KARTA PRZEDMIOTU

I. Dane podstawowe

Nazwa przedmiotu	Fizykochemia układów biologicznych
Nazwa przedmiotu w języku angielskim	Physico-chemistry of biological systems
Kierunek studiów	Biotechnologia
Poziom studiów (I, II, jednolite magisterskie)	I
Forma studiów (stacjonarne, niestacjonarne)	stacjonarne
Dyscyplina	Nauki biologiczne
Język wykładowy	Grupy w języku polskim – język polski Grupy w języku angielskim – język angielski

Koordynator przedmiotu/osoba odpowiedzialna	dr Artur Banach

Forma zajęć *(katalog zamknięty ze słownika)*	Liczba godzin	semestr	Punkty ECTS
wykład	15 (15 remote)	1	3 (1 remote)
konwersatorium	-	-	
ćwiczenia	30	1	
laboratorium	-	-	
warsztaty	-	-	
seminarium	-	-	
proseminarium	-	-	
lektorat	-	-	
praktyki	-	-	
zajęcia terenowe	-	-	
pracownia dyplomowa	-	-	
translatorium	-	-	
wizyta studyjna	-	-	

Wymagania wstępne	Knowledge of chemistry, physics and mathematics on high school level

II. Cele kształcenia dla przedmiotu

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 systems
Discussion of the application of the physico-chemical properties of biological systems in biotechnology.

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

Symbol	Opis efektu przedmiotowego	Odniesienie do efektu kierunkowego
WIEDZA		
W_01	Student presents terminology used in physico-chemistry, defines phenomena and biophysical processes occurring in biological system used in biotechnology	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 for biotechnologists	K_W03
W_04	presents knowledge in the field of laboratory techniques and research tools used in physico-chemistry of biological systems for biotechnologists	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
UMIEJĘTNOŚCI		
U_01	applies techniques and research tools in the field of physico-chemistry of biological system for biotechnologists	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
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

Lecture: Definition of biological systems, relation to biotechnology. 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 equation). Viscosity of liquids. The osmotic pressure, diffusion, dialysis. Application of presented method in biotechnology.
Classes: Lab organization (didactic laboratory regulations, lab equipment). Colloids – preparation and study of properties. Demonstration of physico-chemical properties natural emulgators. Study of hydrophilic-lipophilic balance natural surfactants. Analysis of physico-chemical properties proteins (salting out/denaturation). Determination of the isoelectric point of proteins. Testing of physico-chemical properties of antifoams. Assay of contact angle in soil, application of Young's equation. Determination of critical micelle concentration (CMC- the stalagmometric and conductometric method). Measurement of viscosity of liquids by used Ostwald viscometer. Analysis of osmotic pressure of the liquid. Purifying of colloids with used dialysis process. The quantitative determination of the components undergoing dialysis process.

V. Metody realizacji i weryfikacji efektów uczenia się

Symbol efektu	Metody dydaktyczne *(lista wyboru)*	Metody weryfikacji *(lista wyboru)*	Sposoby dokumentacji *(lista wyboru)*
WIEDZA			
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
UMIEJĘTNOŚCI			
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
KOMPETENCJE SPOŁECZNE			
K_01	Laboratory classes	Observation	Rating card / Report from observation

VI. Kryteria oceny, wagi…

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. Obciążenie pracą studenta

Forma aktywności studenta	Liczba godzin
Liczba godzin kontaktowych z nauczycielem	45 (15 remote)
Liczba godzin indywidualnej pracy studenta	45 (10 preparation for remote hours)

VIII. Literatura

Literatura podstawowa
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.
Literatura uzupełniająca
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.