



## Course syllabus - part A Biophysics

**48SJO-BIOPHY**  
**ECTS: 5.00**  
**CYCLE: 2023**

### SUBJECT MATTER CONTENT

#### LECTURE

. MECHANICS OF THE BODY 1.1 Skeleton, forces, and body stability 1.2 Muscles and the dynamics of body movement 1.3 Physics of body crashing 2. ENERGY HOUSEHOLD OF THE BODY 2.1 Energy balance in the body 2.2 Energy consumption of the body 2.3 Heat losses of the body 3. PRESSURE SYSTEM OF THE BODY 3.1 Physics of breathing 3.2 Physics of the cardiovascular system 4. ACOUSTICS OF THE BODY 4.1 Nature and characteristics of sound 4.2 Production of speech 4.3 Physics of the ear 4.4 Diagnostics with sound and ultrasound 5. OPTICAL SYSTEM OF THE BODY 5.1 Physics of the eye 6. ELECTRICAL SYSTEM OF THE BODY 6.1 Physics of the nervous system 6.2 Electrical signals and information transfer

#### CLASSES

M2. Ionizing radiation. Determination of linear and mass absorption coefficient of gamma rays for different materials. M3. Electrical activity of the heart. Electrocardiography. Determination of the heart's electrical vector. M12. Laminar and turbulent flow. Measurement of fluid viscosity. M5. The sense of hearing. Measures of auditory threshold. M6. Physical principles of ultrasound in medicine. Ultrasonography. Determination of blood pressure. M7. Modeling the electrical properties of biological objects. Examination of serial RLC circuit. M8. The phenomenon of absorption and emission of light in analysis. Measurement of absorption spectra and the concentration of riboflavin in aqueous solutions using a spectrophotometer. Determination of concentrations of substances in solution using fluorescence. M9. Optical rotation of solutions. Measurement of the concentration of optically active substances by using a polarimeter. M10. Determination of changes of thermodynamic function of state. Determination of changes in the entropy of the system. Determination of enthalpy change in the process of dissolving salt.

#### SEMINAR

Seminar in eMGLISH

#### TEACHING OBJECTIVE

Transfer of knowledge about physical laws and phenomena with particular application in medicine. Development of personal abilities towards self-education in the category of application of physical methods. Ability of performing simple physical experiments, assessment of precision of physical measurements and discussion. Development of common work in group.

#### DESCRIPTION OF THE LEARNING OUTCOMES OF THE COURSE IN RELATION TO THE DESCRIPTION OF THE CHARACTERISTICS OF THE SECOND LEVEL LEARNING OUTCOMES FOR QUALIFICATIONS AT LEVELS 6-8 OF THE POLISH QUALIFICATION FRAMEWORK IN RELATION TO THE

**Legal acts specifying learning outcomes:**  
311/2023

**Disciplines:** medical sciences

**Status of the**

**course:** Obligatoryjny

**Group of courses:** A -

przedmioty podstawowe

**Code:** ISCED 0912

**Field of study:** Medicine

**Scope of**

**education:** Medicine

**Profile of education:**

General academic

**Form of studies:** full-time

**Level of studies:** uniform

master's studies

**Year/semester:** /1

**Types of classes:** Lecture, Classes, Seminar

**Number of hours in**

**semester:** Lecture: 15.00,

Classes: 30.00, Seminar:

10.00

**Language of**

**instruction:** English

**Introductory subject:**

mathematics

**Prerequisites:** no

**Name of the organisational**

**unit conducting the**

**course:** Katedra Fizyki i

Biofizyki

**Person responsible for the**

**realization of the course:** dr

hab. Krzysztof Bryl, prof. UWM

**e-mail:**

krzysztof.bryl@uwm.edu.pl

**Additional remarks:** No

## SCIENTIFIC DISCIPLINES AND THE EFFECTS FOR FIELDS OF STUDY:

**Symbols for outcomes related to the discipline:**

M/NMA\_P7S\_WG+++

**Symbols for outcomes related to the field of study:**

B.W29.+ , K.7.+ , B.U1.+

### LEARNING OUTCOMES:

#### Knowledge:

W1 - Understanding physical phenomena and processes and their connection with functioning of living organisms.

#### Skills:

U1 - Can perform simple observations in open area or in the laboratory.

#### Social competence:

K1 - Is able to perform any role in the team.

### TEACHING FORMS AND METHODS:

Lecture(W1;):ecture with multimedial support

Classes(W1;U1;K1;):performention of experiments and the analysis of data

Seminar(W1;):Oral presentation

### FORM AND CONDITIONS OF VERIFYING LEARNING

#### OUTCOMES:

Lecture (Written exam) - Test -

Classes (Write-up) - points -

Classes (Written test) - points -

Seminar (Presentation) - Points -

#### BASIC LITERATURE:

1. Halliday D., *Fundamentals of Physics Extended 8ed.*, Wyd. John Wiley Sons, R. 2008

2. R. K. Hobbie, B. J. Roth, *Intermediate Physics for Medicine and Biology 4ed*, Wyd. Springer, R. 2007

#### SUPPLEMENTARY LITERATURE:

# Detailed description of ECTS credits awarded - part B

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**Biophysics**

The number of ECTS credits awarded consists of:

1. Contact hours with the academic teacher:

|                             |                |
|-----------------------------|----------------|
| - participation in: Lecture | 15.0 h         |
| - participation in: Classes | 30.0 h         |
| - participation in: Seminar | 10.0 h         |
| - consultation              | 4.0            |
|                             | Total: 59.0 h. |

2. Independent work of a student:

|   |         |
|---|---------|
| Preparing for seminars, laboratories and tests. | 64.00 h |
| Preparation preliminary presentation            | 2.00 h  |

Total: 66.0 h

contact hours + independent work of a student Total: 125.0 h

1 ECTS credit = 25-30 h of an average student's work, number of ECTS credit = 125.0 h : 25.0 h/ECTS = 5.00 ECTS on average: 5.0 ECTS

- including the number of ECTS credits for contact hours with the direct participation of an academic teacher: 0,00 ECTS points,

- including the number of ECTS credits for hours of independent work of a student: