COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electrical Power Engineering [S1Eltech2>ElEn]

Course

Field of study
Electrical Engineering

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of mathematics, physics, and electrical engineering.

Course objective

Learning about the physical principles of electricity generation in different types of power plants. Learning about issues related to fuel combustion in power plants. Learning about the design and operation of basic power generation equipment.

Course-related learning outcomes

Knowledge:
1) Knows and understands the basic issues related to the operation and construction of the power system and understands the processes of electricity generation.
2) Has basic knowledge of energy conversion in various types of power plants, including in particular conventional power plants.

Skills:
1) Able to evaluate electricity generation technologies in terms of their efficiency and environmental

impact
2) Able to test and diagnose simple energy systems and devices.

Social competences:
1) Is ready to perform professional roles, take responsibility for jointly implemented tasks, and adhere to professional ethics.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture
- knowledge assessment in the form of a written exam consisting of 6 open-ended questions. Pass mark - 50% of the total points. Additionally, active participation in lectures will be rewarded.
Classes
- passing based on ongoing knowledge checks and a written test on the tasks
Laboratory
- assessment based on reports on completed laboratory exercises and participation in classes

Programme content

Characteristics of the electricity generation process in a steam power plant - thermal cycles, methods of improving efficiency, technological systems. Stoichiometry of solid fuels. Energy devices forming a power unit - construction and principle of operation. Fundamentals of heat transfer theory - exchangers. Selected renewable sources - construction and principle of operation.

Course topics

Lecture:
Introduction to electrical power engineering - characteristics of the electrical power system.
Characteristics of the electricity generation process in a steam power plant - fuel combustion process, basics of stoichiometry. Determining boiler efficiency.
Power equipment - design and operating principles of basic power equipment: boiler, turbine, generator, transformer.
Heat exchangers used in conventional steam units. Basics of heat transfer theory.
Fuel-air-exhaust system, thermal system, cooling system, power output system - construction, equipment, operation.
Thermal cycles of steam, gas, gas-steam, and nuclear power plants, as well as combined heat and power plants, and their development.
Methods for improving the efficiency of thermal cycles.
Selected renewable sources - construction and operating principle of a fuel cell. Electrolyzer. Electrolysis process. Production of pure hydrogen.
Exercises:
Energy and stoichiometric calculations for power plant technological systems
Laboratory:
The laboratory program includes:
• Measurement of the quality of fossil fuels and biomass using a calorimetric bomb
• Technical analysis of coal
• Fuel cell
• Biomass pelletizing process
• Control of the gas fuel combustion process

Teaching methods

Lecture
Lecture with multimedia presentation supplemented with examples given on the board.
Exercises
Math problems calculated on the board
Laboratory
Laboratory exercises performed on real models.

Bibliography

Basic:
1. M. Pawlik, F. Strzelczyk: Elektrownie, WNT W-wa 2012, 2017
2. T.Chmielniak: Technologie energetyczne, WNT W-wa 2014
3. J. Marecki: Podstawy przemian energetycznych, WNT W-wa 2014
4. Skorek J., Kalina J.: Gazowe układy kogeneracyjne. Wydawnictwa Naukowo-Techniczne 2005
5. Wójs K. Odzysk i zagospodarowanie niskotemperaturowego ciepła odpadowego ze spalin wylotowych PWN 2015

Additional:
1. T.Chmielniak: Technologie energetyczne, WNT W-wa 2014
2. Skorek J., Kalina J.: Gazowe układy kogeneracyjne. Wydawnictwa Naukowo-Techniczne 2005
3. Portacha J., Układy cieplne elektrowni i elektrociepłowni konwencjonalnych jądrowych i odnawialnych, Oficyna Wydawnicza Politechniki Warszawskiej, 2016.
4. Chmielniak, Tadeusz, Ziębik, Andrzej, Obiegi cieplne nadkrytycznych bloków węglowych, Wydawnictwo Politechniki Śląskiej, 2010
5. Anuszczyk J., Maszyny elektryczne w energetyce. WNT 2005
6.Tokarz. T.J. Kontrola procesów cieplnych w siłowniach parowych część I i część II, Wydawnictwo AGH 2015.
7. Szczerbowski R. Energetyka węglowa i jądrowa Wybrane aspekty. Wydawnictwo Fundacja na rzecz Czystej Energii. Rok wydania 2017

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	38	1,50