



Subject card

Subject name and code	Physicochemical Tests of Solutions , PG_00053219						
Field of study	Chemistry						
Date of commencement of studies	October 2020		Academic year of realisation of subject		2022/2023		
Education level	first-cycle studies		Subject group		Optional subject group 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	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		4.0		
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. Dorota Warmińska				
	Teachers		dr hab. inż. Maciej Śmiechowski				
			dr hab. inż. Piotr Bruździak				
			prof. dr hab. inż. Janusz Stangret				
			dr hab. inż. Dorota Warmińska				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	15.0	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		5.0		35.0	100
Subject objectives	The aim of the subject is to familiarize the students with the physicochemical properties of solutions used for their characterization and the practical applications of measurements of these properties.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U03] can make detailed documentation of the results of self-conducted experiments and prepare a report describing these results		The student conducts experimental measurements and computer simulations in the field of physicochemistry of solutions using various techniques and is able to document and interpret their results.		[SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment		
	K6_W03		The student explains the observed physicochemical properties of solutions and predicts some of their properties on the basis of microscopic structural features.		[SW1] Assessment of factual knowledge		
	[K6_U01] knows how to get information from literature, databases and other sources, can integrate the information obtained, interpret and critically evaluate it, and draw conclusions, and to formulate and justify the opinions		The student searches the sources for the values of physicochemical properties of solvents used in technological processes and selects the solvent for the process.		[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information		
	[K6_U05] can, on the basis of the collected experimental or source material, prepare an oral communication with a multimedia presentation		The student presents a multimedia presentation on a given topic related to the physicochemical properties of various types of solutions.		[SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment		

Subject contents	<i>Lecture:</i> Resume of phenomenological thermodynamics: principles of thermodynamics, thermodynamic potentials, Gibbs-Duhem equation, partial quantities, apparent quantities, excess quantities; Basic information about solutions: definitions, classification of solvents and solutes; Water as solvent; Imperfect solutions: regular and athermal solutions; Advanced colligative properties: osmotic coefficients, osmotic virial equation; Equations of state of liquids and solutions; Gas solubility; Influence of high pressures and temperatures on solutions; Supercritical fluids; Advanced solution electrochemistry: activity coefficients of electrolytes; Macromolecule and polymer solutions: Flory-Huggins theory; Colloidal solutions; Spectroscopic studies of solutions. <i>Laboratory:</i> Exercises in physicochemical properties of solutions and methods of computer simulation of solutions. <i>Seminar:</i> Calculations in advanced physicochemistry of solutions: activity coefficients, pH, stability constants of complexes. Presentations extending the topics of the lectures.		
Prerequisites and co-requisites	Successfully finished subjects: Mathematics, Physics, Physical chemistry		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lab reports	60.0%	30.0%
	Multimedia presentation	50.0%	10.0%
	Calculations test	50.0%	20.0%
	Lecture test	50.0%	40.0%
Recommended reading	Basic literature	<ol style="list-style-type: none">1. H. Buchowski, W. Ufnalski, Roztwory, WNT, Warszawa 1995.2. K. Pigoń, Z. Ruziewicz, Chemia fizyczna. Tom 1. Podstawy fenomenologiczne, PWN, Warszawa 2005.3. E. T. Dutkiewicz, Fizykochemia powierzchni, WNT, Warszawa 1998.4. Praca zbiorowa, Chemia fizyczna, PWN, Warszawa 1980.5. A. Kiswa, Elektrochemia I. Jonika, WNT, Warszawa 2000.	
	Supplementary literature	<ol style="list-style-type: none">1. J. J. Fiałkow, A. N. Żytomirskij, J. A. Tarasenko, Chemia fizyczna roztworów niewodnych, PWN, Warszawa 1983.2. A. Olszowski, L. Komorowski, Chemia fizyczna. Tom 4. Laboratorium fizykochemiczne, PWN, Warszawa 2013.3. L. L. Lee, Molecular Thermodynamics of Electrolyte Solutions, World Scientific, Singapore 2008.4. J. H. Hildebrand, J. M. Prausnitz, R. L. Scott, Regular and Related Solutions: The Solubility of Gases, Liquids, and Solids, Van Nostrand Reinhold Company, New York 1970.	
	eResources addresses	Adresy na platformie eNauczanie: Badania fizykochemiczne roztworów 2022 - Moodle ID: 28418 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=28418	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		