**SYLLABUS**

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

1. Basic Course/Module Information

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| Course/Module title | *BIOCHEMICAL INSTRUMENTAL ANALYSIS* |
| Course/Module code \* | *B/I/SBA.7* |
| Faculty (name of the unit offering the field of study) | *INSTITUTE OF BIOTECHNOLOGY* |
| Name of the unit running the course | *DEPARTMENT OF BIOTECHNOLOGY* |
| Field of study | BIOLOGY and BIOTECHNOLOGY |
| Qualification level | FIRST |
| Profile |  |
| Study mode | *STATIONARY* |
| Year and semester of studies | *3RD YEAR/ 5TH SEMESTER* |
| Course type | *SPECIALIZATION* |
| Language of instruction | ENGLISH |
| Coordinator | DR HAB. EWA SZPYRKA |
| Course instructor | *DR INŻ. MAGDALENA PODBIELSKA* |

\* - as agreed at the faculty

1.1.Learning format – number of hours and ECTS credits

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Semester | 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)

Lab classes - pass with a grade

2. Prerequisites

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| KNOWLEDGE OF BASIC ISSUES IN THE FIELD OF GENERAL, INORGANIC AND ORGANIC CHEMISTRY AND LABORATORY TECHNIQUES. |

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

3.1. Course/Module objectives

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| 01 | *ACQUAINTANCE OF THE STUDENT WITH THE MOST IMPORTANT INSTRUMENTAL METHODS USED IN BIOCHEMICAL ANALYSIS, INCLUDING MOLECULAR AND ATOMIC SPECTROSCOPY, CHROMATOGRAPHIC METHODS, MASS SPECTROMETRY.* |
| 02 | *GAINING KNOWLEDGE BY THE STUDENT ABOUT THEORETICAL FOUNDATIONS OF INDIVIDUAL INSTRUMENTAL METHODS, APPLICATION RANGES, APPARATUS CONSTRUCTION, VALIDATION OF ANALYTICAL METHODS AND STATISTICAL ASSESSMENT OF MEASUREMENT RESULTS.* |
| 03 | *ACQUISITION BY THE STUDENT OF THE ABILITY TO ISOLATE SELECTED BIOCHEMICAL COMPOUNDS FROM THE TESTED SAMPLES, TO CLEAN-UP SAMPLES AND TO MAKE QUALITATIVE / QUANTITATIVE DETERMINATIONS USING INSTRUMENTAL ANALYSIS TECHNIQUES (GAS AND LIQUID CHROMATOGRAPHY, MASS SPECTROMETRY).* |

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 | THE STUDENT PRESENTS KNOWLEDGE IN THE FIELD OF INSTRUMENTAL METHODS OF BIOCHEMICAL ANALYSIS AND ANALYTICAL TECHNIQUES, INCLUDING SEPARATION TECHNIQUES. | K\_W02, K\_W04,  K\_W14, K\_W15 |
| LO\_02 | THE STUDENT PRESENTS THE PRINCIPLES OF OCCUPATIONAL HYGIENE AND SAFETY AT WORK IN THE ANALYTICAL LABORATORY. | K\_W09 |
| LO\_3 | THE STUDENT PERFORMS QUALITATIVE / QUANTITATIVE ANALYSIS OF PHYSICOCHEMICAL PARAMETERS BY INSTRUMENTAL METHODS OF BIOCHEMICAL ANALYSIS. HE PERFORMS CALCULATIONS OF OBTAINED MEASUREMENTS AND HE INTERPRETS THE OBTAINED RESULTS. | K\_U01, K\_U02, K\_U03, K\_U05, K\_U07, K\_U08, K\_U11, K\_U12,  K\_K01, K\_K02,  K\_K06 |
| LO\_4 | THE STUDENT APPLIES THE PRINCIPLES OF SAFETY AND HYGIENE AT WORK IN THE ANALYTICAL LABORATORY. | K\_U10 |
| LO\_5 | THE STUDENT DEMONSTRATES RESPONSIBILITY FOR LABORATORY EQUIPMENT AND HE RESPECTS THE WORK OF OTHER PEOPLE. | K\_K04 |

