

Subject card

Subject name and code	Biomolecules - structure, synthesis and properties Methodology (M02_B1), PG_00196898						
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 Subject group related to scientific research 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	2	ECTS credits			6.0		
Learning profile	academic	Assessment form			credit		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Katarzyna Węgrzyn				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	85.0	0.0	0.0	85
	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	85	10.0	55.0	150		
Subject objectives	Program block 01 in Module 02 aims to provide advanced knowledge about the structure and properties of biomolecules (such as active low- and medium-molecular-weight compounds as well as proteins, nucleic acids, sugars and lipids) that create more complex biological systems, cellular compartments. The student will acquire practical skills related to the use of biomolecule isolation methods and their biochemical, biophysical and bioinformatic analysis. The student will gain awareness of safety rules for working in the laboratory and will acquire competences to work independently and in a team.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[BIOTECHL3_U01] The graduate possesses practical skills in performing laboratory procedures, documenting results, and applying techniques necessary in biotechnology, including methods of isolation, modification, selection, and analysis of organisms, tissues, cells, and molecules; has the ability to operate advanced laboratory.		The student has practical skills related to the use of methods for the isolation of biomolecules and their biochemical, biophysical and bioinformatic analysis. Is able to document activities and results of analyzes performed.		[SU1] oral statement/conversation/discussion [SU3] text preparation/written work [SU4] test/exam - oral or written [SU6] demonstration of practical skills [SU8] observation of student's independent or team work		
	[BIOTECHL3_K04] The graduate is aware of the importance of occupational safety rules, is able to apply them and react in hazardous situations, ensuring their own safety and the safety of others.		The student knows and follows the safety rules applicable in the laboratory, identifies potential hazards, and takes appropriate actions in emergency situations.		[SK1] oral statement/conversation/discussion [SK4] test/exam - oral or written [SK8] observation of student's independent or team work		
	[BIOTECHL3_K02] The graduate is willing to work in a team, in particular to carry out joint laboratory work.		The student can work in a team when carrying out laboratory tasks (shares responsibilities, actively participates in discussions, and contributes to the joint analysis of results).		[SK8] observation of student's independent or team work		

Subject contents	<p>M1. Laboratory exercises (computer room)</p> <p>Bioinformatic methods in the analysis of nucleic acids and proteins</p> <ul style="list-style-type: none"> • Identification and retrieval of information related to nucleotide and amino acid sequences • Visualization of the spatial structures of biomolecules • Taxonomic and evolutionary analysis of biomolecules • Identification of metabolic pathways <p>M2. Laboratory exercises</p> <p>1. Calculations in laboratory work</p> <p>2. Carbohydrates</p> <ul style="list-style-type: none"> • thin layer chromatography <p>3. Nucleic acids</p> <ul style="list-style-type: none"> • Genomic DNA isolation • plasmid DNA isolation • determination of phosphates in RNA and DNA • PCR and agarose electrophoresis of nucleic acids <p>4. Proteins</p> <ul style="list-style-type: none"> • Salting out proteins • Protein electrophoresis under denaturing conditions, • Coomassie Blue staining • Protein overproduction in the bacterial system and its purification (affinity chromatography) • Protein electrophoresis under denaturing conditions, silver staining • Molecular filtration • protein immunodetection - Western blotting, ELISA • protein immunodetection - ELISA <p>5. Lipids</p> <ul style="list-style-type: none"> • Extraction of lipids from various biological materials and analysis of the lipid composition of the obtained extracts • Analysis of the fatty acid composition of selected lipids and detection of selected isoprenoids 		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
Recommended reading	Basic literature	<ul style="list-style-type: none"> • A guide to exercises on the biochemical and biophysical basis of plant development. A. Banaś, K. Jasieniecka-Gazarkiewicz, K. Demski. 2017. University of Gdańsk Publishing House. ISBN: 978-83-7865-558-9 • A collection of biochemistry exercise protocols developed at the Department of Molecular Enzymology, MWB, UG and MUG (materials available on the GUMed extranet). • Molecular cloning A laboratory manual by Sambrook, Fritsch and Maniatis • Molecular cloning A laboratory manual. 4th edition, (2012) Green, Sambrook • Script "Laboratory of Genetic Engineering - materials for students" Katarzyna Węgrzyn 	
	Supplementary literature	<ul style="list-style-type: none"> • Exercises in biochemistry, edited by Leokadia Kłyszajko-Stefanowicz, Ed. Naukowe PWN, Warszawa 2005 • Exercises in chemistry and biochemistry, edited by Teresa Stelmaszyńska-Zgliczyńska and Piotr Leidler, Ed. Jagiellonian University, Kraków 2001, Biochemistry. • Practical classes for students of medicine, dentistry and pharmacy, edited by Marusz M. Żydowo, ed. IV amendment, MAKmed, Gdańsk 1997 	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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