



Subject card

Subject name and code	Physicochemical Tests of Solutions , PG_00053219						
Field of study	Chemistry						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
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. Maciej Śmiechowski					
	Teachers	dr hab. inż. Maciej Śmiechowski 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 course is to familiarize students with the current state of knowledge in the field of experimental physicochemistry of solutions and modeling of solution properties and to provide in-depth knowledge about anhydrous systems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W03	The student relates the expected properties of a solvent with molecular descriptors and knows the basics of theory of modeling of solution properties.			[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 uses physicochemical databases to predict the properties of liquid mixtures and select a solvent with the desired properties.			[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
	[K6_U03] can make detailed documentation of the results of self-conducted experiments and prepare a report describing these results	The student prepares reports on his/her own experiments containing appropriate tables and charts, analyzes the obtained data based on the physicochemical model and determines the accuracy and precision of the obtained results based on literature data.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task		
	[K6_U05] can, on the basis of the collected experimental or source material, prepare an oral communication with a multimedia presentation	The student prepares a multimedia presentation on a given topic related to the physical chemistry of solutions.			[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task		

Subject contents	<p><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.</p> <p><i>Laboratory:</i> Exercises in measuring the physicochemical properties of solutions.</p> <p><i>Seminar:</i> Calculations in advanced physicochemistry of solutions: osmometry, activity coefficients, stability constants of complexes. Presentations extending the topics of the lectures.</p>																	
Prerequisites and co-requisites	Completion of basic course in mathematics, physics, and physical chemistry at the first-cycle level of studies.																	
Assessment methods and criteria	<table border="1" data-bbox="448 568 1487 741"> <thead> <tr> <th data-bbox="448 568 794 607">Subject passing criteria</th> <th data-bbox="794 568 1141 607">Passing threshold</th> <th data-bbox="1141 568 1487 607">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 607 794 645">Written test in tutorial exercises</td> <td data-bbox="794 607 1141 645">50.0%</td> <td data-bbox="1141 607 1487 645">20.0%</td> </tr> <tr> <td data-bbox="448 645 794 683">Laboratory reports</td> <td data-bbox="794 645 1141 683">60.0%</td> <td data-bbox="1141 645 1487 683">30.0%</td> </tr> <tr> <td data-bbox="448 683 794 721">Multimedia presentation</td> <td data-bbox="794 683 1141 721">50.0%</td> <td data-bbox="1141 683 1487 721">10.0%</td> </tr> <tr> <td data-bbox="448 721 794 741">Written test in lecture material</td> <td data-bbox="794 721 1141 741">50.0%</td> <td data-bbox="1141 721 1487 741">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Written test in tutorial exercises	50.0%	20.0%	Laboratory reports	60.0%	30.0%	Multimedia presentation	50.0%	10.0%	Written test in lecture material	50.0%	40.0%
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Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. K. Pigoń, Z. Ruziewicz, <i>Chemia fizyczna. Tom 1. Podstawy fenomenologiczne</i>, PWN, Warszawa 2005. 2. A. Olszowski, L. Komorowski, <i>Chemia fizyczna. Tom 4. Laboratorium fizykochemiczne</i>, PWN, Warszawa 2013. 3. Praca zbiorowa, <i>Chemia fizyczna</i>, PWN, Warszawa 1980. 																
	Supplementary literature	<p>Series "Lectures in physical chemistry":</p> <ol style="list-style-type: none"> 1. H. Buchowski, W. Ufnalski, <i>Roztwory</i>, WNT, Warszawa 1995. 2. H. Buchowski, W. Ufnalski, <i>Podstawy termodynamiki</i>, WNT, Warszawa 1994. 3. J. Sadlej, <i>Spektroskopia molekularna</i>, WNT, Warszawa 2002. 4. A. Kiswa, <i>Elektrochemia I. Jonika</i>, WNT, Warszawa 2000. 5. H. Buchowski, W. Ufnalski, <i>Fizykochemia gazów i cieczy</i>, WNT, Warszawa 1998. 																
	eResources addresses	<p>Adresy na platformie eNauczanie:</p> <p>Badania Fizykochemiczne Roztworów 2024 - Moodle ID: 36867 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36867</p>																
Example issues/ example questions/ tasks being completed																		
Work placement	Not applicable																	