



Subject card

Subject name and code	Applications of physics in biology and medicine, PG_00051076						
Field of study	Technical Physics						
Date of commencement of studies	October 2021		Academic year of realisation of subject		2024/2025		
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	4		Language of instruction		Polish		
Semester of study	7		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Division of Atomic, Molecular and Optical Physics -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Piotr Weber				
	Teachers		dr Piotr Weber				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
	Additional information: The meeting with students takes the form of a traditional lecture with a presentation and a computer laboratory. The computer laboratory is associated with building programs for analyzing signals generated by living organisms. During the laboratory, students learn selected signal analysis methods.						
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	Familiarization students with the functioning of living organisms in the context of physical phenomena. Familiarization with the techniques of measuring selected parameters describing a living organism. Familiarization with the methods of observation of selected structures and phenomena occurring in living organisms. Human-generated signal analysis						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U02		The student is able to analyze the problem based on the knowledge of physics and the basics of biology		[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information		
	K6_W02		The student has knowledge of selected applications of physics in biology		[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge		

Subject contents	<p>The lecture is divided into several parts, the topics of which present various applications of physics in biological and medical sciences. Among other things, theoretical applications are discussed - constituting a physicochemical background for the description of phenomena occurring at various levels of the internal structure of living organisms. At the same time, depending on the discussed part of the lecture, empirical methods used in the study of living systems and diagnostic tools are presented. The lecture consists of the following parts:</p> <ul style="list-style-type: none">• Living organisms - structure and properties• Theoretical methods of describing biological molecules• Experimental methods of analyzing biological molecules• Biothermodynamics and metabolism• Electrical properties of living organisms• Biomechanics• Physical basics of selected methods of imaging tissues and organs• Statistics in biology and medicine• Signal analysis in biology		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	50.0%	60.0%
	tests and reports	50.0%	40.0%
Recommended reading	Basic literature	J. P. Keener, J. Sneyd, "Mathematical Physiology", Springer, 1994	
	Supplementary literature	K. Sneppen, G. Zocchi, "Physics in Molecular Biology", Cambridge University Press, 2006	
	eResources addresses	Adresy na platformie eNauczanie: Zastosowanie fizyki w biologii i medycynie 2024/2025 - Moodle ID: 39019 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=39019	
Example issues/ example questions/ tasks being completed	<p>1. List the features of living organisms that you know and describe them. 2. Explain the concepts used in molecular biology: replication, transcription, translation. 3. What is ATP (adenosine triphosphate) and what role does it play in metabolism? 4. Describe the structure of nucleic acids. How is RNA different from DNA? What are its functions? 5. Describe the structure of phospholipids. What does it mean that phospholipids are amphiphiles? 6. What is the isoelectric focusing technique? 7. What is the metabolism of a living organism? Explain the concept of metabolic pathway.</p>		
Work placement	Not applicable		

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