Faculty of Medicine in Rijeka

Curriculum
2025/2026

For course

Epigenetics in Health and Disease

Study program:	**Medical Studies in English (R)** (elective) University integrated undergraduate and graduate study
Department:	**Department of Medical Biology and Genetics**
Course coordinator:	**izv. prof. dr. sc. Dević Pavlić Sanja, dipl. sanit. ing.**
Year of study:	**3**
ECTS:	**1.5**
Incentive ECTS:	**0 (0.00%)**
Foreign language:	**Possibility of teaching in a foreign language**

Course information:

Epigenetics in Health and Disease is an elective course conducted in the 3rd year of the Integrated undergraduate and graduate university study of Medicine in English. It consists of 5 hours of lectures and 20 hours of seminars.

The aim of the course is to describe and explain the fundamentals of epigenetics, mechanisms of epigenetic regulation, and the role of the epigenome in the development of various diseases and disorders, through critical evaluation and discussion of current scientific articles in the form of Journal Club meetings.

Course content:
To achieve the planned learning outcomes, course classes are organized into lectures and seminars:
LECTURES:
L1 Introduction to epigenetics: basic concept and historical development. The relationship between the genome and the epigenome.
L2 Mechanisms of epigenetic modifications: DNA methylation, histone modifications, chromatin remodeling, non-coding RNA molecules.
L3 Inheritance of epigenetic information: inheritance of DNA methylation pattern, inheritance of histone tags, chromatin replication.
L4 Epigenetic control of gene expression. Experimental approaches to epigenome research.
L5 Genomic imprinting disorders. Epigenome changes in health and disease.
SEMINARS:
S1 Introductory seminar: Instructions for using academic research databases. Selection of the scientific research for presentation. Topics assignment*.
S2 Searching available scientific articles on the assigned topic* and selecting a research study.
S3 Written argumentation of the selected study with a clear and concise presentation of the hypothesis, results, and conclusions.
S4 Preparation for Journal Club by reading the selected research. Formulating discussion questions.
S5 Journal Club with group discussion of the selected research study.
*Seminar topics:
Journal Club topic 1: The impact of aging on the epigenome
Journal Club topic 2: The impact of environmental factors on the epigenome
Journal Club topic 3: Epigenetics and the development of diseases and disorders
Journal Club topic 4: Epigenetics and disease prevention and treatment

Teaching:
Teaching is conducted in the form of lectures and seminars according to the "flipped classroom" principle, in which students learn new content independently by going through and solving prepared materials asynchronously in an online environment in order to then apply the acquired knowledge in more active forms of on-site teaching.
All lectures are prepared as interactive lessons within the Merlin e-learning system, which students can access asynchronously at a time that suits them, within the specified time frame.
Seminars are delivered in a hybrid format: the introductory seminar and the final Journal Club discussion are held onsite, while the remaining seminars take place asynchronously through interactive online activities within the Merlin e-learning system.
The final seminar is an onsite Journal Club for which students prepare by completing the preceding interactive online tasks. During this seminar, students are divided into teams according to topic and critically evaluate the selected study and discuss the assigned questions, applying the knowledge of epigenetics they have acquired.

[Ishodi učenja]:

Course learning outcomes:
The approach to teaching is based on learning outcomes that determine what students will be able to do after completing all course requirements
I. COGNITIVE DOMAIN – KNOWLEDGE
1. Describe and explain the structure of epigenome, including DNA methylation, histone modifications, chromatin remodelling, and noncoding RNA molecules
2. Describe and explain the function of the epigenome, including the regulation of gene transcription and its connection to the genome
3. Describe the basic epigenetic principles and the role of epigenetic variations in health and disease
4. Give examples of medical conditions and diseases caused by changes in the epigenome
5. Assess the applicability of epigenomics to the diagnosis, treatment, or follow-up of disease
6. Compare different methods of epigenome research in the context of human health and disease
7. Integrate previously acquired knowledge in cell biology, genetics and molecular biology and apply it to the level of the genome of the whole organism.
II. PSYCHOMOTORIC DOMAIN - SKILLS
1. Independently search available literature databases (PubMed, Scopus, Web of Science, ScienceDirect)

2. Present the results of the conducted epigenetic research in written and oral form according to structured questions
3. Critically assess the impact of aging and environmental factors on epigenome variability
4. Critically evaluate the role of epigenome in the prevention and/or treatment of diseases and disorders
5. Actively discuss and critically comment on conducted research of the epigenome role in the context of human health and disease
6. Argue the advantages and disadvantages of existing epigenome research in the context of human health and disease

List of assigned reading:

1. Working materials available through the Merlin e-learning system.

List of optional reading:

1. Epigenetic influence and disease [Internet]. Nature Education; c2014. [cited 2020 Jul 10]. Available from: https://www.nature.com/scitable/topicpage/epigenetic-influences-and-disease-895/
2. Learn.Genetics [Internet]. Genetic Science Learning Center; University of Utah; c2020. [cited 2020 Jul 10]. Available from: https://learn.genetics.utah.edu/content/epigenetics/
3. Bitesize Bio [Internet]. Science Squared; c2020. A Crash Course in Epigenetics Part 1-Part4. 2012 Jun [cited 2020 Jul 10]. Available from: https://bitesizebio.com/8807/a-crash-course-in-epigenetics-part-1-an-intro-to-epigenetics/

Method of examination.:

According to the Decision on changes in the assessment and evaluation of student work in elective courses in the 2025/2026 academic year at the study programs of the Faculty of Medicine in Rijeka, elective courses are evaluated with a descriptive grade P (passed) instead of a numerical grade.

