

**SYLLABUS**  
**concerning the cycle of education 2023-2029**

Academic Year 2023/2024

**1.1.BASIC INFORMATION CONCERNING THIS SUBJECT / MODULE**

Subject / Module	Biophysics
Course code / module *	Bf / B
Faculty of (name of the leading direction)	College of Medical Sciences
Department Name	Faculty of Mathematics and Natural Sciences, University of Rzeszow
Field of study	medical direction
Level of education	uniform master's studies
Profile	practical
Form of study	stationary / extramural
Year and semester	year I, semester I
Type of course	Mandatory

\* - According to the resolutions of the Faculty of Medicine

**1.2. Forms of classes, number of hours and ECTS**

Lecture	Exercise	Conversation	Laboratory	Seminar	ZP	Practical	Self-learning	Number of points ECTS
15	30	-	-	15	-	-	-	4

**1.3. The form of class activities**

☒ classes are in the traditional form

☐ classes are implemented using methods and techniques of distance learning

**1.4. Examination Forms / module** (exam, credit with grade or credit without grade)

**2. REQUIREMENTS**

Physics in the field - extended level.  
Biology: human biology - advanced level.

**3. OBJECTIVES, OUTCOMES, AND PROGRAM CONTENT USED IN TEACHING METHODS**

**3.1. Objectives of this course/module**

C1	Mastering the theoretical basis of physical phenomena occurring in the human body.
C2	Understanding the physical processes occurring and used in medicine.

### 3.2 OUTCOMES FOR THE COURSE / MODULE (TO BE COMPLETED BY THE COORDINATOR)

EK (the effect of education)	The content of the learning effect defined for the subject (module)	Reference to directional effects (KEK)
EK_01	He knows physical laws describing the flow of liquids and factors affecting the vascular resistance of blood flow	B.W5
EK_02	He knows natural and artificial sources of ionizing radiation and its interaction with matter	B.W6
EK_03	He knows the physical basis of non-invasive imaging methods	B.W8
EK_04	He knows the physical basis of selected therapeutic techniques, including ultrasound and irradiations	B.W9
EK_05	Uses knowledge of the laws of physics to explain the influence of external factors, such as temperature, acceleration, pressure, electromagnetic field and ionizing radiation, on the body and its components	B.U1
EK_06	Is able to assess the harmfulness of non-ionizing radiation dose, ionizing dose and other physical factors acting on the body and applies to the principles of radiation protection	B.U2

### 3.3 CONTENT CURRICULUM (filled by the coordinator)

#### A. Lectures

Course contents of lectures
Methods for the development of experimental data. Basics of error theory.
Physical basics of ultrasonography
Röntgen diagnostics.
X-ray computed tomography.
NMR imaging.
Positron emission tomography.
Influence of electric and magnetic fields on the living organism.
The influence of ionizing radiation on the body of live radiotherapy.

#### B. Seminars

1. Ultrasonic absorption in the air.
2. Analysis of the spectrum of speech sounds using the PRAAT program.
3. Measurements of the magnetic field created by circuits with current.
4. Determination of the viscosity coefficient of the liquid using the Höppler rheo viscometer.
5. Harmonic analysis of vibrations - the physical basis of applying ultrasounds in medicine.
6. The wave nature of ultrasounds - diffraction.
7. Determination of electrochemical equivalent of copper and Faraday constant.
8. Determination of focal lengths of lenses by means of optical bench.
9. Construction and operation of an optical microscope. Observation and

registration of tissue preparations and bacteria.  
 10. Examination of the resolving power of the eye.  
 11. Determining the electrical axis of the heart - electrocardiography (ECG).  
 12. Determining the hearing performance - determining the audiogram.

