

- evaluation of the knowledge and skills listed on the written exam,

Laboratory classes

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

Projects

- assessment of knowledge and skills related to the implementation of the project task, assessment of the completed project.

Programme content

Lecture

Structure of the power system, load variability in the power system. System sources. Energy characteristics and relative increments of production sources. Operation of a power plant in the power system - economic load distribution, selection of a set of generating units. The role of various types of power plants in the operation of the power system. Movement flexibility of power units. Operation of wind farms in the power system. Operation of a hydroelectric power plant in the power system. Nuclear power plant operation in the power system. Distributed generation and hybrid manufacturing systems.

Performance characteristics of PV panels. The use of solar farms for the so-called "peak shaving" load. Planning of systemic attempts to defend and rebuild generation capacity in the National Power System.

Laboratory classes

Determination of operational characteristics of conventional power sources.

Modeling and determination of operational indicators of a steam power plant in the Matlab environment

Modeling and analysis of the work of selected production sources in the matlab / simulink environment. Modeling the equation describing the dynamics of the generator.

Modeling the generator's work with the simpowersystem library.

Determining the value of time of using the capacity of the installed photovoltaic farm.

Determining the value of time of use of the installed wind farm capacity.

Projects

Design task:

- technical and economic analysis of a distributed electricity generation system.

- modeling and analysis of the operation of the technological system of a system power plant.

Teaching methods

Lecture

- lecture with multimedia presentation

Laboratory classes

- laboratory exercises performed with the help of engineering programs

Projects

- independent solution of a project-related problem in the field of work and operation of various types of generation sources.

Bibliography

Basic

1. Gładyś H., Matla R., Praca elektrowni w systemie elektroenergetycznym, WNT, W-wa , 1995

2. Machowski Jan, Lubośny Zbigniew, Stabilność systemu elektroenergetycznego. PWN 2021

3. Janiczek R., Przygrodzki M., Rozproszone źródła energii w systemie elektroenergetycznym. Wydawnictwo Politechniki Śląskiej, Gliwice 2006.

4. Paska J., Rozproszone źródła energii, Oficyna Wydawnicza Politechniki Warszawskiej, 2017

5. Lubośny Z., Elektrownie wiatrowe w systemie elektroenergetycznym, Wydawnictwa Naukowo-Techniczne, 2007

6. Lubośny Z., Farmy wiatrowe w systemie elektroenergetycznym, Wydawnictwa Naukowo-Techniczne, 2013

7. Machowski .J., Regulacja i stabilność systemu elektroenergetycznego. 2007

Additional

1. Michałowski S., Plutecki J., Energetyka wodna. WNT. 1975

2. Janiczek R.S.: Eksploatacja elektrowni parowych, WNT, 1992

3. Kubowski J., Elektrownie jądrowe, WNT 2017

4. Jasicki Z., Elektromechaniczne stany przejściowe w systemach energetycznych T2, PWN 1987

5. Bartosz Ceran, Krzysztof Sroka., Planowanie pracy hybrydowego systemu wytwórczego w systemie elektroenergetycznym w ujęciu wieloaspektowym. Acta Energetica - 2017, nr 1 (30), s. 4-14

7. Ireneusz Grządzielski (WE), Krzysztof Sroka (WE), Daria Złotecka (WE), Adam Kurzyński, Marcin Kaczmarek, Michał Brzozowski, Jarosław Borodynko. Próba systemowa uruchomienia bloku cieplnego w Elektrowni Turów jako weryfikacja możliwości wykorzystania Elektrowni Wodnej Dychów w procesie restytucji KSE. Przegląd Elektrotechniczny - 2019, R. 95, nr 2, s. 29-34

Breakdown of average student's workload

	Hours	ECTS
Total workload	140	5,0
Classes requiring direct contact with the teacher	75	3,0
Student's own work (literature studies, preparation for laboratory classes, preparation of reports, preparation for projects, project preparation, preparation for exam) [1]	65	2,0

[1] delete or add other activities as appropriate