



## Subject card

Subject name and code	Separation Techniques Biomolecules, PG_00054720						
Field of study	Biotechnology						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2025/2026		
Education level	first-cycle studies		Subject group		Optional subject group 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	3		Language of instruction		Polish		
Semester of study	5		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Microbiology -> Faculty Of Chemistry -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Rafał Piątek				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	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	45		5.0		25.0	75
Subject objectives	Familiarize the student with the techniques used in the separation of biomolecules for example proteins.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U09		The student is able to apply the following chromatographic techniques: gel chromatography, ion exchange chromatography, affinity chromatography, hydrophobic chromatography.		[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment		
	K6_W09		The student is able to apply knowledge of general chemistry, physical and quantum chemistry in understanding the properties of biomolecules relevant to separation techniques. The student is able to present knowledge in the field of biomolecule chromatography		[SW1] Assessment of factual knowledge		

Subject contents	Lecture:		
	1. Separating biomass from the culture medium; cell disintegration; protection of proteins against degradation.		
	2. Selective precipitation of components of the mixture (Franz Hofmeister, ion specific phenomena); selective degradation of mixture components.		
	3. Gel chromatography.		
	4. Ion exchange chromatography.		
	5. Affinity Chromatography.		
	6. Hydrophobic interaction chromatography.		
	7. Electrophoretic techniques (including isoelectric focusing - Rotofor Cell Bio-Rad; 491 Prep Cell Bio-Rad).		
	8. Filtration techniques.		
	9. Protein purification under denaturing conditions and refolding.		
	10. Apparatus and detectors.		
	11. Strategies for purifying proteins from post-culture fluid, cell cytoplasm and periplasmic space.		
	12. Examples of protein purification in laboratory conditions (own research).		
	13. Examples of purification of proteins produced on an industrial scale.		
	Laboratory:1. Methods of disintegration of bacterial and yeast cells.		
	2. Gel chromatography.		
	3. Ion exchange chromatography.		
	4. Affinity Chromatography.		
	5. Hydrophobic chromatography.		
	6. SDS-PAGE electrophoresis of elution fractions.		
7. Buffer exchange methods: dialysis, ultrafiltration.			
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture	60.0%	50.0%
	Laboratory	60.0%	50.0%
Recommended reading	Basic literature	The Busy Researcher's guide to biomolecule chromatography.PerSeptive Biosystems 1996.	
		The Physical Basis of Biochemistry. PR. Bergethon. Springer 2000.	
		Source information from the GE website.	
	Supplementary literature	No need.	
	eResources addresses	Podstawowe <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22437">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22437</a> - Materials including lecture presentations. Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Physicochemical parameters of proteins used in chromatographic techniques. The influence of sample preparation on the effect of chromatographic separation. The course of separation using gel permeation chromatography. The course of separation using ion exchange chromatography. The course of separation using the hydrophobic chromatography technique. The course of separation using affinity chromatography. Biomolecule detection methods. Designing a multi-stage chromatographic process. Designing the process of purifying protein forming inclusion bodies. Designing the process of refolding denatured protein. Electrophoretic techniques in protein chromatography.		
Work placement	Not applicable		