COURSE DESCRIPTION CARD - SYLLABUS

Course name
Combined Heat and Power

Course

Field of study
Power Engineering
Year/Semester
3/5
Area of study (specialization)
-
Profile of study
general academic
Level of study
First-cycle studies
Course offered in
Polish
Form of study
full-time
Requirements
compulsory

Number of hours

Lecture
30
Laboratory classes
0
Other (e.g. online)
0
Tutorials
15
Projects/seminars
0

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

1. Basic knowledge of thermodynamics, fluid mechanics, energy technology and equipment, fuels and their utilization

2. Solving tasks of the balance of mass and energy in simple circuits of thermal power plants.

3. Student is aware of the need to broaden their competence, willingness to work together as a team.

Course objective

The objective of the course is acquisition of skills to carry out energy and economic analysis of combined heat and power (CHP) technological systems with the use of different types of primary energy.

Course-related learning outcomes

Knowledge

1. Student has structured and theoretically founded knowledge in the basics of combined heat and power.

2. Student knows and understands the phenomena, processes, and technological systems that are capable of converting energy from renewable sources to electricity and heat.

Skills

1. Student is able to recognize and explain patterns for various cogeneration technologies.

2. Student is able to evaluate CHP technologies in terms of their efficiency and environmental impact.

3. Student is able to identify and justify prospective cogeneration technologies.

Social competences

1. Student is aware of the social effects of rational use of energy resources to meet the country's energy needs.

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,

- continuous evaluation for each class skills and expertise by conducting discussions on current issues related to the development of cogeneration.

Tutorials:

Assesment criteria base on the current check messages and two written tests of the accounting tasks

Programme content

Heating systems and CHP-plant parameters. Backpressure and heat extraction-backpressure turbine sets. Gas power plants and gas-steam power plants. Distributed cogeneration using low-power gas turbines and internal combustion piston engines. Innovative technologies - fuel cells, Stirling engines, ORC systems. Technical and economic grounds selection of technological solution of CHP-plant. Energy analysis of CHP plant operation and costs of combined heat and power. Evaluation of cost-CHP. Certificates of origin as instruments of promotion of cogeneration. Methodology for determining the electricity generated in cogeneration.

Content of accounting practice is closely related to the lectures.

Teaching methods

Lecture:

Lecture with multimedia presentation supplemented with examples given on the board.

Tutorials:

Examples solved by students on the board.

Bibliography

Basic

1. J.Szargut, A.Ziębik, Podstawy energetyki cieplnej, PWN, 2000

2. J. Skorek, J. Kalina, Gazowe układy kogeneracyjne, WNT, Warszawa 2005

3. J. Marecki, Gospodarka skojarzona cieplno-elektryczna, WNT, W-wa 1991

Additional

1. R. Bartnik, Elektrownie i elektrociepłownie gazowo-parowe, WNT 2012, 2017

2. K.Buczek, Skojarzone wytwarzanie ciepła i energii elektrycznej w małych elektrociepłowniach, Wydawnictwo i Handel Książkami; Krosno.2001

3. B, Kolanowski, Small Scale Cogeneration Handbook, Fairmont Press, 2011

4. M.Pawlik, F.Strzelczyk, Elektrownie, WNT W-wa 2012, 2017

5. R. Turschmid, Kotłownie i elektrociepłownie przemysłowe, Arkady, W-wa 1988

Breakdown of average student's workload

	Hours	ECTS
Total workload	124	5,0
Classes requiring direct contact with the teacher	54	2,0
Student's own work (literature studies, preparation for tutorials, preparation for tests/exam) [1]	70	3

[1] delete or add other activities as appropriate