

## 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 Oldziej				
	Teachers						
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	<p>M1.</p> <p>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.</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, 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</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, selected 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	<table border="1"> <thead> <tr> <th data-bbox="456 1420 794 1451">Subject passing criteria</th> <th data-bbox="799 1420 1137 1451">Passing threshold</th> <th data-bbox="1142 1420 1481 1451">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 1458 794 1489">Part M3</td> <td data-bbox="799 1458 1137 1489">51.0%</td> <td data-bbox="1142 1458 1481 1489">30.0%</td> </tr> <tr> <td data-bbox="456 1496 794 1527">Part M4</td> <td data-bbox="799 1496 1137 1527">51.0%</td> <td data-bbox="1142 1496 1481 1527">30.0%</td> </tr> <tr> <td data-bbox="456 1534 794 1565">Part M1</td> <td data-bbox="799 1534 1137 1565">51.0%</td> <td data-bbox="1142 1534 1481 1565">10.0%</td> </tr> <tr> <td data-bbox="456 1572 794 1603">Part M2</td> <td data-bbox="799 1572 1137 1603">51.0%</td> <td data-bbox="1142 1572 1481 1603">30.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Part M3	51.0%	30.0%	Part M4	51.0%	30.0%	Part M1	51.0%	10.0%	Part M2	51.0%	30.0%
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Example issues/ example questions/ tasks being completed	
Work placement	Not applicable

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