University of Gdańsk

Subject card

Subject name and code	Biotechnology - mathematics, physics, chemistry Methodology (M01_B2), PG_00192248		
Field of study	Biotechnology		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
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	7.0
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. Piotr Szuca dr hab. Rafał Dutkiewicz, prof. UG dr Marta Orlikowska mgr inż. Paulina Truszkowska dr hab. Aneta Szymańska, prof. UG dr Krzysztof Kowitz dr Sandra Brzeska dr hab. Agnieszka Chylewska, prof. UG dr hab. Dawid Dębowski, prof. UG dr Julia Witkowska dr Paweł Klinga dr Bartosz Makuracki dr inż. Irena Bylińska dr hab. Ewa Wieczerzak dr Aleksandra Nowel	

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	10.0	66.0	175

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.	The student uses selected mathematical tools to describe and analyze phenomena occurring in biological systems, develops and presents research results using statistical methods and appropriate IT tools, searches, analyzes and interprets information from professional databases used in biotechnology and assesses the reliability and usefulness of biological data obtained from databases and scientific literature.	[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.	The student interprets and explains biological phenomena and processes, in particular cellular processes at the molecular level, based on knowledge of the laws and principles of chemistry, physics and mathematics.	[SW4] test/exam - oral or written

Subject contents

M1.

Practical laboratory work skills combined with chemical calculations: Discussion of the principles of safe laboratory work and familiarization with Safety Data Sheets (SDS). Description of selected 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, Selected 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, selected 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

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Part M3</td><td>51.0%</td><td>30.0%</td></tr>
<tr><td>Part M4</td><td>51.0%</td><td>30.0%</td></tr>
<tr><td>Part M1</td><td>51.0%</td><td>10.0%</td></tr>
<tr><td>Part M2</td><td>51.0%</td><td>30.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>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</td></tr>
<tr><td>Supplementary literature</td><td>G. M. Fichtencholz, Rachunek różniczkowy i całkowy, t. 1, 2 i 3, PWN, 1985</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2"></td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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