



## 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

0

Tutorials

15

Projects/seminars

0

### Number of credit points

4,00

### Coordinators

dr inż. Dawid Kucharski

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### 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 human organs 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