

KARTA PRZEDMIOTU**I. Dane podstawowe**

Nazwa przedmiotu	Chemia fizyczna
Nazwa przedmiotu w języku angielskim	Physical chemistry
Kierunek studiów	Biotechnologia
Poziom studiów (I, II, jednolite magisterskie)	I
Forma studiów (stacjonarne, niestacjonarne)	stacjonarne
Dyscyplina	
Język wykładowy	Grupy w języku polskim – język polski, grupy w języku angielskim – język angielski

Koordinator przedmiotu/osoba odpowiedzialna	Dr Ludomir Kwietniewski
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Forma zajęć (<i>katalog zamknięty ze słownika</i>)	Liczba godzin	semestr	Punkty ECTS
wykład	30	II	6
ćwiczenia	30	II	

Wymagania wstępne	Basics of chemistry, physics and mathematics
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II. Cele kształcenia dla przedmiotu

1. To gain a knowledge of the general principles of thermodynamics, electromagnetic properties of molecules, theories of adsorption, chemical kinetics, rate laws for chemical reactions and reaction mechanisms.

III. Efekty uczenia się dla przedmiotu wraz z odniesieniem do efektów kierunkowych

Symbol	Opis efektu przedmiotowego	Odniesienie do efektu kierunkowego
WIEDZA		
W_01	describes issues in the field of physics, mathematics and chemistry required to understand and interpret basic natural phenomena and processes	K_W02
W_02	presents knowledge in terms of statistics and computer science giving the possibility to describe and interpret natural phenomena especially relevant for biotechnology	K_W03
W_03	presents the principles of health, safety work and ergonomics, indicates the psychophysical possibilities of a human in the work environment	K_W09

UMIEJĘTNOŚCI		
U_01	carries out observations and performs physical, chemical and biological measurements	K_U02
U_02	describes, explains and interprets chemical and physicochemical phenomena at an advanced level	K_U08
U_03	uses knowledge in the field of physical-chemical conditions of phase boundary in order to describe and interpret life sciences phenomena	K_U09
U_04	performs qualitative and quantitative analyzes by using classical and instrumental method	K_U10
U_05	prepares a written study on issues related to biotechnology sciences in the language in which classes are conducted and in another modern language using the scientific language	K_U13
U_06	uses statistical methods and information technology to describe natural phenomena as well as to analyze and process experimental data	K_U14
U_07	designs and performs research tasks or expertise in the field of chemistry, biochemistry and biology	K_U15
U_08	learns independently in a targeted manner in the field of biotechnology, updates his knowledge and skills, applies new research techniques and plans his professional development	K_U17
KOMPETENCJE SPOŁECZNE		
K_01	possesses appropriate habits required to the work in scientific laboratories especially in aseptic conditions, proceeds according to work safety regulations, knows how to react in states of danger	K_K04

IV. Opis przedmiotu/ treści programowe

<p>First Law of Thermodynamics. Thermodynamic functions. Hess's law and Kirchhoff's law. Second Law of Thermodynamics. Entropy in irreversible processes.</p> <p>Molecules in electric, magnetic and electromagnetic fields. Dipole moments. Electrical double layer. Classification of electricity conductors. Electrolytes and their properties.</p> <p>Theoretical ground of kinetics. Rate of chemical reactions. Kinetic equations. Orders of chemical reactions. Activation energy. Catalysis – homo- and heterogeneous.</p> <p>Partition of substances between two phases. Homo- and heterogeneous solid surfaces. Physical and chemical adsorption. Adsorptive surface layers. Theories and isotherms of adsorption.</p>
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V. Metody realizacji i weryfikacji efektów uczenia się

Symbol efektu	Metody dydaktyczne <i>(lista wyboru)</i>	Metody weryfikacji <i>(lista wyboru)</i>	Sposoby dokumentacji <i>(lista wyboru)</i>
WIEDZA			

W_01	Conventional lecture	Exam	Rated text of the written work
W_02	Laboratory classes	Colloquium/test/written test	Completed and evaluated colloquium/test/written test
W_03	Laboratory classes	Observation	Evaluation card
UMIEJĘTNOŚCI			
U_01	Laboratory classes	Report	Print / Report file
U_02	Laboratory classes Conventional lecture	Report Exam	Print / Report file Rated text of the written work
U_03	Laboratory classes	Report	Print / Report file
U_04	Laboratory classes	Report	Print / Report file
U_05	Laboratory classes	Report	Print / Report file
U_06	Laboratory classes	Report	Print / Report file
U_07	Laboratory classes	Report	Print / Report file
U_08	Laboratory classes Conventional lecture	Colloquium/test/written test Exam	Completed and evaluated colloquium/test/written test Rated text of the written work
KOMPETENCJE SPOŁECZNE			
K_01	Laboratory classes	Observation	Evaluation card

VI. Kryteria oceny, wagi

Lecture: Grade from the written exam (100 %).

Classes: Written tests in the form of colloquia and / or tests on issues from the main chapters (80%), preparation of written reports on the classes (8%), assessment of student's activity during classes (theoretical preparation for classes, practical exercises, activity, ability to work in a group, compliance with health and safety rules) (12%).

Mark	Evaluation criteria	
verygood (5)	the student realizes the assumed learning outcomes at a very good level	the student demonstrates knowledge of the education content at the level of 91-100%

overgood (4.5)	the student accomplishes the assumed learning outcomes an over good level	the student demonstrates knowledge of the education content at the level of 86-90 %
good(4)	the student accomplishes the assumed learning outcomes at a good level	the student demonstrates knowledge of the education content at the level of 71-85%
quitegood(3.5)	the student accomplishes the assumed learning outcomes at a quite good level	the student demonstrates knowledge of the education content at the level of 66-70%
sufficient (3)	the student accomplishes the assumed learning outcomes at a sufficientlevel	the student demonstrates knowledge of the education content at the level of 51-65%
insufficient (2)	the student accomplishes the assumed learning outcomes at an insufficientlevel	the student demonstrates knowledge of the education content below the level of 51%

VII. Obciążenie pracą studenta

Forma aktywności studenta	Liczba godzin
Liczba godzin kontaktowych z nauczycielem	60
Liczba godzin indywidualnej pracy studenta	90

VIII. Literatura

Literatura podstawowa
1. P. Atkins. The Elements of Physical Chemistry, 6th edition. Oxford University Press, 2013.
2. P. Atkins, J. De Paula. Physical Chemistry for Life Science, 2nd edition. Oxford University Press, 2010.
Literatura uzupełniająca
1. C. Trapp, M. Caddy. Solutions Manual to accompany Physical Chemistry for the Life Sciences. Oxford University Press, 2011