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 | Basics of electronics |
| 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 II, winter semester |
| Course type | basic |
| Language of instruction | English |
| Coordinator | PhD Andrzej Wal |
| Course instructor | PhD Andrzej Wal |

\* - 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** |
| 3 |  | 30 |  |  |  |  |  |  | 3 |

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)

*pass with a grade*

2. Prerequisites

|  |
| --- |
| *Knowledge of physics in the field of electricity and magnetism. Knowledge of analysis and algebra, including the binary system* |

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

3.1. Course/Module objectives

|  |  |
| --- | --- |
| O1 | *Presentation of the basics of modern electronics* |
| O2 | *The student will learn the principles of operation of modern elements of electrical circuits and the principles and laws of DC, alternating sinusoidal single-phase and three-phase circuits, as well as methods of their theoretical description* |
| O3 | *The student will get acquainted with the principles of operation of basic electronic circuits* |
| O4 | *Developing the ability to use basic electronic components in electronic circuits (including digital)* |

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 | *Student knows and understands the basic laws describing the flow of electric current through passive and active elements of circuits* | K\_W02 |
| LO\_02 | *Student knows and understands the basic aspects of the construction and operation of simple electronic systems, in particular the limitations related to the tolerance of the parameters of electronic components and their reliability* | K\_W07 |
| LO\_03 | *Student analyses parameters of electronic systems* | K\_U01, K\_Uo7 |
| LO\_04 | *Student can measure the parameters of electronic circuits using meters, oscilloscopes and generators* | K\_U02 |
| LO\_05 | *Student can plan and perform simple measurement systems to determine the parameters of electronic systems, interpret the results and formulate conclusions on this basis, and assess measurement errors* | K\_U06, K\_Uo8 |
| LO\_06 | *Student is able to work in a group to solve problems* | K\_K01 |

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

1. Lectures

|  |
| --- |
| Content outline |
|  |
|  |
|  |

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

|  |
| --- |
| Content outline |
| *Ohm's law, Kirchhoff's laws, classical theory of conductivity* |
| *Passive elements, connecting elements* |
| *Equivalent delta-star connections. Substitute circuits. Thevenin and Norton Principle. Voltage divider, resistance bridge, compensation method of resistance measurement* |
| *Terminal method for describing electrical circuits. Electric current receivers, two-, three- and four-terminal network* |
| *Alternating current, graphical representation, symbolic method* |
| *RLC circuits* |
| *Fundamentals of semiconductor physics, semiconductor diodes* |
| *Bipolar layer transistor. Unipolar transistor* |
| *Integrated circuits* |
| *Electronic amplifiers* |
| *Generators and power sources* |
| *Digital circuits* |

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*

*Classes: discussion/project work (research project, implementation project, practical project)/ group work (problem solving, case study, discussion)*

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, activity during classes* | *lectures* |
| LO\_02 | *test, activity during classes* | *lectures* |
| LO\_03 | *test, activity during classes* | *lectures* |
| LO\_04 | *activity during classes* | *lectures* |
| LO\_05 | *activity during classes* | *lectures* |
| LO\_06 | *activity during classes* | *lectures* |

4.2 Course assessment criteria

|  |
| --- |
| *Passing the subject will be done through reports, active participation in classes, participation in discussions. Verification of the achieved learning outcomes is controlled during the course.* |

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) | 3 |
| Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.) | 40 |
| Total number of hours | 73 |
| Total number of ECTS credits | 3 |

\* 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:  *J. Barlett, Electronics for Beginners: A Practical Introduction to Schematics, Circuits, and Microcontrollers, ‎ Apress, 2020.*  *S.N. Makarov, R. Ludwig, S.J. Bitar, Practical Electrical Engineering, Springer 2016.*  *Ch. Platt, Make: Electronics: Learning by Discovery: A hands-on primer for the new electronics enthusiast, Make Community, LCC, 2021.*  *P. Horowitz, W. Hill, The Art of Electronics, Cambridge University Press, 2015* |
| Complementary literature:  *Ch. Platt, Make: More Electronics: Journey Deep Into the World of Logic Chips, Amplifiers, Sensors, and Randomicity, ‎ Make Community, LLC, 2014.* |

Approved by the Head of the Department or an authorised person