**SYLLABUS**

**regarding the qualification cycle FROM 2024TO 2025**

1. Basic Course/Module Information

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| --- | --- |
| Course/Module title | *Molecular biology* |
| Course/Module code \* |  |
| Faculty (name of the unit offering the field of study) | *College of natural Sciences, Institute of Biotechnology* |
| Name of the unit running the course | *Institute of Biotechnology* |
| Field of study | Biology, Biotechnology |
| Qualification level  | II grade |
| Profile | *general academic strand* |
| Study mode | *stationary* |
| Year and semester of studies |  |
| Course type |  |
| Language of instruction | English |
| Coordinator | Justyna Ruchala, PhD |
| Course instructor | *Justyna Ruchala, PhD* |

\* - 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** |
| Summer |  |  |  | 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)

credit with grade, exam

2. Prerequisites

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| Knowledge in the fields of biochemistry, molecular biology, and cell biology. |

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

3.1. Course/Module objectives

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| --- | --- |
| O1 | *Expanding theoretical knowledge in the field of structure and functions of biological macromolecules and macromolecular complexes of DNA, RNA and proteins.* |
| O2 | *To acquaint students with the molecular basis of the main cellular processes.* |
| O3 | *Preparing students to use selected experimental techniques used in molecular biology.* |

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 understands and describes the main elements of the structure of nucleic acids and proteins, characterizing their biological functions. | O\_K\_04 |
| LO\_02 | The student understands the course of key processes related to the metabolism of nucleic acids and proteins and the expression of genetic information. | O\_K\_01 |
| LO\_03 | The student knows the application of molecular biology in industry and medicine. | O\_K\_01 |
| LO\_04 | The student knows the use of advanced techniques and research tools, including bioinformatics used in molecular biology for the modification and analysis of genomes | O\_K\_05 |
| LO\_05 | The student is able to handle specialized equipment with the principles of occupational health and safety and good laboratory practice, the scope to perform independent research tasks | O\_S\_02 |
| LO\_06 | The student is able to use publicly available databases of sequences and structures of biological macromolecules and uses a professional language in the field of | O\_S\_11 |

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

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

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| Content outline  |
| Practical requirements for molecular biology research, good laboratory practice |
| Introduction to DNA cloning. Features of cloning vectors and expression vectors. Types of vectors used for cloning in prokaryotic and eukaryotic organisms. |
| Structure of a plasmid vector. The most common methods of DNA isolation. Mini prep isolation of DNA by the alkaline lysis method. |
| Application of restriction endonuclease in DNA analysis. Restriction hydrolysis of recombinant plasmid DNA.  |
| Nucleic acid electrophoresis in agarose gels |
| Construction of recombinant DNA molecules |
| Generation and identification of recombinant clones |
| Purification of RNA |
| Real-time PCR reaction, the principle of the reaction, analysis of the obtained results. |

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*

Laboratory exercises - work in the laboratory, work in groups, processing the results, performing 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 – Lo-03 | *PRESENCE IN LECTURES, ACTIVITY, EXAM* | L |
| LO-o4 – Lo-06 | Test, ACTIVITY, OBSERVATION DURING CLASSES | Le |

4.2 Course assessment criteria

|  |
| --- |
| For passing the course is the achievement of all assumed learning outcomes.Lab classes: * conducting laboratory experiments,
* colloquium

Obtaining a positive grade from the lab classes is required for taking part in the exam. |

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) | 10 |
| Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.) | 85 |
| Total number of hours | 125 |
| 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

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| Compulsory literature:“Molecular biology”, B.R. Glick, American Society of Microbiology, 2017. |
| Complementary literature: „Lehninger Principles of Biochemistry”, D. L. Nelson, M. M. Cox; W. H. Freeman – 5. edycja, 2008.„Genomes 4th edition” T. A. Brown, Garland Science, 20019.http://ncbi.nlm.nih.gov./books/bv.fcgi?rid=genomes |

Approved by the Head of the Department or an authorised person