(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: Beyond the Genome: Exploring the Epigenetic Code

Course unit code:

Course aims:
This course provides an in-depth introduction to the field of epigenetics, exploring how heritable changes in gene expression occur without alterations to the DNA sequence. Students will gain a comprehensive understanding of key epigenetic mechanisms, including DNA and histone modifications, chromatin remodeling, and their roles in regulating gene expression. The course also highlights the implications of epigenetic changes for development, health, and disease, with a focus on cancer, neurodegenerative, and metabolic disorders. By the end of the course, students will be able to critically evaluate epigenetic data, understand the molecular basis of epigenetic regulation, and be aware of current strategies for epigenetic therapies.

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. Introduction to Epigenetics
2. DNA Modifications
3. Histone Modifications
4. Chromatin Remodeling
5. Epigenetics in Health and Disease

Course objectives:

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

- define epigenetics and distinguish between genetic and epigenetic changes,
- describe key DNA modifications and the enzymes involved,
- explain histone modifications and the concept of the histone code,
- understand chromatin structure and remodeling,
- discuss the impact of epigenetic regulation on development, differentiation, and disease, including cancer, neurodegenerative, and metabolic disorders,
- outline current strategies for epigenetic therapies.

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

- critically analyze case studies and experimental data related to epigenetic modifications,
- interpret the functional consequences of DNA and histone modifications on gene expression,
- evaluate the relevance of chromatin remodeling complexes in transcriptional regulation,
- integrate knowledge of epigenetic mechanisms to understand disease processes.

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

- demonstrate a critical and reflective approach to evaluating epigenetic research and data,
- recognize the importance of accuracy, reproducibility, and ethical considerations in epigenetic studies,
- show openness to innovative and interdisciplinary approaches in biomedical research.

Required and recommended learning resources (readings):

- Ferguson, B. S. (Ed.). (2025). Nutritional epigenomics (2nd ed.). Elsevier.
- Carlberg, C., & Molnár, F. (2025). Nutrigenomics: How Science Works (2nd ed.). Springer

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: