



Subject card

Subject name and code	PHYSICAL CHEMISTRY, PG_00049195						
Field of study	Chemistry						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2024/2025		
Education level	first-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	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			7.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Physical Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Piotr Bruździak					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	45.0	0.0	15.0	105
	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	105		5.0		65.0	175
Subject objectives	The aim of the course is to gain the knowledge of the laws governing physical and chemical transitions of systems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_U07	Student defines and describes basic laws and phenomena of chemical thermodynamics. Student solves calculation problems in ideal gas thermodynamics, thermochemistry, chemical equilibria and phase equilibria. Student explains theoretical background of physicochemical experiments in phenomenological thermodynamics. Student applies knowledge of phenomenological thermodynamics in practical laboratory experiments. Student elaborates and interprets results of self-conducted physicochemical experiments.			[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
	K6_W03	Student presents a chosen physicochemical problem on the basis of self study of the subject literature.			[SW2] Assessment of knowledge contained in presentation		

Subject contents	<p>Properties of basic states of matter. Elementary kinetic-molecular structure of matter. Intermolecular interactions. Basic terms of chemical thermodynamics: work, heat, internal energy, reversible and irreversible processes, I law of thermodynamics, enthalpy, heat capacity, thermochemistry, II law of thermodynamics, entropy, - molecular and phenomenological interpretation, consequences of I and II laws of thermodynamics, free energy and enthalpy and their temperature dependence, criteria for spontaneous processes, partial molar thermodynamic quantities, III law of thermodynamics. Chemical equilibria: thermodynamic criteria for chemical equilibrium, dependence of equilibrium constant on temperature and pressure. Phase equilibria: phase rule, Clausius-Clapeyron equation, phase diagrams in one- and multicomponent systems, distillation, rectification, crystallization, extraction. Solutions: ideal and non-ideal solutions, standard states, activity coefficients, colligative properties, thermodynamics of mixing. Surface phenomena. Adsorption. Colloids. Transport phenomena.</p>														
Prerequisites and co-requisites	<p>Preceding subjects: mathematics, physics, general chemistry. Elementary knowledge of matter structure, general chemistry and calculus</p>														
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 844 794 875">Subject passing criteria</th> <th data-bbox="799 844 1141 875">Passing threshold</th> <th data-bbox="1145 844 1484 875">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 882 794 913">short tests + seminar presentation</td> <td data-bbox="799 882 1141 913">60.0%</td> <td data-bbox="1145 882 1484 913">30.0%</td> </tr> <tr> <td data-bbox="453 920 794 952">tests + laboratory reports</td> <td data-bbox="799 920 1141 952">60.0%</td> <td data-bbox="1145 920 1484 952">30.0%</td> </tr> <tr> <td data-bbox="453 958 794 990">exercise - 2 written tests</td> <td data-bbox="799 958 1141 990">50.0%</td> <td data-bbox="1145 958 1484 990">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	short tests + seminar presentation	60.0%	30.0%	tests + laboratory reports	60.0%	30.0%	exercise - 2 written tests	50.0%	40.0%
Subject passing criteria	Passing threshold	Percentage of the final grade													
short tests + seminar presentation	60.0%	30.0%													
tests + laboratory reports	60.0%	30.0%													
exercise - 2 written tests	50.0%	40.0%													
Recommended reading	Basic literature	<p>1. Chemia fizyczna, P. W. Atkins, PWN. 2. Chemia fizyczna, 1.Podstawy fenomenologiczne, K. Pigoń i Z. Ruziewicz, PWN. 3. Chemia fizyczna. Ćwiczenia laboratoryjne. Red. H. Strzelecki i W. Grzybkowski, Wydawnictwo PG.</p>													
	Supplementary literature	<p>1. Chemia fizyczna, Część I, W. Libuś, Wydawnictwo PG. 2. Chemia fizyczna. Zbiór zadań z rozwiązaniami, P.W. Atkins, C.A. Trapp, M.P. Cady, C. Giunta, PWN. 3. Zbiór zadań testowych z chemii fizycznej, I. Uruska, Wydawnictwo PG. 4. Eksperymentalna chemia fizyczna dla inżynierów, Praca zbiorowa, Red. H. Strzelecki, Wydawnictwo PG. 5. Chemia fizyczna. Laboratorium fizykochemiczne, L. Komorowski, A. Olszowski, PWN.</p>													
	eResources addresses	Adresy na platformie eNauczanie:													
Example issues/ example questions/ tasks being completed															
Work placement	Not applicable														