



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Electrical Power Engineering [N1Eltech1>ElEn]

### Course

Field of study

Electrical Engineering

Year/Semester

2/4

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

part-time

Requirements

compulsory

### Number of hours

Lecture

20

Laboratory classes

10

Other

0

Tutorials

10

Projects/seminars

0

### Number of credit points

5,00

### Coordinators

dr inż. Radosław Szczerbowski

radoslaw.szczerbowski@put.poznan.pl

### Lecturers

### Prerequisites

Student has basic knowledge of mathematics, physics and theoretical electrical engineering. Student has the ability to effectively self-educate in a field related to the chosen field of study. Student is aware of the need to expand their competences, and is ready to cooperate as part of a team.

### Course objective

Getting to know the physical basics of electricity generation in various types of power plants. Learning about issues related to the combustion of fossil fuels. Getting to know the construction and principles of operation of basic energy devices.

### Course-related learning outcomes

Knowledge:

1. General knowledge on the construction of the power system and understanding of electricity generation processes.
2. Basic knowledge of energy conversion in various types of power plants, including in particular conventional power plants.

#### Skills:

1. Student is able to evaluate electricity generation technologies in terms of their efficiency and environmental impact.
2. Student is able to test and diagnose simple energy systems and devices.

#### Social competences:

1. Student is able to work in a group during laboratory tests and present the effects of the work done.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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#### Lecture

- written exam

#### Tutorials

- credit on the basis of the current checking of knowledge and a written test on accounting tasks

#### Laboratory classes

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

### Programme content

Characteristics of the electricity generation process in a steam power plant. Stoichiometry of solid fuels. Power equipment - construction and principle of operation. Efficiency of power equipment. Basics of the theory of heat exchange - exchangers. Thermal circuits of conventional electric power sources. Methods of improving the efficiency of thermal circuits. Technological systems of power plants and thermal power plants. Selected renewable sources - construction principle of operation.

### Course topics

#### Lecture

Introduction to electric power generation - characteristics of the electric power system. Characteristics of the process of electricity generation in a steam power plant - the process of fuel combustion, the basics of stoichiometry.

Power equipment - construction and principle of operation of basic power equipment: boiler, turbine, generator, transformer). Determination of boiler efficiency, energy losses in the boiler and turbine. Heat exchangers used in conventional steam units. Fundamentals of heat transfer theory. Selected renewable sources - construction of the principle of operation of a heat pump and a fuel cell.

Thermal circuits of steam, gas, gas-steam and nuclear power plants. Power systems and equipment forming the thermal cycle of a power plant. Fuel-air-combustion system, thermal system, cooling system, power derivation system - construction, operation. Methods of improving the efficiency of thermal circuits. Technological systems of power plants and thermal power plants and their development.

#### Exercises

Energy and stoichiometric calculations of technological systems of power plants.

#### Laboratory

Study of fossil fuels. Determination of characteristics of fuel cells. Study of a heat pump. Study of the heat exchange process.

The laboratory program includes:

- Measuring the quality of fossil fuels and biomass using a bomb calorimeter
- Technical analysis of coal
- Measuring the characteristics of the heat pump
- Measuring the operational characteristics of the electrolyzer and fuel cell

### Teaching methods

#### Lecture

Lecture with a multimedia presentation supplemented with examples given on the blackboard.

#### Tutorials

Accounting tasks counted on the blackboard.

Laboratory classes  
Laboratory exercises performed on physical workstations.

## 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. Portacha J., Układy cieplne elektrowni i elektrociepłowni konwencjonalnych jądrowych i odnawialnych, Oficyna Wydawnicza Politechniki Warszawskiej, 2016.
2. Chmielniak, Tadeusz, Ziębik, Andrzej, Obiegi cieplne nadkrytycznych bloków węglowych, Wydawnictwo Politechniki Śląskiej, 2010
3. Anuszczyk J., Maszyny elektryczne w energetyce. WNT 2005
4. Tokarz. T.J. Kontrola procesów cieplnych w siłowniach parowych część I i część II, Wydawnictwo AGH 2015.
5. Ceran B. Wpływ pracy farm wiatrowych w systemie elektroenergetycznym na pracę konwencjonalnego bloku parowego. Przegląd Naukowo-Metodyczny, Edukacja dla Bezpieczeństwa - 2016, nr 1, s. 1161-1168
6. 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	130	5,00
Classes requiring direct contact with the teacher	60	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	70	3,00