GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Biophysics, PG_00047801		
Field of study	Biomedical Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study 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	2	Language of instruction	Polish
Semester of study	4	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		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Brygida Mielewska	
	Teachers	dr Brygida Mielewska dr inż. Marcin Dampc dr inż. Ireneusz Linert	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	15.0	0.0	0.0	45

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	45	4.0	51.0	100

Subject objectives

Student acquaints with problems of functioning of living organisms in the context of physicsal phenomena. Student gains skils of techniques of measurement of physical parameters and observation of processes typical for living structures. Student performs experiments and analyses obtained results.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W52] Knows and understands, to an advanced extent, selected aspects of chemistry and biochemistry, constituting general knowledge related to the field of study	student knows the theory and types of chemical bonds	[SW1] Assessment of factual knowledge
[K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study	student knows and understands seleted physical laws of thermodynamics, fluid mechanics, waves, geometric optics and light wavea	[SW1] Assessment of factual knowledge
[K6_U07] can apply methods of process and function support, specific to the field of study	student applies experimental methods and computer simulations in measurements	[SU4] Assessment of ability to use methods and tools
[K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	student applies experimental methods and computer simulations in measurements	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>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. Reological 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. Physicsal processes in excited molecules. Photochemical reactions, photosensibilisation, phototherapy.Laser radiation, its influence and applications.

Laboratory

1. Acoustic orientation in space 2. Determination of visual field of human eye 3. Time-resolving capability of human eye 4. Electrophoretic mobility 5. Determination of diffusion potential</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Physics - elementary course Mathematics - differentials, integrals Chemistry - periodic system of the elements, chemical bonds, types of chemical reactions</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Written exam or tests</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Laboratory</td><td>50.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. Skrypt z materiałami do przedmiotu Biofizyka 2. Materiały do przedmiotu opracowane w formie edukacji na odległość, 3. Jaroszyk F. (pod red.)., Biofizyka podręcznik dla studentów, Wydawnictwo Lekarskie PZWL 2006 4. Jóźwiak 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</td></tr>
<tr><td>Supplementary literature</td><td>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</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
BEEofizyka dla IBM 24/25 - Moodle ID: 44459
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=44459</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>Describe thermodiffusion</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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