COURSE DESCRIPTION CARD - SYLLABUS

Course name
Thermodynamics - thermodynamisc of heat engines [S1TOZ1>Ttmc]

Course

Field of study
Circular System Technologies

Year/Semester
2/3

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
0

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

1,00

Coordinators

dr hab. Maciej Galiński prof. PP
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Lecturers

Prerequisites

Students have knowledge in general chemistry (writing chemical reactions, converting concentrations, knowledge of laboratory glassware and basic laboratory equipment). Students have knowledge in mathematics and physics enabling the introduction of problems in physical chemistry (basic laws of physics, differential calculus). Students are able to prepare solutions of specific concentrations. Students are aware of further development of their competence.

Course objective

The aim of the tutorial is to familiarize the student with the calculations of thermodynamic parameters, determination of changes in thermodynamic functions of physical changes and analysis. Thermodynamic cycles. Fundamentals of thermodynamics of heat machines.

Course-related learning outcomes

Knowledge:
the student has knowledge of physics and chemistry allowing to understand the phenomena and changes occurring in technological and environmental processes (k_w02).
the student has an ordered, theoretically founded knowledge covering key problems in the field of

technical thermodynamics (k_w17).

Skills:
the student is able to obtain information from literature, databases and other sources related to circular system technologies, also in a foreign language, to integrate them, interpret and draw conclusions and formulate opinions (k_u01).
the student has the ability to self-study, is able to use source information in polish and a foreign language in accordance with the principles of ethics, reads with understanding, conducts analyzes, syntheses, summaries, critical assessments and correct conclusions (k_u04).
the student correctly uses in the discussion and correctly uses the nomenclature and terminology in the field of circular system technology, chemistry, technology and chemical engineering, environmental protection and related disciplines, also in a foreign language (k_u05).

Social competences:
the student independently determines and implements the action plan entrusted to him, defining the priorities for its implementation, critically assesses the level of advancement in the implementation of the assigned task (k_k03).
objectively assesses the level of their knowledge and skills, understands the importance of improving professional and personal competences adequately to the changing social conditions and the progress of science (k_k05).
participates in discussions and is able to conduct discussions, is open to different opinions and ready to assertively express feelings and critical comments (k_k08).

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Calculation exercises:
assessment on the basis of points obtained for activity during classes, passing tests and tests. Passing threshold: 60% of points.

Programme content

Thermodynamic parameters and physicochemical functions. Principles of thermodynamics. Heat balance of chemical reactions. Chemical
change and equilibrium. Entropy. Thermodynamic potentials.

Course topics

alculations of thermodynamic parameters and physicochemical functions in the field of thermodynamics: Principles of thermodynamics. Heat balance of physical and chemical changes. Calculation of thermal effects on the basis of table values. Heat capacity Cv and Cp and their dependence on temperature. Calculating the influence of temperature on the thermal effects of chemical processes. Entropy as a state function that determines the direction of the process. Thermodynamic potentials. Heat machines, Carnot engine, diesel engine, Stirling engine, heat pump, refrigeratot.

Teaching methods

Calculation exercises with discussion. Deductive method. Exercises consist of solving partial tasks and solving detailed problems.

Bibliography

Basic
1. P. Atkins, Chemia Fizyczna, PWN Warszawa 2019.
2. P. Atkins, C.A. Trapp, M.P. Cady, C. Giunta, Chemia fizyczna. Zbiór zadań z rozwiązaniami.
3. J. Demichowicz-Pigoniowa, Obliczenia fizykochemiczne, Wydawnictwo Politechniki Wrocławskiej Wrocław 1997.
4. W. Ufnalski, Obliczenia fizykochemiczne, Wydawnictwo Politechniki Warszawskiej 1995.
Additional

1. P. Atkins, Podstawy Chemii Fizycznej, PWN Warszawa 1999.
2. L. Sobczyk, A. Kisza, Chemia fizyczna dla przyrodników, PWN Warszawa 1977.
3. J. Minczewski, Chemia analityczna, PWN Warszawa 2005.

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,00
Classes requiring direct contact with the teacher	16	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	9	0,50