COURSE DESCRIPTION CARD - SYLLABUS

Course name
Biophysics [S1IBio1>Biof]

Course

Field of study
Biomedical Engineering

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

4,00

Coordinators

dr inż. Dawid Kucharski
dawid.kucharski@put.poznan.pl

Lecturers

Prerequisites

Basic knowledge of physics, mathematics. Ability to physically describe a biological system.

Course objective

Getting to know the fundamentals of biophysics, physics of a biological cells and solving the logical biophysical tasks.

Course-related learning outcomes

Knowledge:
A student knows the fundamentals of mathematics and the ability to use it for a biophysical description of a living system. Based on physical laws and theory, a student should do an interpretation of a selected human internal organs functions. A student should know a selected method of structure cells and a tissues investigation, together with physiological processes. A student has an elementary knowledge about chemistry and can adapt it for a biological systems description.

Skills:
A student can: observe physical phenomena inside the human body; describe biophysical problems and

can merge then into technical issues; do the measurements and compute the biophysical quantities.

Social competences:
A student understands a whole life learning necessity.
A student can collaborate with others.
A student knows the necessity of an interdisciplinary way for the bioengineering problems.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

course final exam, written or oral form (to choose) (4 questions) and class exam (4 tasks to solve). In both exams, the condition to receive a positive evaluation is to obtain at least 50% of the maximum points.

Programme content

Physical laws and principles in the description of biological systems.
Understanding the physical mechanisms related to the functioning of specific living objects: organisms, organs, tissues, cells, and such processes and transformations as energy, electrical phenomena, and movement mechanics. From single-particle quantum mechanics to organ biophysics.

Course topics

Lectures scope:
Structure of matter, Elements of quantum physics, Biological structures. Fundamentals of biothermodynamics, Physical properties of a cell membrane. Molecular and ionic transport. Diffusion and osmosis. Information transport through a cell membrane. External-field-body interaction. Radiation-matter interaction. Biophysics of the senses. Elements of biomechanics of muscles and biological liquids.
Classes scope: computational tasks (about lectures scope)

Teaching methods

1. Lectures: oral presentation with illustrated examples on a blackboard, calculations.
2. Classes: tasks calculations.

Bibliography

Basic:
1. F. Jaroszyk, Biofizyka, Wydawnictwo Lekarskie PZWL, Warszawa 2001.
2. Z. Jóźwiak, G.Bartosz (red.), Biofizyka. Wybrane zagadnienia wraz z ćwiczeniami, PWN, Warszawa 2003.

Additional:
1. I. Herman, Physics of the Human Body, Springer Science & Business Media, Berlin, Heidelberg (2007).
2. M. Ashrafuzzaman and J. A. Tuszynski, Membrane Biophysics, Springer Science & Business Media (2012).

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	47	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	53	2,00