**SYLLABUS**

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

1. Basic Course/Module Information

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| --- | --- |
| Course/Module title | Theranostics and Medical Nanotechnology |
| 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 | Biotechnology |
| Qualification level | II |
| Profile | *Academic* |
| Study mode | *full time studies* |
| Year and semester of studies | summer |
| Course type |  |
| Language of instruction | English |
| Coordinator | dr hab. Maciej Wnuk, prof. UR |
| Course instructor | Dr hab. Anna Lewińska, dr hab. Maciej Wnuk, prof. UR; dr inż. Jagoda-Adamczyk-Grochala; dr inż. Anna Deręgowska |

\* - 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** |
|  | 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)

lecture - pass without a grade

Laboratory - pass with a grade

2. Prerequisites

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| Completed courses with Cell biology, Chemistry, Biochemistry |

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

3.1. Course/Module objectives

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| --- | --- |
| C1 | The aim of course is familiarizing the student with the strategy of using theranostic tools |
| C2 | Understanding the different drug delivery systems used in medical therapy and experimental therapy. |
| C3 | Discussion about of selected theranostic techniques and production methods of theranostatic tools |

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 |
| EK­\_01 | The student knows the basic techniques and research tools, as well as the processes  technological applications used in thranostics | K\_W04, K\_W05, |
| EK­\_02 | The student knows the principles of design, receiving and practical use of nanomaterials and biomaterials for diagnostic and therapeutic applications | K\_W10, |
| EK\_03 | The student knows the principles of conducting experimental work of a design nature concerning the construction of tools for theronostics | K\_W13,  K\_W15 |
| EK\_04 | The student is able to receive nanoplatforms for the delivery of drugs and characterize their properties | K\_U03,  K\_U07,  K\_U08  K\_K04 |
| Ek\_05 | The student is able to solve scientific problems based on English-language scientific literature in the field of theronostics | K\_U06,  K\_U12,  K\_K01, ,  K\_K06 |

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

1. Lectures

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| Content outline |
| Clinical history of theranostics |
| Molecular tracers used in theranostics |
| Overview methods for characterization of nanomaterials for theranostics |
| Nucleic Acid Aptamers as Emerging Tools for Diagnostics and Theranostics |
| Theranostics and Image Guided Drug Delivery |
| Types of nanoplatforms for diagnostic and therapeutic applications |
| Nano-Pharmacokinetics and Theranostics |
| Overview selected examples of the application of theranostics tools in medical practice |

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

|  |
| --- |
| Content outline |
| Syntehsis and characterization nanoplatform |
| Functionalization of the nanoplatform with an antibody. Control of functionalization process |
| Attaching (uploading) drugs to a nanoplatform |
| Determination of the efficiency of nanoplatform uptake by cells using imaging cytometry |

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*

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

laboratory exercises - working in groups in the laboratory using laboratory equipment; execution and planning of 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,…) |
| Ek\_ 01 \_19 | WRITTEN COLLOQUIUM, REPORTS, STUDENT ACTIVITY DURING CLASSES | Lecture |
| Ek\_ 01-03 | essay | Lecture |

4.2 Course assessment criteria

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| **Exercises: passing with a grade.**  Assessment based on the arithmetic mean of partial grades from: colloquia, reports on exercises performed, performance of experiments during exercises and active participation in all laboratory classes  **Lecture: written exam.**  The condition for admission to the exam is to pass the exercises.  The positive assessment from the exam is determined by the number of points obtained (>50% of the maximum number of points): dst 51-59%, dst plus 60-69%, db 70-79%, db plus 81-89%, bdb > 90%).  The condition for passing the subject is to achieve all the assumed learning outcomes |

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) | 30 |
| Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.) | 65 |
| 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:   1. Theranostics, Editors: Jyotsna Batra, Srilakshmi Srinivasan, 2019, Volume 2054, ISBN : 978-1-4939-9768-8 2. Handbook of Nanomaterials for Cancer Theranostics,2018 Elsevier Science, ISBN: 9780128133392 |
| Complementary literature:  PUbmed |

Approved by the Head of the Department or an authorised person