**SYLLABUS**

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

1. Basic Course/Module Information

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| --- | --- |
| Course/Module title | *Biologically active substances* |
| 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 | *Department of Biotechnology* |
| Field of study | Biology and Biotechnology |
| Qualification level | Second grade |
| Profile | *Academic* |
| Study mode | *Full-time course* |
| Year and semester of studies | *Winter* |
| Course type | *Basic* |
| Language of instruction | English |
| Coordinator | *Assoc. Prof. Grzegorz Chrzanowski, PhD, D.Sc.* |
| Course instructor | *Assoc. Prof. Grzegorz Chrzanowski, PhD, D.Sc.* |

\* - 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** |
| winter |  |  |  | 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)

2. Prerequisites

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| Knowledge in the fields of organic chemistry, biochemistry and laboratory techniques. |

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

3.1. Course/Module objectives

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| --- | --- |
| O1 | *Expanding theoretical knowledge in the structure and functions of plant secondary metabolites and their biological activity and biosynthesis.* |
| O2 | *To acquaint students with the biosynthesis of the main secondary metabolites.* |
| O3 | *Preparing students to use selected experimental techniques used in biochemistry and phytochemistry.* |

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\_o1 | The student understands and describes the main groups of the primary and secondary plant metabolites. | O\_K\_03 |
| LO\_02 | The student understands the course of key processes related to the biosynthesis of plant metabolites. | O\_K\_05 |
| LO\_03 | The student knows the application of natural compounds in industry and medicine. | O\_K\_09 |
| LO\_04 | The student knows the use of advanced techniques and research tools, including statistics for the analysis of phytochemicals. | O\_K\_01, O\_K\_02 |
| LO\_05 | The student is able to use specialized equipment with the principles of occupational health and safety and good laboratory practice, the scope to perform independent research tasks. | O\_K\_04, O\_K\_06 |
| LO\_06 | The student is able to exploit general public datasets and uses professional language in the field of biochemistry and phytochemistry. | O\_S\_04 |
| LO\_07 | The student is able to perform tasks while working in a team, performing the tasks provided for in the program of chemical and biological experiments. | O\_S\_08, O\_S\_09 |

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

1. Lectures

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| Content outline |

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

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| Content outline |
| Cultivation of algae and preparation of plant and algal materials for analysis. |
| Polyphenols (phenolic acids, flavonoids, anthocyanins) – extraction, purification and analysis. |
| Carotenoids and other pigments – extraction, purification and chromatographic and spectral analysis. |
| Steam distillation of essential oils and analysis. |
| Application of mass spectrometry for identification of natural compounds. |
| Antioxidant capacity of natural compounds. |
| Deterrent and toxic activity of phytochemicals against insects. |

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, performing experiments, discuss the results, preparation of reports from the laboratory experiments.

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 | *PRESENCE IN LECTURES, ACTIVITY* | L |
| LO-o2 | ACTIVITY, preparation of reports, TEST | L |

4.2 Course assessment criteria

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| A: Remembering of knowledge;  B: Understanding of questions;  C: Solving a typical written task;  D: Solving a non-standard written task;  Assessment criteria:  - for the insufficient solution of tasks only in area A and B = grade 2.0  - for solving tasks only in areas A and B, the possibility of obtaining max. ratings 3.0  - for solving A + B + C tasks, the possibility of obtaining max. ratings 4.0  - for solving tasks in the area of A + B + C + D, the possibility of obtaining a score of 5.0  Completion of the laboratories is based on the performance of experiments during classes and the positive grades obtained in the tests. |

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.) | 30 |
| Total number of hours | 75 |
| 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

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

7. Instructional materials

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| Compulsory literature:  Grotewold E. 2006. The science of flavonoids. Springer, New York, NY. DOI 10.1007/978-0-387-28822-2  Baser K.H.C. and Buchbauer G. 2016. Handbook of essential oils: science, technology, and applications. CRC Press Taylor & Francis Group.  Wink M. 2010. Biochemistry of plant secondary metabolism. Annual plant reviews, 40. Blackwell Publishing Ltd. DOI:10.1002/9781444320503. |
| Complementary literature:  Kohlmünzer K. 2007. Farmakognozja. Podręcznik dla studentów farmacji. Wydanie V. Wydawnictwo Lekarskie PZWL, Warszawa  NIST Chemistry WebBook - <https://webbook.nist.gov/chemistry/> DOI: https://doi.org/10.18434/T4D303 |

Approved by the Head of the Department or an authorised person