Załącznik nr 1.5 do Zarządzenia Rektora UR nr 7/2023

SYLABUS

CONCERNING THE EDUCATION CYCLE *2024-2030*

(extreme dates)

Academic year 2024/2025

1. BASIC INFORMATION CONCERNING THIS SUBJECT

Subject	**Biophysics**
Course code *	**Bf/B**
Faculty of (name of the leading direction)	**Medical College of the University of Rzeszów**
Department Name	**Department of Photomedicine and Physical Chemistry, English Division**
Field of study	**Medical direction**
level of education	**Uniform master studies**
Profile	**General academic**
Form of study	**Stationary/ non- stationary**
Year and semester	**Year I semester I**
Type of course	**Obligatory**
Language	**English**
Coordinator	**Dr hab. n. med. inż. Prof. UR Dorota Bartusik-Aebisher**
First and Last Name of the Teachers	**Dr hab. n. med. inż. Prof. UR Dorota Bartusik-Aebisher**

*** - According to the resolutions of Educational Unit**

1.1. Forms of classes, number of hours and ECTS

Semester No.	Lecture	Exercise	Conversation	Laboratory	Seminar	ZP	Practical	Other	**Number of points ECTS**
	20	**30**	**-**	**-**	**-**	**-**	**-**	**-**	**5**

1.2. The form of class activities

X classes are in the traditional form

x classes are implemented using methods and techniques of distance learning

LECTURES – HYBRID FORM, IN CONTACT

SEMINARS, NONE

EXERCISE /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.

3.2 OUTCOMES FOR THE COURSE

EK (learning effect)	Content of the learning effect defined for the subject	Reference to directional effects [1]
EK_01	The student knows physical laws describing the flow of liquids and factors affecting the vascular resistance of blood flow	B.W5
EK_02	The student knows natural and artificial sources of ionizing radiation and its interaction with matter	B.W6
EK_03	The student knows the physical basis of non-invasive imaging methods	B.W7
EK_04	The student knows the physical basis of selected therapeutic techniques, including ultrasound and irradiations	B.W 8
EK_05	The student 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	B.U2

[1] In 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.

3.3 CONTENT CURRICULUM

A. Problems of the lecture

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

A. Problems of laboratories and practical classes

COURSE CONTENTS
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 rheoviscometer. **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. **10.** Examination of the resolving power of the eye.

3.4 Didactic methods

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

Exercise: 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-EK_11	WRITTEN TEST,	**LECTURE**
EK_ 12-EK_20	PRELIMINARY AND FINAL COLLOQUIUM, REPORT AND OBSERVATION DURING CLASSES	**Exercise**

4.2 Conditions for completing the course (evaluation criteria)

Semester 1

Knowledge assessment:

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

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

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

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

3.0 - shows knowledge of education content at 60% -68%
2.0 - shows knowledge of education content below 60%

Skill assessment:

3.0- Mastering program content at the basic level, chaotic answers, necessary guidance

questions, performing laboratory activities with the help of a teacher.

3.5- Mastering program content at the basic level, systematic answers, requires the help of a teacher. Laboratory activities performed with the help of a teacher, with inadequate performance.

4.0- Mastering program content at the basic level, systematized, independent answers. Solving problems in typical situations, laboratory activities performed independently, quite efficiently, with a small amount of error.

4,5- The scope of presented knowledge exceeds the basic level based on the supplementary literature provided. Solving problems in new and complex situations. Laboratory activities carried out independently, quite efficiently and correctly.

5.0- The scope of presented knowledge goes beyond the basic level based on independently acquired scientific sources of information, laboratory activities carried out independently, efficiently and correctly

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	50
Contact hours (with the teacher) participation in the consultations, exams	50
Non-contact hours - student's own work (preparation for classes, exam, writing a paper, etc.)	50
SUM OF HOURS	150
TOTAL NUMBER OF ECTS	**5**

** 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

Paul Davidovits . Physics in Biology and Medicine. 4th Edition. Academic Press
Class handouts

Acceptance Unit Manager or authorized person