



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 2020	Academic year of realisation of subject			2023/2024		
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	Zakład Fizyki Atomowej, Molekularnej i Optycznej -> Instytut Fizyki i Informatyki Stosowanej -> 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 laboratory. The laboratory is divided into two blocks. As part of the first block, students perform tests on themselves and analyze the results statistically and formulate conclusions; they describe everything in the report. The second block of the laboratory is computer classes and building simple programs for analyzing signals from living organisms. As part of this block, they will learn about selected methods of signal analysis.							
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_W02		The student has knowledge of selected applications of physics in biology		[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge		
	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 analyze information		

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	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Subject passing criteria</th> <th style="width: 33%;">Passing threshold</th> <th style="width: 34%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>tests and reports</td> <td>50.0%</td> <td>40.0%</td> </tr> <tr> <td>exam</td> <td>50.0%</td> <td>60.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	tests and reports	50.0%	40.0%	exam	50.0%	60.0%
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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											