

Course Syllabus

I. General Information

Course name	General chemistry with elements of physical chemistry
Programme	Biotechnology
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	BSc
Form of studies (full-time, part-time)	part-time
Discipline	Biological sciences
Language of instruction	English

Course coordinator/person responsible	Dr Ludomir Kwietniewski
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Type of class (<i>use only the types mentioned below</i>)	Number of teaching hours	Semester	ECTS Points
lecture	45	I, II	10
tutorial	20	I, II	
classes	45	I, II	
laboratory classes			
workshops			
seminar			
introductory seminar			
foreign language classes			
practical placement			
field work			
diploma laboratory			
translation classes			
study visit			

Course pre-requisites	Basics of chemistry, physics and mathematics.
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II. Course Objectives

1. To acquaint students with laboratory equipment and laboratory routines, learn about essential chemical laws, familiarize with the structure of the atom and the periodic table of elements. Discussion of the properties of representative elements, their preparation and application.
2. To familiarize students with chemical concepts to describe chemical processes, solutions, chemical formulas and chemical reaction as well as solution concentrations, electrolytic dissociation and pH of solutions and classical chemical thermodynamics.
3. Discussion of Bronsted and Lewis theory and processes occurring in buffer solutions and during hydrolysis of salt.
4. To familiarize students with definitions and descriptions of interfaces phenomena, e.g. adsorption and wetting.

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	describes issues in the field of 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 general and physical chemistry	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
SKILLS		
U_01	carries out observations and performs physical and chemical 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 general and physical chemistry 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	K_U15
U_08	learns independently in a targeted manner in the field of general and physical chemistry, updates his knowledge and skills, applies new research techniques	K_U17
SOCIAL COMPETENCIES		
K_01	possesses appropriate habits required to the work in scientific laboratories, proceeds according to work safety regulations, knows how to react in states of danger	K_K04

IV. Course Content

Essential chemical laws. Periodic table of elements and the structure of atoms. Properties of representative elements, their preparation and application. Chemical bonds. Chemical equilibrium. Theories of acids and bases. Solubility and solubility product. The concept of ionic product of water and pH. Hydrolysis of salt. Oxidation and reduction reactions. Physical chemistry, thermodynamics. The first law of thermodynamics. The second law of thermodynamics. Enthalpy, entropy and Gibbs' potential. Division of substances between two phases, extraction. Adsorptive surface layers, adsorption isotherms. Rate of chemical reactions, kinetic equation. Theories of chemical kinetics. Electrochemistry.

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods (choose from the list)	Forms of assessment (choose from the list)	Documentation type (choose from the list)
KNOWLEDGE			
W_01	Conventional lecture	Exam	Evaluated written paper
W_02	Laboratory classes	Test/written test	Evaluated test/written test
W_03	Laboratory classes	Observation	Rating card
SKILLS			
U_01	Laboratory classes	Report	Report printout / Report file
U_02	Laboratory classes Conventional lecture	Report Exam	Report printout / Report file Evaluated written paper
U_03	Laboratory classes	Report	Report printout / Report file
U_04	Laboratory classes	Report	Report printout / Report file
U_05	Laboratory classes	Report	Report printout / Report file
U_06	Laboratory classes	Report	Report printout / Report file
U_07	Laboratory classes	Report	Report printout / Report file
U_08	Laboratory classes Conventional lecture	Test/written test Exam	Evaluated test/written test Evaluated written paper
SOCIAL COMPETENCIES			
K_01	Laboratory classes	Observation	Rating card
K_01	Laboratory classes	Observation	Rating card
K_01	Laboratory classes	Observation	Rating card

VI. Grading criteria, weighting factors.....

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%).

Tutorial: Written tests in the form of colloquia and / or tests on issues from the main chapters (90%), activity.

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. Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	110
Number of hours of individual student work	140

VIII. Literature

Basic literature
1. P. Atkins, Physical Chemistry, 10th edition, P. Atkins, J. De Paula, Oxford University Press 2014.
2. P. Atkins, The Elements of Physical Chemistry, 6th edition, Oxford University Press 2013.
3. P. Atkins, J. De Paula, Physical Chemistry for Life Science, 2nd edition, Oxford University Press 2010.
4. E. Brady, J.R. Holum, Fundamentals To of Chemistry, J. Wiley, New York, 1988.