COURSE SYLLABUS

I. General Information

Course name	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	chemical sciences
Language of instruction	English

Course coordinator/person responsible	dr Anna Borówka

Type of class	Number of teaching hours	Semester	ECTS points
lecture	30 (of which 10 remote)	II	6 (of which 1 remote)
classes	30	II	

Course pre-requisites	Basics of chemistry, physics and mathematics

II. Course Objectives

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. 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 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 physicochemical 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 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 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

First Law of Thermodynamics. Thermodynamic functions. Hess's law and Kirchhoff's law. Second Law of Thermodynamics. Entropy in irreversible processes.
Molecules in electric, magnetic and electromagnetic fields. Dipole moments. Electrical double layer. Classification of electricity conductors. Electrolytes and their properties. Electrochemistry.
Theoretical ground of kinetics. Rate of chemical reactions. Kinetic equations. Orders of chemical reactions. Activation energy. Catalysis – homo- and heterogeneous.
Partition of substances between two phases. Homo- and heterogeneous solid surfaces. Physical and chemical adsorption. Theories and isotherms of adsorption.

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

Symbol	Didactic methods	Forms of assessment	Documentation type
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

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%).

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)	60 (of which 10 remote)
Number of hours of individual student work	90 (of which 15 - preparation for remote classes)

VIII. Literature

Basic literature
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.
Additional literature
1. C. Trapp, M. Caddy. Solutions Manual to accompany Physical Chemistry for the Life Sciences. Oxford University Press, 2011