Appendix No. 1.5 to the Resolution No. 7/2023

of the Rector of the University of Rzeszów

**SYLLABUS**

**regarding the qualification cycle FROM ………TO…..**

**Academic year 2024/2025**

1. Basic Course/Module Information

|  |  |
| --- | --- |
| Course/Module title | Physics |
| Course/Module code \* |  |
| Faculty (name of the unit offering the field of study) | College of Natural Sciences |
| Name of the unit running the course | Institute of Physics |
| Field of study | Diagnostic systems in medicine |
| Qualification level | First-cycle studies |
| Profile |  |
| Study mode | Full-time |
| Year and semester of studies | Year 1, winter or summer semester |
| Course type |  |
| Language of instruction | English |
| Coordinator | prof. Antoni Szczurek |
| Course instructor |  |

\* - as agreed at the faculty

1.1.Learning format – number of hours and ECTS credits

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Semester  (n0.) | Lectures | Classes | Colloquia | Lab classes | Seminars | Practical classes | Internships | others | **ECTS credits** |
| 1 |  | 30 |  |  |  |  |  |  | **5** |

1.2. Course delivery methods

☒ conducted in a traditional way

☐ involving distance education methods and techniques

1.3. Course/Module assessment (exam, pass with a grade, pass without a grade)

Classes - pass with a grade

2. Prerequisites

|  |
| --- |
| KNOWLEDGE OF PHYSICS AND MATHEMATICS AT THE SECONDARY SCHOOL LEVEL |

3. Objectives, Learning Outcomes, Course Content, and Instructional Methods

3.1. Course/Module objectives

|  |  |
| --- | --- |
| O1 | *to familiarize students with the basic concepts used in physics* |
| O2 | teaching students to formulate physical issues and problems in the language of mathematics |
| O3 | acquiring by students the ability to use the laws of physics in practice in solving simple physical problems |

3.2. Course/Module Learning Outcomes (to be completed by the coordinator)

|  |  |  |
| --- | --- | --- |
| Learning Outcome | The description of the learning outcome  defined for the course/module | Relation to the degree programme outcomes |
| LO\_01 | the student knows differential and integral calculus, algebra and applied mathematics issues enabling the description, understanding and modeling of physical problems with a significant level of complexity | K\_W01 |
| LO\_02 | the student knows the basic theorems and laws of the main fields of physics, in particular, mechanics, electromagnetism, optics, thermodynamics, electricity and quantum mechanics | K\_W02 |
| LO\_03 | the student is able to analyze problems in the field of physics and find solutions based on known theorems and methods | K\_U01 |
| LO\_04 | the student is able to present the elaboration of a specific problem in the field of physics and its applications in medicine and technology | K\_U05 |
| LO\_05 | the student is able to carry out simple physics experiments and interpret the obtained results | K\_U06 |
| LO\_06 | the student can work in a group and organize individual and teamwork | K\_U14 |
| LO\_07 | the student can design his/her educational path related to issues in the field of physics | K\_U15 |
| LO\_08 | the student is ready to take action to popularize physics and its application in medicine | K\_K04 |
| LO\_09 | the student is ready to perform professional roles in a responsible manner that require competences appropriate for a graduate of Diagnostic systems in medicine studies | K\_K06 |

**3.3. Course content (to be completed by the coordinator)**

1. Lectures

|  |
| --- |
| Content outline |
| Subject and methodology of physics: Systems of units; mathematical apparatus used in physics |
| Kinematics of a material point. Description of motion, speed and acceleration; examples of movements, observation of position and time from two reference systems |
| Laws of motion: the principle of inertia; equations of motion; examples of solving equations of motion. Kinetic and static friction. |
| Conservation rules: momentum and angular momentum; work, power, energy; |
| Rigid body mechanics: rigid body model; statics and dynamics of a rigid body |
| Hydrostatics and Hydrodynamics: fluid pressure; Pascal's law; Archimedes' law; pressure measurements, barometer and manometers; general characteristics of fluid flow |
| Laws of thermodynamics. First and second laws of thermodynamics. Carnot cycle. Entropy |
| The right warmth. The heat of transformation. Heat transfer. |
| Electrostatics. Electrostatic field in a vacuum. Coulomb's law. electric field. Gauss' law. |
| Electric current. Basics of the classical theory of conductivity, Ohm's law, Joule-Lenz's law, Kirchhoff's laws - selected applications |

