



Subject card

Subject name and code	Physical Chemistry, PG_00048785						
Field of study	Green Technologies						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2022/2023		
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	4	ECTS credits			6.0		
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	dr hab. inż. Dorota Warmińska					
	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	0.0	90
	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	90	5.0		55.0	150	
Subject objectives	The aim of the subject is familiarizing the students with basic concepts in electrochemistry, chemical kinetics and surface phenomena.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W02] has a basic knowledge of chemistry including general chemistry, inorganic, organic, physical, analytical, including the knowledge necessary to describe and understand the phenomena and chemical processes occurring in the environment; measurement and the determination of the parameters of these processes.	Student knows ecological and social consequences of practical implementations of the phenomena under study. Student efficiently uses basic concepts involved in the subject, is conscious of their mutual relations and is capable to explain these relations.			[SW1] Assessment of factual knowledge		
	[K6_U03] is able to use information and communication technologies relevant to the common tasks of engineering, is able to use known methods and mathematical-physical models to describe and explain phenomena and chemical processes	Student can analyse basic problems in the field and construct solving algorithms. Student is oriented in basic measuring techniques in physical chemistry and is familiar with relevant instrumentation. Student understands physico-chemical formulae and expressed verbally their meaning. Student is capable of expressing assorted relations verbally with precision allowing for writing a suitable equation.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		

Subject contents	<p>Interfacial phenomena. Surface tension. Surfactants. Adsorption on liquid-gas interface. Gibbs adsorption isotherm. Characterization of colloidal particles. Structure of colloidal particle. Electrokinetic phenomena. Coalescence and coagulation Adsorption on solid-gas interface. Langmuir isotherm. BET isotherm. Thermodynamic description.</p> <p>Electrolyte solution. Theory of strong electrolytes. Activity coefficients. Electrical conductivity. Electrode-solution interface. Interfacial potentials. Electrodes and galvanic cells. Thermodynamics of galvanic cells. Electromotive force measurements. Practical aspects of potentiometry. The determination of pH. Standard reduction potentials. The electrochemical series. Electrode polarization. Electrolysis. Galvanic sources of energy. Corrosion.</p> <p>Chemical kinetics. Reaction rates. Rate laws and rate constants. Elementary reactions. Reaction mechanisms. Homogeneous and heterogeneous catalysis. Enzymatic processes. Chain reactions. Explosion.</p>														
Prerequisites and co-requisites	Knowledge of mathematics, physics and inorganic chemistry at BSc level.														
Assessment methods and criteria	<table border="1" data-bbox="448 479 1487 645"> <thead> <tr> <th data-bbox="448 479 794 510">Subject passing criteria</th> <th data-bbox="794 479 1141 510">Passing threshold</th> <th data-bbox="1141 479 1487 510">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 510 794 542">2 written tests in calculations</td> <td data-bbox="794 510 1141 542">50.0%</td> <td data-bbox="1141 510 1487 542">30.0%</td> </tr> <tr> <td data-bbox="448 542 794 602">performing 5 experiments and delivering the reports</td> <td data-bbox="794 542 1141 602">100.0%</td> <td data-bbox="1141 542 1487 602">30.0%</td> </tr> <tr> <td data-bbox="448 602 794 645">written exam</td> <td data-bbox="794 602 1141 645">50.0%</td> <td data-bbox="1141 602 1487 645">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	2 written tests in calculations	50.0%	30.0%	performing 5 experiments and delivering the reports	100.0%	30.0%	written exam	50.0%	40.0%
Subject passing criteria	Passing threshold	Percentage of the final grade													
2 written tests in calculations	50.0%	30.0%													
performing 5 experiments and delivering the reports	100.0%	30.0%													
written exam	50.0%	40.0%													
Recommended reading	<table border="1" data-bbox="448 651 1487 1016"> <tbody> <tr> <td data-bbox="448 651 794 775">Basic literature</td> <td colspan="2" data-bbox="794 651 1487 775"> 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 </td> </tr> <tr> <td data-bbox="448 775 794 976">Supplementary literature</td> <td colspan="2" data-bbox="794 775 1487 976"> 1. Wykłady z chemii fizycznej (praca zbiorowa). Wydawnictwo NT 2. Chemia fizyczna. 2.Fizykochemia molekularna. K.Pigoń i Z.Ruziewicz, PWN 3.Eksperymentalna chemia fizyczna. Red.: H.Strzelecki, Wydawnictwo PG 4. Zadania z chemii fizycznej, Red. I.Uruska, Wydawnictwo PG 5. Chemia fizyczna. Zbiór zadań z rozwiązaniami. P.W.Atkins i inni, PWN </td> </tr> <tr> <td data-bbox="448 976 794 1016">eResources addresses</td> <td colspan="2" data-bbox="794 976 1487 1016">Adresy na platformie eNauczanie:</td> </tr> </tbody> </table>			Basic literature	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		Supplementary literature	1. Wykłady z chemii fizycznej (praca zbiorowa). Wydawnictwo NT 2. Chemia fizyczna. 2.Fizykochemia molekularna. K.Pigoń i Z.Ruziewicz, PWN 3.Eksperymentalna chemia fizyczna. Red.: H.Strzelecki, Wydawnictwo PG 4. Zadania z chemii fizycznej, Red. I.Uruska, Wydawnictwo PG 5. Chemia fizyczna. Zbiór zadań z rozwiązaniami. P.W.Atkins i inni, PWN		eResources addresses	Adresy na platformie eNauczanie:				
Basic literature	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														
Supplementary literature	1. Wykłady z chemii fizycznej (praca zbiorowa). Wydawnictwo NT 2. Chemia fizyczna. 2.Fizykochemia molekularna. K.Pigoń i Z.Ruziewicz, PWN 3.Eksperymentalna chemia fizyczna. Red.: H.Strzelecki, Wydawnictwo PG 4. Zadania z chemii fizycznej, Red. I.Uruska, Wydawnictwo PG 5. Chemia fizyczna. Zbiór zadań z rozwiązaniami. P.W.Atkins i inni, PWN														
eResources addresses	Adresy na platformie eNauczanie:														
Example issues/ example questions/ tasks being completed	<p>1. Description of the phase diagram for a simple eutectic system.</p> <p>2. Description of the measurement of electrical conductivity.</p> <p>3. Hitthorf method for ion transfer numbers.</p>														
Work placement	Not applicable														