

**Subject card**

<b>Subject name and code</b>	Principles of biotechnology - mathematics, physics, chemistry Methodology (M01_B2), PG_00193730						
<b>Field of study</b>	Biotechnology						
<b>Date of commencement of studies</b>	October 2025	<b>Academic year of realisation of subject</b>	2025/2026				
<b>Education level</b>	Bachelor's studies	<b>Subject group</b>	Obligatory subject group in the field of study				
<b>Mode of study</b>	full-time studies	<b>Mode of delivery</b>	at the university				
<b>Year of study</b>	1	<b>Language of instruction</b>	Polish				
<b>Semester of study</b>	1	<b>ECTS credits</b>	8.0				
<b>Learning profile</b>	academic	<b>Assessment form</b>	credit				
<b>Conducting unit</b>							
<b>Name and surname of lecturer (lecturers)</b>	<b>Subject supervisor</b>	dr hab. Stanisław Ołdziej					
	<b>Teachers</b>	dr hab. Stanisław Ołdziej dr hab. Rafał Dutkiewicz dr hab. Szymon Ziętkiewicz dr Sandra Brzeska mgr inż. Paulina Truszkowska dr hab. Agnieszka Chylewska dr Mateusz Kowalik dr Jacek Tryba dr hab. Elżbieta Jankowska dr Marta Orlikowska dr hab. Aneta Szymańska dr Aleksandra Nowel dr Bartosz Makuracki dr Julia Witkowska dr Ewa Kozłowska-Walania dr Ewa Wieczerzak					
<b>Lesson types</b>	<b>Lesson type</b>	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	<b>Number of study hours</b>	0.0	61.0	38.0	0.0	0.0	99
	E-learning hours included: 0.0						
<b>Learning activity and number of study hours</b>	<b>Learning activity</b>	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM		
	<b>Number of study hours</b>	99	30.0	75.0	204		
<b>Subject objectives</b>	Establish the basic knowledge of chemistry, mathematics and physics necessary to understand and describe biological phenomena. The student will also become familiar with basic mathematical and statistical methods used to describe and analyze basic chemical and physical processes occurring in living organisms						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[BIOTECHL3_U03] The graduate applies mathematical and statistical methods to describe phenomena and analyze data and is able to use professional databases used in biotechnology.	he student will become familiar with basic mathematical and statistical methods used to describe and analyze basic chemical and physical processes occurring in living organisms	[SU4] test/exam - oral or written
	[BIOTECHL3_W06] The graduate possesses structured and advanced knowledge of exact and natural sciences necessary to understand biological phenomena and processes, in particular cellular processes at the molecular level.	Establish the basic knowledge of chemistry, mathematics and physics necessary to understand and describe biological phenomena	[SW4] test/exam - oral or written
Subject contents	<p>M1.</p> <p>Practical laboratory work skills combined with basic chemical calculations: Discussion of the principles of safe laboratory work and familiarization with Safety Data Sheets (SDS). Description of basic laboratory equipment, equipment and laboratory glassware and their uses. Chemical calculations: calculation of solution concentrations (molar, percentage), dilution of solutions, conversion of concentrations. Preparation of solutions of specific concentrations from tureens and base solutions and working with strong acids and bases. Methods of determining pH (indicators, pH-metric measurement). Protolysis of salt solutions. Buffer solutions: preparation, pH measurement and buffer capacity testing. Laboratory notes: principles of keeping accurate records and recording experimental results.</p> <p>M2. (Bioorganic Chemistry)</p> <p>Electron configuration, chemical bonding, hybridization, Lewis structures, resonance structures, Concept of acidity/alkalinity in organic chemistry, Isomerism: constitutional, geometric, configurational, conformational, Groups of organic compounds, their nomenclature and properties, Basic mechanisms in organic chemistry (nucleophilic, electrophilic and free radical substitution, nucleophilic and electrophilic addition, elimination), Properties and reactions of alcohols and thiols - Properties and reactions of aldehydes and ketones, Properties and reactions of carboxylic acids and their derivatives, Properties and reactions of aliphatic, aromatic, heterocyclic amines</p> <p>M3. (Mathematics)</p> <p>Continues (number e), Overview of elementary functions (inverse function), Limit and continuity of functions, properties of continuous functions, differentiation of functions, applications of the derivative, Indeterminate integral of a function, basic methods of integration, Definite and improper integral, applications of integration</p> <p>M4. (Elements of Biophysics)</p> <p>Introduction to data handling and presentation: measurement data, error, significant figures. graphs, calibration curves, equation of a straight line, linearization of graphs. - Ionizing radiation, activity, decay period, doses; measurement and units. - Sedimentation methods, centrifugation. Viscosity, Sedimentation methods, centrifugation to equilibrium in cesium chloride density gradient, Viscosity coefficient of liquids using Stokes method. - Study of radiative penetration.</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Part M3	0.0%	30.0%
	Part M2	0.0%	30.0%
	Part M1	0.0%	10.0%
	Part M4	0.0%	30.0%

Recommended reading	Basic literature	G. Kwiecińska, Matematyka, cz. I, II i III, Wydawnictwo UG, 2001  Z. Galus - Ćwiczenia rachunkowe z chemii analitycznej  John McMurry Chemia organiczna, Wydawnictwo Naukowe PWN  Paula Yurkanis Bruice Organic chemistry, Pearson Education Limited  Skrypt "Biofizyka z elementami fizyki" S. Ziętkiewicz
	Supplementary literature	G. M. Fichtenholz, Rachunek różniczkowy i całkowy, t. 1, 2 i 3, PWN, 1985
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

Document generated electronically. Does not require a seal or signature.