GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physical Chemistry, PG_00048936		
Field of study	Chemistry		
Date of commencement of studies	February 2022	Academic year of realisation of subject	2021/2022
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Physical Chemistry -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Jan Zielkiewicz	
	Teachers		

Lesson type and method of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	30.0	0.0	0.0	60

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	60	10.0	30.0	100

Subject objectives

Learning the principal laws governing physical and chemical processes

Learning outcomes

Course outcome	Subject outcome	Method of verification
K7_U01	ability of critical evaluation of information sources, available in the literature	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
K7_W05	Understanding the origin and essence of one of the most fundamental law of nature: the second law of termodynamics.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
K7_W02	In solving of physical problems, student can use methods of probability theory, and appropriate mathematical tools for description of large population systems.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

Subject contents

1. Kinetic theory of gases - main idea, molecular chaos hypothesis, distribution of particles in space, distribution of energy of particles, maximum likelihood principle. The Boltzmann definition of entropy. Application of classical mechanics, the Hamilton formalism and its application in statistical mechanics. Configurational space and phase space, the Gibbs ensemble and the Liouville theorem. Entropy of ideal gas, the Sackur-Tetrode equation.

2. Simple aplications of the kinetic theory of gases (diffusion, thermal conductivity etc). Paramagnetism, Curie-Weiss model, second order phase transition. basic ideas of polymer physics, polymers in solutions, the Flory-Huggins model

3. Introduction to computer simulations. Models of intermolecular interactions, periodic boundary conditions, numeric solutions of the equation of motion. NpT and NVE ensembles. Monte Carlo simulations, the Metropolis algorithm, equivalence of molecular dynamics and the Monte Carlo methods. Simple methods of analysis of the results of simulations

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Mathematics, Physics, Physical Chemistry,</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>exam</td><td>55.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. J. Stecki Termodynamika statystyczna.

2. A. J. Anselm Podstawy fizyki statystycznej i termodynamiki.

3. N. A. Smirnowa Metody termodynamiki statystycznej w chemii fizycznej.

4. L. D. Landau, E. M. Lifszyc Fizyka statystyczna.

5. M. Łopuszański, B. Pawlikowski Fizyka statystyczna.

6. K. Huang Mechanika statystyczna.

7. T. Hill Introduction to statistical thermodynamics.

8. D. McQuarrie Statistical thermodynamics.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. W. Rubinowicz, W. Królikowski Mechanika teoretyczna.

2. G. Białkowski Mechanika klasyczna.</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">The microstate and the macrostate of the system, intuitive definition of the Boltzmann's entropy

The Gibbs statistical ensemble and distribution of points in the phase space

Absolute entropy of ideal gas, the Sackur-Tetrode equation.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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