



## Subject card

Subject name and code	PHYSICAL CHEMISTRY, PG_00049198						
Field of study	Chemistry						
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			7.0		
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. Janusz Stangret					
	Teachers	dr hab. inż. Piotr Bruździak prof. dr hab. inż. Janusz Stangret dr hab. Aneta Panuszko dr inż. Joanna Grabowska					
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_W03	Student has a basic knowledge of theoretical chemistry. Student defines and describes basic laws and phenomena of electrochemistry, chemical kinetics and elementary molecular spectroscopy. Student solves calculation problems in electrochemistry, chemical kinetics and surface science. Student explains theoretical background of physicochemical experiments in electrochemistry, chemical kinetics, surface science and electronic spectroscopy. Student applies knowledge of electrochemistry, chemical kinetics, surface science and electronic spectroscopy in practical laboratory experiments.			[SW1] Assessment of factual knowledge		
	[K6_U03] can make detailed documentation of the results of self-conducted experiments and prepare a report describing these results	Student elaborates and interprets results of self-conducted physicochemical experiments. Student presents the results in the form of a report.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information		

Subject contents	<p>Ionic equilibria in solutions: ion activity, electrolyte activity, activity coefficients, theory of strong electrolytes. Electric conductivity of electrolyte solutions. Interfacial electrical potential differences. Galvanic cells: cell thermodynamics, electromotive force (EMF), standard electrode potential, half-cell classification, galvanic series, EMF measurement, pH measurement. Electrode polarization and electrode processes. Electrochemical analytical methods. Chemical kinetics: basic terminology, experimental methods, basic kinetic equations, kinetics of compound reactions, mechanisms of elementary reactions. Catalysis: homo- and heterogenic, enzymatic. Theoretical background of molecular spectroscopy: rotatory, vibrational, electronic, NMR and EPR. Electrical properties of molecules.</p>																	
Prerequisites and co-requisites	<p>Preceding subjects: mathematics, physics, general chemistry, physical chemistry 3rd semester. Knowledge of problems from physical chemistry 3rd semester.</p>																	
Assessment methods and criteria	<table border="1" data-bbox="448 741 1487 913"> <thead> <tr> <th data-bbox="448 741 794 779">Subject passing criteria</th> <th data-bbox="794 741 1141 779">Passing threshold</th> <th data-bbox="1141 741 1487 779">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 779 794 817">short tests + seminar presentation</td> <td data-bbox="794 779 1141 817">60.0%</td> <td data-bbox="1141 779 1487 817">20.0%</td> </tr> <tr> <td data-bbox="448 817 794 855">exercise - 2 written tests</td> <td data-bbox="794 817 1141 855">50.0%</td> <td data-bbox="1141 817 1487 855">20.0%</td> </tr> <tr> <td data-bbox="448 855 794 893">tests + laboratory reports</td> <td data-bbox="794 855 1141 893">60.0%</td> <td data-bbox="1141 855 1487 893">20.0%</td> </tr> <tr> <td data-bbox="448 893 794 913">Written exam</td> <td data-bbox="794 893 1141 913">50.0%</td> <td data-bbox="1141 893 1487 913">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	short tests + seminar presentation	60.0%	20.0%	exercise - 2 written tests	50.0%	20.0%	tests + laboratory reports	60.0%	20.0%	Written exam	50.0%	40.0%
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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. Grzybowski, Wydawnictwo PG. 4. Zbiór zadań testowych z chemii fizycznej, I. Uruska, Wydawnictwo PG. 5. Z. Kęcki, Podstawy spektroskopii molekularnej, PWN. 6. Zbiór zadań z chemii fizycznej, I. Uruska, Wydawnictwo Pg, Gdańsk 1997. 7. L.Komorowski, A. Olszowski Chemia Fizyczna. Laboratorium fizykochemiczne, Wydawnictwo PWN, 2013.</p>																
	Supplementary literature	<p>1. Elektrochemia, W. Libuś, Z. Libuś, PWN. 2. Chemia fizyczna, 2. Fizykochemia molekularna, K. Pigoń i Z. Ruziewicz, PWN. 3. Chemia fizyczna. Zbiór zadań z rozwiązaniami, P.W. Atkins, C.A. Trapp, M.P. Cady, C. Giunta, PWN. 4. Eksperymentalna chemia fizyczna dla inżynierów, Praca zbiorowa, Red. H. Strzelecki, Wydawnictwo PG. 5. Artykuły źródłowe i opracowania monograficzne. 6. Chemia fizyczna t.3 obliczenia fizykochemiczne, J. Demichowicz-Pigoniowa, A. Olszowski, Wydawnictwo PWN, 2010. 7. M. Pilarczyk, Zadania z chemii fizycznej, PG, Gdańsk 1996. 8. Detailed bibliography can be found in H. Strzelecki, W. Grzybowski "Chemia fizyczna - Ćwiczenia laboratoryjne" Wydawnictwo PG, Gdańsk, 2004</p>																
	eResources addresses																	

Example issues/ example questions/ tasks being completed	
Work placement	Not applicable