Student work will be assessed through activities carried out during the course. Each individual activity must be assessed as passed in order for the course to be considered successfully completed.

During the course, the following will be evaluated: knowledge acquired through lectures, and preparation and assignments related to the Journal Club seminars. Knowledge acquired through the lectures will be evaluated through an exam in the form of a written multiple-choice test, where students must correctly answer at least 15 questions (50%). The test is administered via the Merlin platform. Passing the test is a prerequisite for participating in the Journal Club seminars.
Preparation and assignments related to the Journal Club include: selecting a study for the Journal Club; completing the task “Research Selection for the Journal Club” via the Merlin platform, reading the selected scientific study and submitting discussion questions via Merlin and actively participating in the Journal Club seminars through group discussion. The task “Research Selection for the Journal Club” must be completed with at least 10 points (50%), and includes filling in and uploading the completed “Research Selection for the Journal Club” form to Merlin by the specified deadline. Preparation for the Journal Club also includes formulating discussion questions about the selected studies, and at least one question must be posted in the “Discussion Questions” forum on Merlin. Finally, active participation in the onsite Journal Club seminar is mandatory and represents the final requirement needed to obtain the grade P (passed) in the course.

The final grade requires completing all course tasks as follows:

Activity	Criterion for grade P
Written test	15-30 points
Research selection for the Journal Club	10-20 points
Discussion questions	min 1 question
Journal Club seminar	Attendance and active participation
Total	Passed P

Curriculum:

Lectures list (with titles and explanation):

Introduction to epigenetics: basic concept and historical development. The relationship between the genome and the epigenome

- define the epigenome
- describe and explain the structure of the epigenome
- explain the differences between the genome and the epigenome

Mechanisms of epigenetic modifications: DNA methylation, histone modifications, chromatin remodeling, non-coding RNA molecules.

- list the mechanisms of epigenetic modifications
- distinguish between mechanisms of epigenetic modifications
- describe and explain individual mechanisms of epigenetic modifications

Inheritance of epigenetic information: inheritance of DNA methylation pattern, inheritance of histone tags, chromatin replication.

- distinguish the mechanisms of inheritance of epigenetic information
- describe and explain the mechanisms of inheritance of epigenetic information

Epigenetic control of gene expression. Experimental approaches to epigenome research.

- describe and explain the function of the epigenome in the context of the regulation of gene expression
- describe ways of controlling gene expression by epigenetic mechanisms
- differentiate between experimental approaches to epigenome research

Genomic imprinting disorders. Epigenome changes in health and disease.

- describe the role of epigenetic variations in health and disease
- give examples of medical conditions and diseases caused by changes in the epigenome

Seminars list (with titles and explanation):

Seminar 1. Introductory seminar: Instructions for using academic research databases. Selection of the scientific research for presentation. Topics assignment.

- List the advantages of a Journal Club
- List the types of scientific articles
- Describe different levels of evidence in scientific publications
- Define the hypothesis of a scientific study
- List available literature databases

Seminar 2. Searching available scientific articles on the assigned topic and selecting a research study.

- Independently search literature databases (PubMed, Scopus, Web of Science, ScienceDirect...)
- Apply specific keywords when searching for scientific articles on the assigned topic
- Apply specific filters when searching for scientific articles on the assigned topic

Seminar 3. Written argumentation of the selected study with a clear and concise presentation of the hypothesis, results and conclusions.

- Present the results of epigenetic research in written form according to structured questions
- Identify the type of scientific article
- Define the hypothesis of the scientific article
- Critically evaluate the significance of the article’s results
- Provide a reasoned justification for selecting the topic based on acquired knowledge of epigenetics

Seminar 4. Preparation for Journal Club by reading the selected research. Formulating discussion questions.

• Critically read scientific articles on the assigned topic
• Identify the roles of epigenetics in specific conditions and diseases
• Assess the applicability of epigenomics in diagnosis, treatment, or disease monitoring

Seminar 5. Journal Club with group discussion of the selected research study.

• Actively discuss and critically comment on studies examining the impact of aging and environmental factors on epigenome variability, as well as the role of the epigenome in the development, prevention, and/or treatment of diseases and disorders
• Argue the strengths and limitations of studies investigating the impact of aging and environmental factors on epigenome variability, and the role of the epigenome in the development, prevention, and/or treatment of diseases and disorders

Student obligations:

Students are required to attend class regularly, prepare for classes and actively participate in classes. All information about the course as well as teaching materials will be available in the Merlin e-learning system. Students are required to regularly access this platform to stay informed about all information or changes related to the course.

