

Subject card

Subject name and code	Biophysics of biologically active compounds - computational exercises, PG_00153634						
Field of study	Biotechnology						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2026/2027		
Education level	Master's studies	Subject group			Obligatory subject group in the field of study 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	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			2.0		
Learning profile	academic	Assessment form			credit		
Conducting unit	Laboratory of Biophysics -> UG Institute of Biotechnology -> Intercollegiate Faculty of Biotechnology UG-MUG -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Jacek Piosik				
	Teachers						
Lesson types	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						
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		5.0		15.0	50
Subject objectives	The course participant should acquire abilities that will allow him to plan and perform independently an experiment, interpret results, and also apply and exploit a suitable computational method and software. He should be able to use in practice the learnt computational techniques in various domains of biotechnology. In particular, the student will get to know: various computational techniques on the basis of linear and contour functions, ways of analyzing and interpreting spectrophotometric spectra, methods of determining association constants on the basis of existing statistical-thermodynamic models, methods of determining enthalpy of reaction, possibilities of various computational methods (Excel, Sigma Plot, MathCad). The student will acquire an ability to solve creatively and alternatively computational problems and will get acquainted with the possibilities of exploiting these abilities and competences in other domains of life.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[BIOTECHMU2_U01] The graduate possesses the skills necessary to design and conduct laboratory research, critically assessing risks, method limitations, and ethical implications of undertaken activities.	The student can plan and implement a computational research plan based on the methods learned.	[SU5] implementation of a problem task [SU8] observation of student's independent or team work
	[BIOTECHMU2_U02] The graduate is able to collect and interpret empirical data; use statistical methods and IT tools in data analysis; formulate conclusions based on empirical data.	The student performs calculations based on collected experimental data. The student can interpret the results and conclude.	[SU1] oral statement/conversation/discussion [SU8] observation of student's independent or team work
	[BIOTECHMU2_W05] The graduate possesses in-depth knowledge of methods used in the field of exact and natural sciences, necessary to understand biological phenomena and processes at the molecular level, and the connection of this knowledge with medical sciences.	The student knows basic and advanced methods of mathematical analysis and selected statistical-thermodynamic models.	[SW1] oral statement/conversation/discussion [SW5] implementation of a problem task
Subject contents	1.Theoretical introduction: review of applied computational programs and practical tasks with the use of these programs. Basic computational techniques. Creating and interpreting graphs. Linear and non-linear extrapolation. Analysis of errors. 2.Analysis of spectrophotometric spectra. Applying Lambert-Beer law. Determination of spectra in the form of molar extinction, isosbestic points, differences between spectra of dimerising and non-dimerising substances, colorimetric determination of concentrations of components in a mixture. 3.Dimerisation of low molecular compounds. Determining the spectrum of monomer and dimer, calculating dimerisation constant. 4. Ligand DNA interactions. Calculating interaction constant, binding site size and concentrations of particular components of a mixture. 5.Interactions of low molecular compounds. Analysis of spectrophotometric spectra of mixtures of ligands and methylxantines, spectra decomposition. Determining complex spectrum comparing methods of linear and non-linear extrapolation. Determining molar fractions. Determining components concentration. Demonstration of applying statistical-thermodynamic models of mixed association. 6. Analysis of modulation of ligand DNA interactions. Analysis of spectrophotometric spectra of mixtures, determining complex spectra, spectra decomposition. Demonstration of applying mathematical models to calculate constant interactions and concentrations of all components of reaction mixtures. 7. Basics of microcalorimetry determining the heat of reaction on the basis of thermograms of ligand titration with methylxantines. 8.Analysis of fluorescent spectra of ligands and their mixtures with DNA and low molecular compounds		
Prerequisites and co-requisites	Lecture "Biophysics of biologically active compounds".		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Observation of the student's work and activity during classes.	20.0%	40.0%
	Performing computational tasks.	20.0%	60.0%
Recommended reading	Basic literature	Materials prepared and provided by the instructor.	
	Supplementary literature	None	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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