

Course Syllabus

I. General Information

Course name	Physico-chemistry of biological systems
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 Artur Banach
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Type of class (<i>use only the types mentioned below</i>)	Number of teaching hours	Semester	ECTS Points
lecture	15	I	3
tutorial			
classes	30	I	
laboratory classes			
workshops			
seminar			
introductory seminar			
foreign language classes			
practical placement			
field work			
diploma laboratory			
translation classes			
study visit			

Course pre-requisites	Knowledge of chemistry, physics and mathematics on high school level
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II. Course Objectives

Familiarization students with the structure and properties of matter.
Knowing the basic physical and chemical processes occurring in biological systems.
Familiarization students with the methods of measurements interactions in biological.
Discussion of the application of the physico-chemical properties of biological systems in biotechnology.

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	Student presents terminology used in physico-chemistry, defines phenomena and biophysical processes occurring in biological system	K_W01
W_02	describes issues in the field of physics, mathematics and chemistry required to understand and interpret basic natural phenomena and processes in biological system	K_W02
W_03	presents knowledge in terms of statistics and computer science giving the possibility to describe and interpret natural phenomena especially relevant for physico-chemistry of biological system	K_W03
W_04	presents knowledge in the field of laboratory techniques and research tools used in physico-chemistry of biological systems	K_W05
W_05	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	applies techniques and research tools in the field of physico-chemistry of biological system	K_U01
U_02	carries out observations and performs physical, chemical and biological measurements	K_U02
U_03	prepares a written study on issues related to physico-chemistry of biological system in English using the scientific language	K_U13
U_04	designs and performs research tasks or expertise in the field of physico-chemistry of biological system	K_U15
U_05	learns independently in a targeted manner in the field of physico-chemistry of biological system, updates his knowledge and skills, applies new research techniques and plans his professional development	K_U17
SOCIAL COMPETENCIES		
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. Course Content

Lecture: Definition of biological systems. Composition of matter. Physical states of matter (solids, liquids, gases, plasma). Kinetic molecular theory of matter. Physical and chemical properties of matter (diffusion, osmosis, surface tension, viscosity, hydrophilicity and hydrophobicity). Liquid mixtures – dispersion systems (colloids, suspensions). Emulsions and the role of emulsifiers. Surface Active Agents, antifoams – the structure, properties (amphiphilic character, micelle, liposomes), applications. The role of HLB and CMC in determination properties of surfactants (applications). The study on properties of proteins (salting out, coagulation, denaturation, isoelectric point). Study of hydrophilic and hydrophobic properties of materials (determination of contact angle, Young's

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 Laboratory analysis	Written exam Test	Written exam Completed and evaluated test
W_02	Conventional lecture Laboratory analysis	Written exam Test	Written exam Completed and evaluated test
W_03	Laboratory analysis	Report	Protocol / Print / Report file
W_04	Laboratory analysis	Observation	Rating card / Report from observation
W_05	Laboratory analysis	Observation	Rating card / Report from observation
SKILLS			
U_01	Laboratory classes	Report	Protocol / Print / Report file
U_02	Laboratory classes	Report	Protocol / Print / Report file
U_03	Laboratory classes	Report	Protocol / Print / Report file
U_04	Laboratory classes	Report	Protocol / Print / Report file
U_05	Practical exercises	Test	Completed and evaluated test
SOCIAL COMPETENCIES			
K_01	Laboratory classes	Observation	Rating card / Report from observation

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

Lecture: Written exam in the form of test - 90%, participation in the lectures - 10%

Classes: 3 tests – 90%, active participation in the classes - 5%, preparation of report – 5%,

Mark	Evaluation criteria	
very good (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%

quite good (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 sufficient level	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 insufficient level	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)	45
Number of hours of individual student work	45

VIII. Literature

Basic literature
Atkins P., De Paula J., Atkins' Physical Chemistry, 10th edition, Oxford University Press 2014. Atkins P., The Elements of Physical Chemistry, 6th edition, Oxford University Press 2013.
Additional literature
Atkins P., De Paula J., Physical Chemistry for Life Science, 2nd edition, Oxford University Press 2010 Solutions Manual to accompany Physical Chemistry for the Life Sciences, C. Trapp, M. Caddy, Oxford University Press 2010. Waigh T., Applied biophysics, Wiley 2007.