1. Classes, tutorials/seminars, colloquia, laboratories, practical classes

|  |
| --- |
| Content outline |
| Vector calculus |
| Kinematics of a material point |
| The dynamics of the material point |
| Conservation rules: momentum and angular momentum; work, power, energy |
| Rigid body mechanics |
| Hydrostatics and hydrodynamics |
| Laws of thermodynamics. First and second laws of thermodynamics |
| Electrostatics |
| Electric current. Ohm's law and Kirchhoff's law |

3.4. Methods of Instruction

e.g.

*Lecture: a problem-solving lecture/a lecture supported by a multimedia presentation/ distance learning*

*Classes: text analysis and discussion/project work (research project, implementation project, practical project)/ group work (problem solving, case study, discussion)/didactic games/ distance learning*

*Laboratory classes: designing and conducting experiments*

4. Assessment techniques and criteria

4.1 Methods of evaluating learning outcomes

|  |  |  |
| --- | --- | --- |
| Learning outcome | Methods of assessment of learning outcomes (e.g. test, oral exam, written exam, project, report, observation during classes) | Learning format (lectures, classes,…) |
| LO-01 | test | classes |
| LO-o2 | test | classes |
| LO-03 | observation during classes, test | classes |
| LO-o4 | observation during classes, test | classes |
| LO-05 | observation during classes, | classes |
| LO-o6 | observation during classes, | classes |
| LO-07 | observation during classes, | classes |
| LO-o8 | observation during classes, | classes |
| LO-09 | observation during classes | classes |

4.2 Course assessment criteria

|  |
| --- |
| Method of passing the classes - passing with a grade;  Completion of the subject will confirm the degree to which the student has achieved the assumed learning outcomes. Verification of the achieved learning outcomes is controlled on an ongoing basis during the course. The grade obtained from completing the course will allow you to assess the degree of achieved effects. The final grade is the arithmetic mean of the grades from the two tests. All tests must be passed. Student activity in class is also taken into account.  Requirements corresponding to individual assessments:  Very good rating  The student has mastered the full range of knowledge and skills specified in the curriculum. He or she efficiently uses the acquired information, knows how to use various sources of knowledge, solves calculation and problem tasks independently, is able to apply acquired knowledge in new situations.  Good rating  The student has mastered a large range of more complex knowledge and skills. However, he or she did not fully master the knowledge specified in the curriculum. He or she applies knowledge correctly to solve common tasks or problems.  Satisfactory  The student has mastered the most important information from the point of view of the subject, simple, easy to learn. He or she solves typical tasks with the help of the teacher, knows the basic theorems and formulas. |

5. Total student workload needed to achieve the intended learning outcomes

– number of hours and ECTS credits

|  |  |
| --- | --- |
| Activity | Number of hours |
| Scheduled course contact hours | 30 |
| Other contact hours involving the teacher (consultation hours, examinations) | 2 |
| Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.) | 63 |
| Total number of hours | 95 |
| Total number of ECTS credits | 5 |

\* One ECTS point corresponds to 25-30 hours of total student workload

6. Internships related to the course/module

|  |  |
| --- | --- |
| Number of hours | *-* |
| Internship regulations and procedures | *-* |

7. Instructional materials

|  |
| --- |
| Compulsory literature:  Resnick Robert, Halliday David, Physics, part I and II, 2002, New York : John Wiley  Paul Peter Urone, Roger Hinrichs, This Physics, 2020. (<https://openstax.org/details/books/physics?Book%20details>)  Gregg Wolfe, et al. College Physics, 2022, <https://openstax.org/details/books/college-physics-ap-courses-2e> |
| Complementary literature:  Additional literature will be available from the academic teacher. |

Approved by the Head of the Department or an authorised person