GDAŃSK UNIVERSITY OF TECHNOLOGY

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 2022	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	4	Language of instruction	Polish 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 -> Wydziały Politechniki Gdańskiej		
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

eNauczanie source address: https://enauczanie.pg.edu.pl/2025/my/courses.php

Moodle ID: 1352 Zastosowanie fizyki w biologii i medycynie
https://enauczanie.pg.edu.pl/2025/course/view.php?id=1352

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_W02	The student has knowledge of selected applications of physics in biology	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
K6_U02	The student is able to analyze the problem based on the knowledge of physics and the basics of biology	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools

Subject contents

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:

- Living organisms - structure and properties
- Theoretical methods of describing biological molecules
- Experimental methods of analyzing biological molecules
- Biotermodynamics and metabolism
- Electrical properties of living organisms
- Biomechanics
- Physical basics of selected methods of imaging tissues and organs
- Statistica in biology and medicine
- Signal analysis in biology

The computer laboratory focuses on developing programs for analyzing signals generated by living organisms, including humans. Students will learn selected signal analysis methods.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
tests and reports	50.0%	40.0%
exam	50.0%	60.0%

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	Basic https://enauczanie.pg.edu.pl/2025/course/view.php?id=1352 - https://enauczanie.pg.edu.pl/2025/course/view.php?id=1352

Example issues/ example questions/ tasks being completed

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.

Work placement

Not applicable

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