



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Thermal power engineering [N2EPI01-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

part-time

Requirements

compulsory

### Number of hours

Lecture

9

Laboratory classes

0

Other

0

Tutorials

9

Projects/seminars

9

### Number of credit points

3,00

### Coordinators

dr inż. Radosław Jankowski

radoslaw.jankowski@put.poznan.pl

### 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

none

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Knowledge acquired in the lecture is verified in an exam consisting of 5 choice questions scored from 0 to 1 and 5 open-ended questions scored from 0 to 2. Passing threshold: > 50% of the points. Passing issues, on the basis of which questions are developed, will be sent to students via email using the university's email system or on the eCourses 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 project classes will be evaluated on the basis of the solution of the engineering problem presented by the student during the presentation at the last class.

## 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, RMS.

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 ciepłone, 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 CH<sub>4</sub>/H<sub>2</sub> 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	0	0,00
Classes requiring direct contact with the teacher	0	0,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	0	0,00