COURSE DESCRIPTION CARD - SYLLABUS

Course name
Thermodynamics

Course

Field of study
Education in Technology and Informatics

Year/Semester
1/1

Area of study (specialization)

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

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

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
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Piotrowo street 3, 60-965 Poznan, Poland

Responsible for the course/lecturer:
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Prerequisites

Basic knowledge of experimental physics and mathematical analysis. The ability to solve simple physical problems based on the possessed knowledge, the ability to obtain information from the indicated sources. Understanding the need to expand your competences, readiness to cooperate as part of the team.

Course objective

1. Providing students with thermodynamic issues related to phenomena occurring in the world around us, for example related to warming, increasing entropy of the world. Getting acquainted with the

principle of operation and construction of instruments for measuring thermodynamic parameters and thermal machines

2. Developing students' skills in solving basic thermodynamic problems, measuring thermodynamic parameters and analyzing the results

3. Shaping students' teamwork skills

Course-related learning outcomes

Knowledge

1. is able to define the basic thermodynamic parameters, theoretically describe the state of the system and its changes, define the basic thermodynamic functions; explain the processes of reaching the state of thermodynamic equilibrium; transport processes, formulate the principles of thermodynamics, explain the principles of operation of thermal machines. Has ordered knowledge of microworld objects for gas, liquid and solid phases [K2_W01].

2. knows and understands the methods of measuring thermodynamic quantities, can calculate the efficiency of thermal machines, estimate the heat flow and work performed in thermodynamic processes [K2_W06].

Skills

1. is able to obtain information from the literature and apply it to solve thermodynamic problems. Can use mathematics for simple problems of heat transport, work in processes, estimate the efficiency of selected thermal machines, can describe thermodynamic changes. Can demonstrate the advantages of heat engines and heat pumps by determining the efficiency; entropy [K2_U04].

2. can identify the physical and technical problem related to heat transport and work in systems [K2_U09].

3. can select standard measuring devices for a specific task [K_U13].

Social competences

1. is able to work on a designated task independently and cooperate in a team, assuming various roles in it; shows responsibility in this work. Is aware and understands the importance of non-technical aspects and effects of engineering activities, including its impact on the environment [K2_K02].

2. understands the need and knows the possibilities of continuous training (first and second degree studies, postgraduate studies), improving professional, personal and social competences [K2_K07].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:
final written examination/oral examination at the end of the semester

Programme content

Thermodynamic parameters: pressure, volume, temperature, system composition. Spontaneous, forced and reversible processes. Ways of achieving thermodynamic equilibrium. Heat conductivity. Barometric

formula. Barometers, manometers. 0 law of thermodynamics. Thermometer equation, thermometer accuracy. Scaling the thermometer. Absolute temperature scale. Gas thermometer. Liquid thermometer. Thermocouple and thermocouple. Resistance thermometer PT100. Calorimetry. Thermal capacity. Cp, Cv of gases, heat capacity of solids. Molar heat of solids. Ideal and real gas equation of state. Gas transformations, volumetric work in transformations. Polytrope equation. Heat and work, Joul's equivalent. Internal energy of gas. Laws of thermodynamics. Entropy; transfer and generated entropy. Thermal machines. Carnot cycle; efficiency. Entropy in change. Steam engine, Otto, Diesel, Stirling, cyclic jet engine. Refrigerator and heat pump. Brownian motion, fluctuations. J. Perrin's experiments with suspension (evidence of the existence of atoms). Assumptions of the kinetic-molecular theory. Average Clearance. Kinematic interpretation of pressure. Kinematic interpretation of temperature. The principle of energy equipartition. Maxwell-Boltzmann gas particle velocity distribution. Thermodynamic definition of temperature.

Teaching methods

Lecture supported by audiovisual means

Tutorial: solving of the mechanical problems on the blackboard, discussion

Bibliography

Basic

1. Fundamentalsof Physics Extended, vol 2, John Wiley & Sons 2014

Additional

Fundamentals

Breakdown of average student's workload

	Hours	ECTS
Total workload	66	3,0
Classes requiring direct contact with the teacher	34	
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	15	

[1] delete or add other activities as appropriate