University of Gdańsk

Subject card

Subject name and code	Principles of biotechnology - mathematics, physics, chemistry Methodology (M01_B2), PG_00193730		
Field of study	Biotechnology		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	8.0
Learning profile	academic	Assessment form	credit
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Stanisław Ołdziej, prof. UG	
	Teachers	dr hab. Stanisław Ołdziej, prof. UG dr hab. Rafał Dutkiewicz, prof. UG dr hab. Szymon Ziętkiewicz dr Sandra Brzeska mgr inż. Paulina Truszkowska dr hab. Agnieszka Chylewska, prof. UG dr Mateusz Kowalik dr Jacek Tryba dr hab. Elżbieta Jankowska, prof. UG dr Marta Orlikowska dr hab. Aneta Szymańska, prof. UG dr Aleksandra Nowel dr Bartosz Makuracki dr Julia Witkowska dr Ewa Kozłowska-Walania dr hab. Ewa Wieczerzak	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	61.0	38.0	0.0	0.0	99
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	99	30.0	75.0	204

Subject objectives	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

M1.

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.

M2. (Bioorganic Chemistry)

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

M3. (Mathematics)

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

M4. (Elements of Biophysics)

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.

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. Fichtencholz, Rachunek różniczkowy i całkowy, t. 1, 2 i 3, PWN, 1985
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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