



Subject card

Subject name and code	Biophysics, PG_00029467						
Field of study	Mathematics						
Date of commencement of studies	October 2024	Academic year of realisation of subject				2026/2027	
Education level	first-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery				at the university	
Year of study	3	Language of instruction				Polish	
Semester of study	5	ECTS credits				4.0	
Learning profile	general academic profile	Assessment form				assessment	
Conducting unit	Department of Physics of Electronic Phenomena -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Brygida Mielewska				
	Teachers		dr Brygida Mielewska				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	60		5.0		35.0	100
Subject objectives	To present physical quantities and phenomena characteristic for living organism						
Learning outcomes	Course outcome	Subject outcome				Method of verification	
	K6_U09	Student solves problems during analysis of experimental data and preparing reports				[SU4] Assessment of ability to use methods and tools	
	K6_U06	Student solves problems during analysis of experimental data and preparing reports				[SU4] Assessment of ability to use methods and tools	
	K6_W03	Student is able to describe and analyse biophysical phenomena with the use of mathematics				[SW1] Assessment of factual knowledge	
	K6_U05	Student can interpret physical law and apply them in description of biological phenomena				[SU3] Assessment of ability to use knowledge gained from the subject	
Subject contents	<p>Course content – lecture</p> <p>LECTURE: Intra- and intermolecular forces Thermodynamic systems and processes. Thermodynamics of non-isolated systems. Equilibrium states. Streams. Biological systems as open thermodynamic systems. States of inequilibrium, Transport phenomena. Bioelectric phenomena, membrane potential, diffusion potential Thermodynamic description of chemical reactions, activation energy, kinetics of enzymatic reactions. Cells biophysics: cell membrane, active and passive transport, information flow through the cell membrane, intra- and intercellular communication hormones, neurotransmitters. Electrical model of cell membrane, resting potential, action potential, signal transduction. Biophysics of muscles. Activation transduction in smooth muscles and striated muscles. Mechanics and energetics of muscle contraction. Mechanics of biological liquids. Rheological properties of blood. Biophysics of vision: structure of human eye, eye resolution Optical defects of the eye. Colour vision, stereoscopic vision. Biophysics of hearing: Structure of human ear. Sound perception: pitch, timbre and loudness. Localisation of sources of sound. Audiology, hearing corrections. Perception of balance. Biophysics of taste and smell. Influence of external factors on living organism: vibrations, infra- and ultrasounds. Influence of pressure: hypo- and hiperbaria, hiperbaric therapy. Influence of external fields: constant and low frequency fields High frequency fields and nonionising radiation. Physical processes in excited molecules. Photochemical reactions, photosensibilisation, phototherapy. Laser radiation, its influence and applications.</p>						
Prerequisites and co-requisites	Physics - elementary course (secodnary school), Mathematics - differentials, integrals Chemistry - periodic system of the elements, chemical bonds, types of chemical reactions						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory	50.0%	60.0%
	final test	0.0%	25.0%
	tests	50.0%	15.0%
Recommended reading	Basic literature	1. Skrypt z materiałami do przedmiotu Biofizyka 2. Materiały do przedmiotu opracowane w formie edukacji na odległość, dostęp: eNauczanie.pg.edu.pl 3. Jaroszyk F. (pod red.), Biofizyka podręcznik dla studentów, Wydawnictwo Lekarskie PZWL 2006 4. Józwiak Z., Bartosz G., Biofizyka wybrane zagadnienia wraz z ćwiczeniami, PWN 2007 5. Piskunowicz P., Tuliszka M., Wybrane ćwiczenia laboratoryjne z biofizyki, Wydawnictwo Naukowe Uniwersytetu Medycznego, Poznań 2007	
	Supplementary literature	1. Nałęcz M. (pod red.), Biocybernetyka i inżynieria biomedyczna 2000, t.1 Biosystemy, Akademicka Oficyna Wydawnicza EXIT, Warszawa 2002 2. Nałęcz M. (pod red.), Biocybernetyka i inżynieria biomedyczna 2000, t.2 Biopomiary, Akademicka Oficyna Wydawnicza EXIT, Warszawa 2002 3. Nałęcz M. (pod red.), Biocybernetyka i inżynieria biomedyczna 2000, t.9 Fizyka Medyczna, Akademicka Oficyna Wydawnicza EXIT, Warszawa 2002	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Describe thermodiffusion		
Practical activities within the subject	Not applicable		

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