



Subject card

Subject name and code	Instrumental methods of studying the structure and activity of biomolecules, PG_00053351						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2025/2026		
Education level	second-cycle studies		Subject group		Optional subject group Specialty 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	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Pharmaceutical Technology and Biochemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Sławomir Milewski				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	0.0	0.0	30
	E-learning hours included: 0.0						
	Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=14100						
	Additional information: Indoor laboratory excercises						
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	30		2.0		18.0	50
Subject objectives	Making students familiar with practical aspects of modern instrumental methods application in studies on biomolecules						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_W02] knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	Student is able to draw conclusions concerning structures of biomolecules based on the results of instrumental analysis	[SW3] Assessment of knowledge contained in written work and projects
	[K7_W53] Knows and understands, to an increased extent, selected aspects of biomedical diagnostics.	Student knows the possibilities of application of chromatographic techniques for purification of biomacromolecules. Student knows the rules of choice of spectroscopic methods for examination of structure and activity of biomolecules and is able to use them in practice.	[SW3] Assessment of knowledge contained in written work and projects
	[K7_U53] can apply advanced equipment used in biomedical diagnostics	Student is able to determine conditions of protein purification by FPLC. Student knows the basic rules of running the microcalorimetric experiments, spectrophotometric measurements and by MS and NR spectroscopy	[SU4] Assessment of ability to use methods and tools
	[K7_K02] is ready to provide critical evaluation of received content and to acknowledge the importance of knowledge in solving cognitive and practical problems	The student is able to determine a schedule for completing a task, perform these tasks as a member of a group, develop the obtained results and conduct a discussion about them.	[SK5] Assessment of ability to solve problems that arise in practice [SK3] Assessment of ability to organize work
Subject contents	1. Analysis of kinetics of protein denaturation by means of differential scanning calorimetry 2. Use of FPLC for isolation and characterisation of biomacromolecules 3. Application of HPLC for isolation of substances of natural origin and examination of antibiotics purity 4. Determination of protein molecular mass by MS-ESI 5. FTIR spectroscopy in examination of protein secondary structure 6. Determination of structure and activity of biomolecules by NMR 7. Examination of biological membranes and transmembrane transport by spectrofluorimetry 8. Spectrofluorimetric determination of kinetic parameters of protein:ligand interaction 9. Differential UV/vis spectroscopy in DNA:ligand interaction studies 10. Application of surface plasmon resonance in biological studies		
Prerequisites and co-requisites	Knowledge of Biochemistry at the 1st level studies		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical exercises	100.0%	20.0%
	Report	50.0%	50.0%
	Assessment of theory knowledge	50.0%	30.0%

Recommended reading	Basic literature	Materials available at the departmental WWW page "Instrumentalne metody badania struktury i aktywności biomolekuł", S. Milewski (red), Wydawnictwo PG 2013
	Supplementary literature	Alan Cooper, Chemia biofizyczna, PWN W-wa, 2010
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. List the ionisation techniques used in mass spectrometry 2. What absorption bands in UV region are characteristic for proteins? 3. Which features of medium-pressure liquid chromatography (FPLC) are crucial for the usefulness of this technique for biomolecules separation?	
Work placement	Not applicable	

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