University of Gdańsk

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

M1. Laboratory exercises (computer room)

Bioinformatic methods in the analysis of nucleic acids and proteins

- 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

M2. Laboratory exercises

1. Calculations in laboratory work

2. Carbohydrates

- thin layer chromatography

3. Nucleic acids

- Genomic DNA isolation
- plasmid DNA isolation
- determination of phosphates in RNA and DNA
- PCR and agarose electrophoresis of nucleic acids

4. Proteins

- 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

5. Lipids

- 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
M1(15%) + M2(85%)	51.0%	100.0%

Recommended reading

Basic literature	• 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. 4thedition, (2012) Green, Sambrook • Script "Laboratory of Genetic Engineering - materials for students" Katarzyna Węgrzyn
Supplementary literature	• Exercises in biochemistry, edited by Leokadia Kłyszejko-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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