(SYLABUS)

Name of the department / clinic providing the course:
Department of Cell-to-Cell Communication

Course title: Międzynarodowa Szkoła Doktorska

Course profile: academic

Speciality: -

Level of course unit: Doctoral School

Course unit title: Reading the Cell: Experimental Techniques for Exploring Cellular Function

Course unit code:

Course aims:
This course introduces students to the principles and applications of fundamental cell and molecular biology techniques used in biomedical research. The aim is to provide students with a broad understanding of methods used to analyse nucleic acids, proteins, and cellular processes, including molecular, biochemical, immunological, and microscopy-based approaches. Students will gain knowledge of commonly used experimental techniques, their applications, strengths and limitations, and their relevance for addressing research questions. Particular emphasis will be placed on experimental design, data analysis, interpretation of results, and troubleshooting. By the end of the course, students will be able to understand the principles underlying major cell and molecular biology techniques and evaluate their suitability for specific research questions.

Form of study: Stacjonarne

Year of study: 1

Types of educational activities and number of hours allocated: 10 hours of seminar (online)

Number of ECTS credits allocated and their structure according to students' from of learning:

Names of course unit's faculty: dr n. biol. inż. Marta Biesiekierska

Prerequisites: Knowledge of the English language at B2 level (at least)

Learning activities and teaching methods: Presentation, active communication

Course unit content:
1. Nucleic acid techniques
2. Protein analysis
3. Immunological techniques
4. Microscopy and image analysis
5. Basics of cell culture

6. Functional assays
7. Cell death and phenotype characterization
8. Gene manipulation
9. Experimental design and data analysis

Course objectives:
Knowledge:
By the end of the course, students will be able to:

- describe the basic principles of commonly used cell and molecular biology techniques,
- recognize the strengths, limitations, and potential sources of error associated with commonly used cell and molecular biology techniques,
- understand the basic principles of experimental design, controls, replication, normalization, and quantitative data analysis.

Skills:
By the end of the course, students will be able to:

- select appropriate cell and molecular techniques to address specific research questions,
- interpret and critically evaluate experimental results obtained using different cell and molecular biology methods,
- identify potential sources of experimental error and propose appropriate troubleshooting strategies,
- integrate results obtained from complementary experimental techniques to draw scientifically justified conclusions.

Attitudes and transferrable (generic) competencies:
By the end of the course, students will:

- adopt a critical approach to the selection and interpretation of experimental methods,
- recognize the importance of accuracy, reproducibility, appropriate controls, and reliable data analysis in biomedical research,
- develop problem-solving skills through the identification and evaluation of experimental limitations and sources of error.

Required and recommended learning resources (readings):

- Carson S., Miller HB., Witherow DC., & Srougi MC. (2025) Molecular Biology Techniques. A Classroom Laboratory Manual. Elsevier.
- Allison LA. (2021) Fundamental Molecular Biology. Wiley.

Assessment methods and criteria: Attendance at the seminar

Rules for making up absences from classes: Meeting during which the PhD student demonstrates their knowledge of the material (e.g., through a brief discussion).

Additional information:
Contact person: dr n. biol. inż. Marta Biesiekierska, marta.biesiekierska@umed.lodz.pl

Statement and signature of the course leader:
I hereby state that the content of the curriculum included in the syllabus below is the result of my individual work completed as part of work contract/cooperation resulting from a civil law contract, and that author rights to this title are not the property of a third party.

Dean’s signature:

Data: