Appendix number 1.5 to The Rector UR Resolution No. *12/2019*

SYLLABUS

**concerning** **the** **cycle** **of** **education** **2022-2028**

(date range)

Academic year 2023/2024

* 1. **BASIC** **INFORMATION** **CONCERNING** **THIS** **SUBJECT**

|  |  |
| --- | --- |
| Subject | **Biophysics** |
| Course code \* | **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** **studies** |
| Profile | **practical** |
| Form of study | **Stationary/** **non-** **stationary** |
| Year and semester | **Year** **I** **semester** **I** |
| Type of course | **Mandatory** |
| Coordinator | **Dr** **hab.** **n.** **med.** **David** **Aebisher,** **Prof** **UR** |
| First and Last Name of the  Teachers | **Dr** **hab.** **n.** **med.** **David** **Aebisher,** **Prof** **UR** |

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

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

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Semester No. | Lecture | Exercise | Conversation | Laboratory | Seminar | Z P | Praktical | Other | **Number** **of** **points** **ECTS** |
| **I** | **20** | **30** | **-** | **-** | **-** | **-** | **-** | **-** | **5** |

* 1. **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** (**exam**, credit with grade or credit without grade)

1. **REQUIREMENTS**

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

# OBJECTIVES, OUTCOMES, AND PROGRAM CONTENT USED IN TEACHING METHODS

* 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. |

* 1. **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.

* 1. **CONTENT** **CURRICULUM**

1. **Course contents of lectures**

|  |
| --- |
| Methods for the development of experimental data. Basics of error theory. |
| Physical basics of ultrasonography 1 |
| Rentgenodiagnostics. |
| 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. |

1. **Seminars**

|  |
| --- |
| Ultrasonic absorption in the air. |
| Analysis of the spectrum of speech sounds using the PRAAT program |
| Measurements of the magnetic field created by circuits with current. |
| Determination of the viscosity coefficient of the liquid using the Höppler rheo viscometer. |
| The wave nature of ultrasounds - diffraction. |
| Determination of electrochemical equivalent of copper and Faraday constant |
| Construction and operation of an optical microscope. Observation and registration of tissue preparations and bacteria |
| Examination of the resolving power of the eye. |
| Determining the electrical axis of the heart – electrocardiography (ECG). |
| 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** |  | |

* 1. **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

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

|  |  |
| --- | --- |
| Activity | **The** **average** **number** **of** **hours** **to** **complete** **the** **activity** |
| Hours of classes according to plan with the 45  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** |

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

1. **TRAINING** **PRACTICES** **IN** **THE** **SUBJECT**

-

**Number** **of** **hours**

-

**Rules** **and** **forms** **of** **apprenticeship**

1. **LITERATURE**

*Class* *handouts*

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

Acceptance Unit Manager or authorized person