**SYLLABUS**

**regarding the qualification cycle FROM 2023TO 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) | *Institute of Biology and Biotechnology* |
| Name of the unit running the course | *Biotechnology Department* |
| Field of study | *Biology and Biotechnology* |
| Qualification level | *Engineering* |
| Profile | *Academic* |
| Study mode | *Full-time course* |
| Year and semester of studies | *summer* |
| Course type | *Basic* |
| Language of instruction | *English* |
| Coordinator | *dr hab. Małgorzata Kus-Liśkiewicz, prof UR* |
| Course instructor | *dr hab. Małgorzata Kus-Liśkiewicz, prof UR* |

\* - as agreed at the faculty

1.1.Learning format – number of hours and ECTS credits

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Semester  (n0.) | Lectures/seminars | 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)

pass with a grade

2. Prerequisites

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| Basic knowledge in biology, chemistry, molecular biology. |

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

3.1. Course/Module objectives

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| --- | --- |
| O1 | *Defining the definition of the biotechnology and list some basic application with using microorganisms* |
| O2 | *Describing the fundamental processes of growth of microorganisms* |

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 | Student should have a knowledge about biotechnological facts, and principles concepts in experimental techniques | TK\_W04,  TK\_W05 |
| LO\_02 | Student will be able to understand the basics in microbial cell growth and plan the methods for microorganisms cultivation | TK\_U02  TK\_U05 |
| LO\_03 | Student will develop an awareness of the relationship between science and technology in terms of the life and biotechnology | TK\_K06 |

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

1. Lectures

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| Content outline |
| Introduction to biotechnology: terms and definitions, the type of biotechnology, application, timeline and historical overview of biotechnology. |
| General characteristics of microorganisms, structure of bacteria and viruses, bacterial growth - bacterial growth curve, factors affecting bacterial growth. |
| Selection and isolation of new strain. |
| Single cell protein – definition and production of biocopmounds. |
| Industrial and environmental biotechnology; pollution, bioremediation, microorganisms in agricultural waste water treatment, bioreactor/fermenter. |
| Heterological protein expression system and recombinant protein as the technique to produce biocompounds. Industrial production of biopharmaceutics (i.e. penicillin, insulin). |

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

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| Content outline |
| Microbial cell culturing, bioreactor cultivation for biocompounds production. |
| Techniques to assess cell growth, metabolic activity. |
| Synthesis of biocompounds and evaluation of the cytotoxicity towards biological system. |

3.4. Methods of Instruction

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

*Laboratory classes: designing and conducting experiments, practical project and group work to solve the problem, distance learning*

4. Assessment techniques and criteria

4.1 Methods of evaluating learning outcomes

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| --- | --- | --- |
| 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-01-03 | Project, written exam | Lectures and lab |

4.2 Course assessment criteria

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| Labs – written project based on the experiments which have been performed during the labs. Criteria: 65% - 3.0; 75% - 3.5; 85% - 4.0; 90 – 4.5; 95-100% - 5.0.  Lecture – score obtained after written exam; criteria: 65% - 3.0; 75% - 3.5; 85% - 4.0; 90 – 4.5; 95-100% - 5.0. |

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) | 15 |
| Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.) | 80 |
| 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

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

7. Instructional materials

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| Compulsory literature:   * Cancer cell culture : methods and protocols / ed. by Simon P. Langdon * Microbial biotechnology in the laboratory and practice : theory, exercises and specialist laboratories / edited by Jerzy Długoński * Biotechnology : a laboratory course / Jeffrey M. Becker, Guy A. Caldwell, Eve Ann Zachgo |
| Complementary literature:  Research article, will be determined during the course |

Approved by the Head of the Department or an authorised person