### 3.4 TEACHING METHODS

**Multimedia lecture** (method giving as a supplement to the problem method)

**Exercises:** working in groups

**Seminar:** attempts to solve problems

## 4 METHODS AND EVALUATION CRITERIA

### 4.1 Methods of verification of learning outcomes

Symbol of effect	Methods of assessment of learning outcomes (Eg.: tests, oral exams, written exams, project reports, observations during classes)	Form of classes
EK_ 01	Examination	Lectures, Exercise, Seminars
EK_ 02	Examination	Lectures, Exercise, Seminars
EK_ 03	Examination	Lectures, Exercise, Seminars
EK_ 04	Examination	Lectures, Exercise, Seminars
EK_ 05	Examination	Lectures, Exercise, Seminars
EK_ 06	Practical pass	Exercise, Seminars
EK_ 01	Practical pass	Exercise, Seminars

### 4.2 Conditions for completing the course (evaluation criteria)

**Classes, seminars (EK\_01, EK\_02, EK\_03, EK\_04, EK\_05, EK\_06):**

1. full participation and activity in the exercises

2. written partial credits. Scope of marks: 2.0 -5.0

Lectures (EK\_01, EK\_02, EK\_03, EK\_04):

1. test pass and open questions:

A: Questions in the field of messages to remember;

B: Questions in the field of speech to understand;

C: Solving a typical written task; D: Solving an atypical writing task; -

for insufficient solution of tasks only from areas A and B = score 2.0

- for solving tasks only from areas A and B, the possibility of obtaining max. rating 3.0

- for solving tasks from the area A + B + C, the possibility of obtaining max. evaluation 4.0

- for the solution of tasks in the area A + B + C + D, the possibility of obtaining a rating of 5.0

**Knowledge assessment:**

Written or oral colloquium

5.0 - has knowledge of the education content at the level of 93% -100%

4.5 - has knowledge of the content of education at the level of 85% -92%

4.0 - has knowledge of the content of education at the level of 77% -84%

3.5 - has knowledge of the content of education at the level of 69% -76%

3.0 - has knowledge of the content of education at the level of 60% -68%

2.0 - has knowledge of the educational content below 60%

**Skill assessment**

5.0 - the student actively participates in the classes, recognizes and is able to properly name the biophysical phenomena in the human body, and to assess the correctness of the biophysical functioning of the human body. He skillfully uses basic laboratory techniques, inorganic and organic compounds

4.5 - the student actively participates in the classes, with little help from the teacher he recognizes and is able to properly name the biophysical phenomena in the human body, and to assess the correctness of the biophysical functioning of the human body. He uses basic laboratory techniques for inorganic and organic compounds

4.0 - the student actively participates in classes, with minor corrections of the teacher, committing minor mistakes in the recognition of biophysical phenomena in the human body. He uses laboratory techniques well, inorganic and organic compounds

3.5 - the student participates in classes, with numerous corrections and teacher's instructions recognizes and is able to correctly name biophysical phenomena in the human body, often making mistakes while using laboratory techniques, inorganic and organic compounds

3.0 - the student participates in classes, with very many corrections and teacher's instructions recognizes and is able to properly name biophysical phenomena in the human body, very often making mistakes while using laboratory techniques, inorganic and organic compounds

2.0 - the student passively participates in classes, commits blatant errors in the diagnosis and proper naming of biophysical phenomena, improperly uses laboratory techniques, committing repeatedly numerous errors, organic and inorganic compounds

**5. Total student workload required to achieve the desired result in hours and ECTS credits**

Activity	Hours / student work
----------	----------------------

Hours of classes according to plan with the teacher	45
Preparation for classes	15
Participation in the consultations	2
The time to write a paper / essay	-
Preparation for tests	20
Participation in colloquia	2
Other (e-learning)	
SUM OF HOURS	100
TOTAL NUMBER OF ECTS	4

**6. TRAINING PRACTICES IN THE SUBJECT / MODUL**

Number of hours	-
Rules and forms of apprenticeship	-

**6. LITERATURE**

1. Paul Davidovits . Physics in Biology and Medicine. 4th Edition. Academic Press
---

Acceptance Unit Manager or authorized person