Exam (exam taking, description of the written/oral/practical part of the exam, point distribution, grading criteria):

According to the Decision on changes in the assessment and evaluation of student work in elective courses in the 2025/2026 academic year at the study programs of the Faculty of Medicine in Rijeka, elective courses are evaluated with a descriptive grade P (passed) instead of a numerical grade.

Other notes (related to the course) important for students:

Academic integrity
The teachers are obligated to respect the University of Rijeka Code of Ethics, and the students are obligated to respect the University of Rijeka Code of Ethics for Students.
Availability of teaching content
All course materials are available on the Merlin e-learning platform.
Contacting teachers
Teachers are available every day during working hours via their e-mail addresses (available on the website of the Faculty of Medicine, University of Rijeka) for all questions regarding the course. Individual or group consultations are possible online via the MS Teams digital platform or onsite at the Faculty of Medicine.

COURSE HOURS 2025/2026

Epigenetics in Health and Disease

Lectures (Place and time or group)	**Seminars** (Place and time or group)
11.12.2025	
	Seminar 1. Introductory seminar: Instructions for using academic research databases. Selection of the scientific research for presentation. Topics assignment.: • Department of Medical Biology and Genetics - Library (08:15 - 11:15) [330] ○ EIHAD
izv. prof. dr. sc. Dević Pavlić Sanja, dipl. sanit. ing. [330]	
12.12.2025	

Introduction to epigenetics: basic concept and historical development. The relationship between the genome and the epigenome:
• ONLINE (08:15 - 09:00) [330]
  ○ EIHAD
 	
Mechanisms of epigenetic modifications: DNA methylation, histone modifications, chromatin remodeling, non-coding RNA molecules.:
• ONLINE (09:00 - 09:45) [330]
  ○ EIHAD
 	
Inheritance of epigenetic information: inheritance of DNA methylation pattern, inheritance of histone tags, chromatin replication.:
• ONLINE (09:45 - 10:30) [330]
  ○ EIHAD
 	
Epigenetic control of gene expression. Experimental approaches to epigenome research.:
• ONLINE (16:15 - 17:00) [330]
  ○ EIHAD
 	
Genomic imprinting disorders. Epigenome changes in health and disease.:
• ONLINE (17:00 - 17:45) [330]
  ○ EIHAD	

izv. prof. dr. sc. Dević Pavlić Sanja, dipl. sanit. ing. [330]	
17.12.2025	
	Seminar 2. Searching available scientific articles on the assigned topic and selecting a research study.: • ONLINE (14:00 - 17:00) [330] ○ EIHAD
izv. prof. dr. sc. Dević Pavlić Sanja, dipl. sanit. ing. [330]	
19.12.2025	
	Seminar 3. Written argumentation of the selected study with a clear and concise presentation of the hypothesis, results and conclusions.: • ONLINE (08:00 - 11:00) [330] ○ EIHAD

izv. prof. dr. sc. Dević Pavlić Sanja, dipl. sanit. ing. [330]	
22.12.2025	
	Seminar 4. Preparation for Journal Club by reading the selected research. Formulating discussion questions.: • ONLINE (08:00 - 11:00) [330] ◦ EIHAD
izv. prof. dr. sc. Dević Pavlić Sanja, dipl. sanit. ing. [330]	
22.01.2026	
	Seminar 5. Journal Club with group discussion of the selected research study.: • Department of Medical Biology and Genetics - Library (09:00 - 12:00) [330] ◦ EIHAD
izv. prof. dr. sc. Dević Pavlić Sanja, dipl. sanit. ing. [330]	

List of lectures, seminars and practicals:

LECTURES (TOPIC)	Number of hours	Location
Introduction to epigenetics: basic concept and historical development. The relationship between the genome and the epigenome	1	ONLINE
Mechanisms of epigenetic modifications: DNA methylation, histone modifications, chromatin remodeling, non-coding RNA molecules.	1	ONLINE
Inheritance of epigenetic information: inheritance of DNA methylation pattern, inheritance of histone tags, chromatin replication.	1	ONLINE
Epigenetic control of gene expression. Experimental approaches to epigenome research.	1	ONLINE
Genomic imprinting disorders. Epigenome changes in health and disease.	1	ONLINE

SEMINARS (TOPIC)	Number of hours	Location
Seminar 1. Introductory seminar: Instructions for using academic research databases. Selection of the scientific research for presentation. Topics assignment.	4	Department of Medical Biology and Genetics - Library
Seminar 2. Searching available scientific articles on the assigned topic and selecting a research study.	4	ONLINE
Seminar 3. Written argumentation of the selected study with a clear and concise presentation of the hypothesis, results and conclusions.	4	ONLINE
Seminar 4. Preparation for Journal Club by reading the selected research. Formulating discussion questions.	4	ONLINE
Seminar 5. Journal Club with group discussion of the selected research study.	4	Department of Medical Biology and Genetics - Library

EXAM DATES (final exam):