I

**SYLLABUS**

**regarding the qualification cycle FROM 2023 TO 2024**

1. Basic Course/Module Information

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| --- | --- |
| Course/Module title | *Microorganisms in Biotechnology* |
| 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 Biotechnology* |
| Field of study | Biotechnology |
| Qualification level | First-cycle studies |
| Profile | *All-academic* |
| Study mode | *Full-time* |
| Year and semester of studies | *II year, III semster* |
| Course type | *specialized* |
| Language of instruction | English |
| Coordinator | Kamila Filip, PhD |
| Course instructor | *Kamila Filip, 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** |
| 2 |  |  |  | 50 |  |  |  |  | 5 |

1.2. Course delivery methods

X 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)

2. Prerequisites

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| knowledge of basic microbiology, biochemistry and molecular biology |

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

3.1. Course/Module objectives

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| --- | --- |
| O1 | *The aim of the course is to study field of applied microbiology and to convey scientific knowledge and information. This course offers a comprehensive study on microorganisms and genetic modified microorganisms (GMM) used in biotechnological industry.* |
| O2 | Preparing students to work in the microbiological laboratory and using appropriate techniques, methods and tools for conducting microbiological processes. |
| O3 | During laboratory classes student will learn rules of enzyme and cells immobilization, biosynthesis chosen bioproducts, organic acids, ethanol. |

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

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| --- | --- | --- |
| Learning Outcome | The description of the learning outcome  defined for the course/module | Relation to the degree programme outcomes |
| LO\_01 | Students know basic safety rules regarding work in the microbiological laboratory. | O\_K09 |
| LO\_02 | Students shall learn various aspects of microbiology such as metabolism pathways, bioproducts obtained from microorganisms in biotechnological industry | O\_K04 |
| LO\_03 | Student knows types of bioreactors and other basic tools used in biotechnology | O\_K05 |
| LO\_04 | Student shall learn basic rules of bioprocess engineering and methods of regulation of biochemical processes | O\_K15 |
| LO\_05 | Student uses appropriate cell culture method to obtain a bioproduct | O\_S02 |
| LO\_06 | Student can use different methods of improvement production strains | O\_S08, O\_S11, O­\_S12 |
| LO\_07 | Student respects rules of professional ethics, can work independently and as a part of a team | O\_C07, O\_C08 |

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

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

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| Content outline |
| Health and safety regulations, laboratory equipment. |
| Obtaining yeast protoplasts. |
| Microbes used in biotechnology – *Bacillus* isolation from soil and Gram staining |
| Fermentation – bioethanol production, analysis of process efficiency |
| Biosynthesis of citric acid by a mold *Aspergillus niger* |
| Ginger beer production on the laboratory scale |
| Isolation and identification acetic acid bacteria from fruits. |
| Milk fermentation – yoghurt production |

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 classes: designing and conducting experiments, work in the laboratory, team work

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-o1-LO06 | TEST, ACTIVITY, OBSERVATION DURING CLASSES | LC |

4.2 Course assessment criteria

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| Laboratory classes assessment – obtained grades of written tests, activity during classes and prepared reports |

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 | 50 |
| Other contact hours involving the teacher (consultation hours, examinations) | 30 |
| Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.) | 30 |
| Total number of hours | 110 |
| 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

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

7. Instructional materials

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| Compulsory literature:  1. Basic biotechnology by Colin Ratledge and Bjørn Kristiansen, Cambridge University press 2006  2. Bacteria: In Biology, Biotechnology and Medicine by Paul Singleton, John Wiley & Sons 1997 |
| Complementary literature:  1. Sangorrin M., Zajonkovsky I., van Broock M., Caballero A. 2002. The use of killer biotyping in an ecological survey of yeast in an old patagonian  winery. World J. Microbiol. Biotechnol. 18, 115-120. |

Approved by the Head of the Department or an authorised person