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

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

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| Content outline |
| • GAS CHROMATOGRAPHY - PRINCIPLE OF EQUIPMENT OPERATION, PREPARATION OF STANDARD AND SAMPLES FOR ANALYSIS (EXTRACTION OF ANALYTES, PURIFICATION OF EXTRACTS), METHOD DESIGNING, PREPARATION OF APPARATUS FOR WORK, ANALYSIS OF SAMPLES, STATISTICAL ANALYSIS OF RESULTS.  • LIQUID CHROMATOGRAPHY - PRINCIPLE OF EQUIPMENT OPERATION, PREPARATION OF STANDARD AND SAMPLES FOR ANALYSIS (EXTRACTION OF ANALYTES, PURIFICATION OF EXTRACTS), METHOD DESIGNING, PREPARATION OF APPARATUS FOR WORK, ANALYSIS OF SAMPLES, STATISTICAL ANALYSIS OF RESULTS.   * MASS SPECTROSCOPY - THE PRINCIPLE OF USING THE APPARATUS, PREPARATION OF THE STANDARD AND SAMPLES FOR ANALYSIS, DESIGNING THE METHOD, PREPARATION OF THE APPARATUS FOR WORK, SAMPLE ANALYSIS, STATISTICAL ANALYSIS OF RESULTS. |

3.4. Methods of Instruction

*LAB CLASSES - WORK IN THE LABORATORY, WORK IN GROUPS, PRACTICAL CLASSES.*

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 | *test, project* | lab classes |
| LO-o2 - LO-o3 | Observation during lab classes, reports, written tests | lab classes |
| LO-o4 - LO-o5 | Observation during lab classes | lab classes |

4.2 Course assessment criteria

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| LABORATORY EXERCISES - OBTAINING POSITIVE GRADES OF WRITTEN TESTS, EXECUTION OF ALL LABORATORY EXERCISES AND PREPARATION OF REPORTS. GRADE OF LABORATORY EXERCISES INCLUDES: GRADES OF TESTS, ASSESSMENT OF STUDENT ACTIVITY DURING CLASSES, ASSESSMENT OF LABORATORY REPORTS AND ASSESSMENT OF STUDENT SKILLS.  EVALUATION METHODS AND CRITERIA:  A: QUESTIONS IN THE FIELD OF INFORMATION TO REMEMBER  B: QUESTIONS IN THE FIELD OF KNOWLEDGE TO UNDERSTAND;  C: SOLVING A TYPICAL WRITTEN TASK;  D: SOLVING A UNTYPICAL WRITTEN TASK;  ASSESSMENT CRITERIA:  - FOR INSUFFICIENT SOLUTION ONLY TASKS WITH THE AREAS A AND B = GRADE 2.0  - FOR SOLVING TASKS ONLY WITH THE AREAS A AND B OBTAINING MAX. GRADE 3.0  - FOR SOLUTION OF TASKS IN A + B + C AREAS POSSIBLE TO OBTAIN MAX. GRADE 4.0  - FOR SOLUTION OF TASKS FROM A + B + C + D AREAS POSSIBLE TO OBTAIN GRADE 5.0 |

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

– number of hours and ECTS credits

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| 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.) | 105 |
| Total number of hours | 150 |
| 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:   * JM Andrade-Garda, A Carlosena-Zubieta, MP Gómez-Carracedo, MA Maestro-Saavedra Problems of Instrumental Analytical Chemistry A Hands-On Guide. World Scientific 2017. * David T. Harvey, Analytical Chemistry 2.1. DePauw University 2016. |
| Complementary literature:   * Scientific publications in a given field |

Approved by the Head of the Department or an authorised person