COURSE DESCRIPTION CARD - SYLLABUS

Course name
Thermomechanics in the power engineering [S1Energ2>TwE]

Course

Field of study
Power Engineering

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of thermodynamics, fluid mechanics and the processes of flow and energy conversion in thermal-flow machines and devices. Ability to describe and calculate basic thermodynamic processes and simple thermal energy conversion systems. Ability to effectively self-educate in the field related to the chosen field of study. The student is aware of the need to expand his competence, willingness to cooperate within the team.

Course objective

To become familiar with basic thermodynamic processes, thermodynamic transformations and the equations of conservation of energy. To become familiar with methods of describing various thermodynamic factors used in power engineering. Getting acquainted with methods of numerical modeling of heat flow. Defining boundary conditions. Acquiring the ability to apply the knowledge gained so far to solve technical problems. Acquiring the ability to operate engineering programs for simulating phenomena, interpreting results and validating with experimental data.

Course-related learning outcomes

Knowledge:

1 Structured and theoretically underpinned knowledge of the basic technologies of energy conversion, methods of modeling these processes and solutions used to recover energy. [K1_W06]
2. Ordered and theoretically underpinned knowledge of the impact of energy processes, including processes of energy generation, storage and supply, on the environment and the environment, as well as the dependence of the characteristic parameters of these processes on the type and intensity of this impact [K1_W19].

Skills:
Designing power systems and their components for various applications, evaluating the design by simulation methods and making a preliminary assessment of the characteristic parameters obtained by simulation methods and their impact on economic aspects. [K1_U18].

Social competences:
Awareness of responsibility for one's own work and readiness to conform to the rules of teamwork and bear the responsibility of one's professional role in jointly implemented activities [K1_K06].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Continuous assessment in each class, rewarding activity and quality of perception, and a written final exam
Laboratory: Continuous evaluation of pre-processing and post-processing of numerical analysis tasks performed in the laboratory room
Project: Evaluation of individual power system component design reports with numerical analysis and resulting device characteristic parameters

Programme content

Introduction to numerical methods used in thermal engineering, including the analysis of components in energy systems and an introduction to CFD and CHT analysis, including turbulence modeling and the issue of confidence levels in analyses. Dimensional analysis, similarity conditions, numerical techniques for solving heat transfer problems, and thermal properties of materials.

Course topics

Introduction to numerical methods used in thermal engineering. Components of energy systems in the context of the analysis methods used. Introduction to CFD and CHT analysis. Presentation of turbulence models and the problems of its modeling in the context of the confidence level of the analysis of power equipment components. Dimensional analysis and similarity conditions. Numerical techniques for solving heat flow problems. Boundary conditions. Thermal properties of materials.

Teaching methods

Auditorium lecture, computer lab, project consultation.

Bibliography

Basic:
1. Hobler T.: Ruch ciepła i wymienniki, WNT 1979
2 Ryszard Gryboś Podstawy mechaniki płynów. Cz. 2, Turbulencja, metody numeryczne, zastosowania techniczne

Additional:
1Bejan A.: Heat Transfer, John Wiley & Sons, Inc., New York 1993
2.Ku Zilati Ku Shaari, Mokhtar Awang Engineering Applications of Computational Fluid Dynamics

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00