

[illegible]

1.2. The form of class activities

☐ classes are in the traditional form

☒ classes are implemented using methods and techniques of distance learning

LECTURES – HYBRID FORM, ON LINE

LABORATORY – IN CONTACT

1.3 Examination Forms (exam, credit with grade or credit without grade)

2. BASIC 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

C1	Mastering the theoretical basis of physical phenomena occurring in the human body.
C2	Understanding the physical processes occurring and used in medicine.
C3	
C4	

3.2 OUTCOMES FOR THE COURSE

EK (the effect of education)	The content of learning outcomes defined for the class (module)	Reference to directional effects ¹
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	B.U2

¹In the case of a path of education leading to obtaining teaching qualifications, also take into account the learning outcomes of the standards of education preparing for the teaching profession.

	the body and applies to the principles of radiation protection	
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3.3 CONTENT CURRICULUM

A. Problems of the lecture

B. Problems of auditorium, seminar, laboratory and practical classes

Course contents	Hours
1. Methods for the development of experimental data. Basics of error theory.	1
2. Physical basics of ultrasonography	1
3. Rentgenodiagnostics.	
4. X-ray computed tomography.	
5. NMR imaging.	
6. Positron emission tomography.	
7. Influence of electric and magnetic fields on the living organism.	
8. The influence of ionizing radiation on the body of live radiotherapy.	
9. Ultrasonic absorption in the air.	
10. Analysis of the spectrum of speech sounds using the PRAAT program	
11. Measurements of the magnetic field created by circuits with current.	
12. Determination of the viscosity coefficient of the liquid using the Höppler rheo viscometer.	
13. Harmonic analysis of vibrations - the physical basis of applying ultrasounds in medicine	
14. The wave nature of ultrasounds - diffraction.	
15. Determination of electrochemical equivalent of copper and Faraday constant.	
16. Determination of focal lengths of lenses by means of optical bench.	
17. Construction and operation of an optical microscope. Observation and registration of tissue preparations and bacteria.	
18. Examination of the resolving power of the eye.	
19. Determining the electrical axis of the heart - electrocardiography (ECG).	
20. Determining the hearing performance - determining the audiogram.	

3.4 Didactic methods

Lecture: problem lecture, lecture with multimedia presentation, distance learning methods

Exercises: text analysis with discussion, project method (research, implementation, practical project), group work (task solving, discussion), didactic games, distance learning methods

Laboratory: performing experiments, designing experiments.

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	TEST. OBSERVATIONS DURING CLASSES	LECTURES, , SEMINARS
EK_02	TEST. OBSERVATIONS DURING CLASSES	LECTURES, SEMINARS
EK_03	TEST. OBSERVATIONS DURING CLASSES	LECTURES, SEMINARS
EK_04	TEST. OBSERVATIONS DURING CLASSES	LECTURES, SEMINARS
EK_05	TEST. OBSERVATIONS DURING CLASSES	LECTURES, EXERCISE, SEMINARS
EK_06	TEST. OBSERVATIONS DURING CLASSES	EXERCISE, SEMINARS
EK_07	TEST. OBSERVATIONS DURING CLASSES	EXERCISE, SEMINARS

4.2 Conditions for completing the course (evaluation criteria)

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	The average number of hours to complete the activity
Contact hours (with the teacher) resulting from the study schedule of classes	45
Contact hours (with the teacher) participation in the consultations, exams	4
Non-contact hours - student's own work (preparation for classes, exam, writing a paper, etc.)	
SUM OF HOURS	45
TOTAL NUMBER OF ECTS	2

** It should be taken into account that 1 ECTS point corresponds to 25-30 hours of total student workload.*

6. TRAINING PRACTICES IN THE SUBJECT

NUMBER OF HOURS	-
RULES AND FORMS OF APPRENTICESHIP	-

7. LITERATURE

Basic literature: Paul Davidovits . Physics in Biology and Medicine. 4th Edition. Academic Press
Additional literature

Acceptance Unit Manager or authorized person