COURSE DESCRIPTION CARD - SYLLABUS

Course name
Thermal power engineering [S2EPiO1-ECiO>EC]

Course

Field of study
Industrial and Renewable Energy Systems

Year/Semester
1/2

Area of study (specialization)
Thermal and Renewable Energy

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
15

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

The student should have basic knowledge in the field of energy machinery and equipment and relations with other areas of knowledge. In addition, he should know and understand the basic methods and practical tools in the field of technical thermodynamics in the aspect of thermal energy as well as the main tasks of energy systems in the field of thermal energy and economic development. The student should also have the ability to use concepts and methods in the description of energy facilities and to solve specific problems arising in thermal energy. He can also collect and process information from databases, literature and the Internet.

Course objective

Providing students with theoretical knowledge and technical aspects related to the analysis of thermal energy systems and deepening the knowledge of basic energy technologies, in particular in terms of minimizing their negative impact on the human environment.

Course-related learning outcomes

Knowledge:
he knows the basic processes taking place in the life cycle, technical and technical points in energy, in

particular in energy.
he knows the legal issues related to the design and use of energy systems, including energy devices used in industry.
has knowledge of the structures and processes of managing energy companies, including supervision in energy companies.

Skills:
he can use his knowledge to search for the right sources and interpret the information found in order to solve both standard and non-standard engineering problems.
he can use the knowledge related to the operation of power plants acquired in an environment professionally involved in engineering activities.
can interact with other people as part of teamwork and take a leading role in teams.

Social competences:
he is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in the event of difficulties in solving the problem on his own.
it is ready to initiate activities for the benefit of the public.
is willing to think and act in an entrepreneurial manner

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: The knowledge acquired during the lecture is verified during an examination consisting of 5 choice questions with a score from 0 to 1 and 5 open questions with a score from 0 to 2. Passing threshold: > 50% of points. Final issues, on the basis of which the questions are developed, will be sent to students by e-mail using the university"s e-mail system or on the eKursy platform.

Tutorials: Continuous assessment in each class of skills and competencies through the solution of engineering tasks and analysis of special cases, evaluation of student's knowledge and skills on the basis of the final written test consisting of 4 tasks. Passing threshold: >50% of the points

Project: The skills acquired during the design class will be assessed on the basis of the solution to the engineering problem presented by the student during the last class presentation.

Programme content

Lecture: Introduction to thermal power and characteristics of energy systems. Characteristics of working mediums used in thermal circuits. Thermal turbines (general characteristics, division, principle of operation). Analysis of cycle efficiency: effect of changing p, T at characteristic points. Steam power plant circuits, cogeneration and trigeneration. Gas turbine circuits: methods of improving the efficiency of gas turbine circuits. Industrial boilers: division, construction, principle of operation, auxiliary equipment. Renewable energy sources: general characteristics, applications, advantages, disadvantages. Environmental aspects of investment in the power industry: environmental decision, integrated permit, construction permit. Environmental protection in the energy industry, legal acts: IED, MCP, BAT conclusions, RMŚ.

Tutorials: Analysis of the failure of machines and energy devices. Analysis of the circulation and efficiency of heating plants and power plants. Analysis of low-temperature waste energy recovery systems. Analysis of the combined production of electricity, heat and cold.

Project: Solving an engineering task in the field of thermal energy.

Course topics

Topics in line with curriculum content

Teaching methods

Lecture: A multimedia presentation, illustrated with examples given on the board.

Tutorials: Multimedia presentation, students solving on the board practical tasks indicated by the instructor.

Project: A multimedia presentation illustrated with examples given on the board and carrying out the tasks given by the teacher - practical exercises.

Bibliography

Basic
1. S. Perycz – Turbiny parowe i gazowe, Wyd. Pol. Gdańskiej,1982
2. J. Szargut, A. Ziębik: Podstawy energetyki cieplnej, PWN, Warszawa 1998;
3. T. Chmielniak – Technologie energetyczne, Wyd. Pol. Śląskiej, 2004
4. R. Domański: Magazynowanie energii cieplnej, PWN, Warszawa, 1990.
5. R. Janiczek – Eksploatacja elektrowni parowych, WNT W-wa 1980,
6. S. Wiśniewski, Termodynamika Techniczna
7. S. Wiśniewski, Wymiana ciepła

Additional
1. T. Chmielniak – Turbiny cieplne, Wyd. Pol. Śląskiej, 2004
2. S. Kruczek: Kotły. Konstrukcja i obliczenia, Wydawnictwo Politechniki Wrocławskiej. Wrocław 2001;
3. P. Orłowski, Kotły parowe w energetyce przemysłowej. Zagadnienia eksploatacyjne, WNT, Warszawa 1976;
4. G. Wielgosiński, R. Zarzycki – Technologie i procesy ochrony powietrza, PWN, 2018.
5. Thermodynamic Analysis of Gas Turbine Systems Fueled by a CH4/H2 Mixture; Laith Mustafa, Rafał Ślefarski, Radosław Jankowski; Sustainability; 2024, vol. 16, iss. 2, s. 1-15

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,00
Classes requiring direct contact with the teacher	50	1,70
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,30