COURSE DESCRIPTION CARD - SYLLABUS

Course name
Generation of electric energy

Course

Field of study
Electrical Engineering

Year/Semester
Winter

Area of study (specialization)
Electric Power Systems

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
english

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other (e.g. online)
0

Tutorials
15

Projects/seminars
15

Number of credit points

6

Lecturers

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

email: bartosz.ceran@put.poznan.pl

tel.616652523

The Faculty of Environmental Engineering and Energy

ul. Piotrowo 3A, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Student has a basic knowledge of the basics of energy conversion and energy machine and equipment. He knows the basics of electrical engineering and power engineering. Understand the basic principles of operation of the machines and know the basic construction of conventional energy equipment. Student is aware of the need to expand their skills and readiness to work together as a team.

Course objective

Obtaining skills in the knowledge of methods of generating electricity in power plants and knowledge of the principles of the use of different types of primary energy to produce electricity.

Course-related learning outcomes

Knowledge

1. Student knows the primary form of energy available in nature and presents the possibility of their use in the energy sector. Able to classify and evaluate the types of power plants. Able to identify and assess the impact of generation sources on the environment.

2. Student has an extended knowledge of the structure and operation of various types of power plants and their role in the power system.

Skills

1. Student is able to use mathematical methods to energy analyzis of technological systems of power plants.

2. Student can design a basic technological systems of power plant and CHP power plants, and evaluate them in terms of the efficiency of electricity and heat.

Social competences

1. Student understand the complexity of many aspects of electrical engineering and can present them in an understandable way

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,

Tutorials

- credit on the basis of the current check messages and one written tests of the accounting tasks

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

Electricity generation in thermal power plants. Ways to improve the efficiency of steam power plants. Fundamentals of thermal cycles. Gas-fired power plants and combined gas-steam systems. The use of nuclear energy to generate electricity. Types of nuclear reactors used in nuclear power plants. The use of water energy to generate electricity. Types of hydropower plants and their role in the power system.

Rules for using wind energy. Wind farms and wind farms. Utilization of sun energy. Photovoltaics. Methods of using geothermal energy. Generation of electricity using fuel cells. Distributed generation and its impact on the operation of the power system. Impact of power plants on the environment and methods of its reduction.

Tutorials

- energy analysis of the steam power plant's,

Laboratory classes

Laboratory measurements at the teaching stands.

Modeling and analysis of work states of selected technologies of electric energy production.

Projects

Design of the technological system of the steam power plant.

Teaching methods

Lecture

- lecture with multimedia presentation supplemented with examples given on the board.

Tutorials

- Tasks counted on the board.

Laboratory classes

- laboratory exercises performed with the help of engineering programs,

- measurements of device working parameters at the teaching stands.

Projects

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

Bibliography

Basic

1. Skorek J., Kalina J.: Gazowe układy kogeneracyjne. Wydawnictwa Naukowo-Techniczne 2005.

2. Portacha J., Układy cieplne elektrowni i elektrociepłowni konwencjonalnych jądrowych i odnawialnych, Oficyna Wydawnicza Politechniki Warszawskiej, 2016.

3. Ackermann G.: Eksploatacja elektrowni jądrowych, WNT Warszawa 1987

4. Paska J., Elektrownie jądrowe, Oficyna Wydawnicza Politechniki Warszawskiej, 1990

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

6. Kowalska A., Wilczyński A., Źródła rozproszone w systemie elektroenergetycznym. Kaprint. 2007

7. Matla R., Gładyś H., Praca elektrowni w systemie elektroenergetycznym. WNT. 1999

8. Paska J., Wytwarzanie rozproszone energii elektrycznej i ciepła. Oficyna Wydawnicza Politechniki Warszawskiej. 2010

9. Chmielniak, Tadeusz, Ziębik, Andrzej, Obiegi cieplne nadkrytycznych bloków węglowych, Wydawnictwo Politechniki Śląskiej, 2010.

10. Paska J., Podstawy elektroenergetyki: metody wytwarzania energii, Ofic. Wydaw.PW,, 1994.

11. Portacha J., Badania energetyczne układów cieplnych elektrowni i elektrociepłowni, Oficyna Wydawnicza Politechniki Warszawskiej, 2002.

12. Tytko R., Odnawialne źródła energii : wybrane zagadnienia, OWG, 2009.

13. Lewandowski W., Proekologiczne odnawialne źródła energii, Wydawnictwa Naukowo-Techniczne, 2013.

14. Klugmann-Radziemska E., Odnawialne źródła energii : przykłady obliczeniowe, Wydawnictwo Politechniki Gdańskiej, 2016.

15. Lewandowski W., Klugmann-Radziemska E., Proekologiczne odnawialne źródła energii : kompendium, Wydawnictwo Naukowe PWN, 2017.

Additional

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

2. Legutko S.; Podstawy eksploatacji maszyn, Wyd. Politechniki Poznańskiej, Poznań 2002

3. Zdzisław Celiński, Energetyka jądrowa, PWN, Warszawa 1991

4. Szargut J., Ziębik A.: Skojarzone wytwarzanie ciepła i elektryczności - elektrociepłownie. Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego 2007.

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

6. Mokrzycki E., Gawlik L., (red. nauk.) Rozproszone zasoby energii w systemie elektroenergetycznym, Wydawnictwo IGSMiE PAN, 2011.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	70	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	55	2,0

[1] delete or add other activities as appropriate