COURSE DESCRIPTION CARD - SYLLABUS

Course name
Power plant in the power system and distributed generation [N2Elenerg1-ISD>PSLiS]

Course

Field of study
Electrical Power Engineering

Year/Semester
2/3

Area of study (specialization)
Smart Grids

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
20

Laboratory classes
20

Other
0

Tutorials
0

Projects/seminars
10

Number of credit points

5,00

Coordinators

dr hab. inż. Bartosz Ceran prof. PP
bartosz.ceran@put.poznan.pl

Lecturers

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 operating states of the generator-rigid network system based on simplified mathematical models of the power system elements.
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:

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

Operation of large power plants and distributed energy sources in the power system

Course topics

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. Actions for power systems defense and restoration procedures in the event of a catastrophic failure. Power system defence and restoration plans. System experiments as the verification of possibility of participating in power system defence and restoration plans.

Laboratory classes
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:
- determining energy characteristics and relative increases of generating units

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	5,00
Classes requiring direct contact with the teacher	50	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	90	3,00