[Medicinski fakultet u Rijeci]

Curriculum
2022/2023

[Za kolegij]

Medical Biology

Study program:	**Medical Studies in English (R)** [Sveučilišni integrirani prijediplomski i diplomski studij]
Department:	**[Katedra za medicinsku biologiju i genetiku]**
Course coordinator:	**izv. prof. dr. sc. Dević Pavlić Sanja, dipl. sanit. ing.**
Year of study:	**1**
ECTS:	**10**
Incentive ECTS:	**0 (0.00%)**
Foreign language:	**Possibility of teaching in a foreign language**

Course information:

Medical Biologyis a mandatory course conductedin the first year (II semester) of the Integrated undergraduate and graduate university study of Medicine in English. It consists of 44 hours of lectures, 40 hours of seminars and 36 hours of practicals, which totals 120 teaching hours. The course is worth 10 ECTS credits, which implies a maximum of 300 hours of student workload (1 ECTS = 30 hours of student workload), i.e. 20 hours of study work for the course per week (including all forms of mandatory classes at the Faculty and study work at home).

The aim of the course is to define, describe and explain fundamental principles of modern biological science necessary for the horizontal and vertical integration of knowledge and skills in the process of understanding, modern diagnosis and treatment of diseases in humans, and for continuous monitoring of new trends in biomedicine, including precise(personalized) and regenerative medicine.

Course content: To achieve the planned learning outcomes, course classes are organized into three large thematic units, which enable a gradual introduction to the cell structure and fundamental molecular processes, developmental biology and genetics and the occurrence of genetic and non-genetic disordersof cellular processes:

1. CELL BIOLOGY

1.1. Introduction to Cell Biology

L1 Cell and Molecular Biology in Medicine; Plan and Literature

L2 Introduction to Cell Biology: Cell Origin and Evolution

L3 Tools of Cell Biology

S1 The Basics of Structure and Function of Prokaryotic and Eukaryotic Cells

P1 The Basics of Light Microscopy. Basic Methods in Slide Preparation. Prokaryotic Cell.

1.2. Biomembranes and Cell Metabolism

L4 Structure of the Plasma Membrane

L5 Transport of Macromolecules: Endocytosis and Exocytosis

L6 Bioenergetics and Metabolism: The Role of Mitochondria and Peroxisomes

S2 Transport of Small Molecules

P2 Eukaryotic Cell

1.3. The Extracellular Interactions

L7 Cytoskeleton and Cell Movement

L8 The Extracellular Matrix

S3 Cell-Cell Interactions

S4 The Basics of Cell Signaling

1.4. Cell Nucleus, Chromatin and Chromosomes

L9 The Structure and Function of Nucleus and Nucleolus

L10 The Organization and Condensation of Chromatin

S5 Mitosis in Plant and Animal Cell. Human Chromosomes.

P3 Mitosis in Plant and Animal Cell. Human Chromosomes.

1.4. Eukaryotic Cell Cycle

L11 Regulation of the Eukaryotic Cell Cycle

L12 Programmed Cell Death

S6 Meiosis. Human Gametogenesis.

P4 Meiosis. Human Gametogenesis.

2. MOLECULAR (FUNCTIONAL) BIOLOGY

2.1. Flow of Genetic Information I: Nucleic Acids, Genome and DNA Replication

L13 The Structure and Function of Nucleic Acids

L14 Genome Organization in Prokaryotes and Eukaryotes. The Human Genome.

L15 The Structure of Eukaryotic Genes

L16 Human Genome Variation

L17 DNA Replication

P5 Genomic DNA Extraction

2.2. Flow of Genetic Information II: Transcription, Translation and Intracellular Molecules Sorting

L18 Transcription. RNA Processing.

L19 Regulation of Transcription

L20 Translation

L21 Posttranslational Modifications, Protein Sorting and Transport (The Endoplasmic Reticulum, Golgi Apparatus and Vesicular Transport)

L22 Regulation of Protein Function. Protein Degradation: The Ubiquitin-Proteasome Pathway and Lysosomal Proteolysis

S8 The Flow of Genetic Information I: DNA Replication, Transcription and RNA Processing

S10 The Flow of Genetic Information II: Translation, Protein Sorting and Transport

2.3. Epigenetic Regulation of Gene Expression

L23 The Basics of Epigenetics I: Epigenetic Modifications

L24 The Basics of Epigenetics II: Genomic Imprinting

S9 Noncoding RNA Molecules

P6 The Relationship Between Chromatin Structure and Transcriptional Activity

3. DEVELOPMENTAL BIOLOGY AND GENETICS

3.1. The Basics of Developmental Biology and Genetics

L25 Assisted Reproductive Technology Techniques

S11 Human Fertilization

3.2. The Basics of Monogenic and Polygenic Diseases, Types of Inheritance

L26 Gene Mutations

L27 DNA Repair

L28 The Basics of Mendelian Genetics

L29 The Basics of Non-Mendelian Inheritance

L30 Population Genetics

S13 Monogenic and Polygenic Diseases

P7 Patterns of Disease Inheritance

3.3. The Basics of Chromosomal Aberrations

L31 The Basics of Chromosomal Abnormalities. Cytogenetic Methods.

S14 Types and Mechanisms of Numerical Chromosomal Aberrations

S15 Types of Structural Chromosomal Aberrations

S16 Problem Assignments: Mendelian and Non-Mendelian Inheritance, Chromosomal Aberrations

P8 Aneuploidy and Polyploidy in Clinical Practice

3.4. Cancer Genetics

L32 Abnormal Cell Cycle in Malignancy

L33 The Development and Causes of Cancer

L34 The Basics of Clinical Cytology

P9 Molecular Oncogenesis in Clinical Practice

P10 Integration of skills from the practical part of the course: Recognizing Microscope Slides

3.5. Tools of Molecular Genetics

L35 Tools of Molecular Genetics in Medicine I

L36 Tools of Molecular Genetics in Medicine II

P11 Tools of Molecular Genetics

3.6. Regenerative Medicine

L38 Stem Cells. Regenerative Medicine.

L39 The Role of Medical Biology in Modern Medicine

COURSE LEARNING OUTCOMES:

The approach to teaching is based on learning outcomes that determine what students will be able to do after they have completed all study work and requirements for the course. Planned outcomes by domains are in accordance with the teaching methods and evaluation of their achievement through the constructive alignment process.

I. COGNITIVE DOMAIN – KNOWLEDGE

1. recognize, differentiate, define and describe the morphology and function of individual cell parts

2. relate, compare and integrate the structure of individual cell parts with their function

3. recognize, differentiate, define and describe the basic molecular processes in the cell

4. recognize, differentiate, define and describe the flow of genetic information through the cell

5. recognize, differentiate, define and describe epigenetic control of gene expression

6. relate, compare and integrate the role of molecular processes and their control in the regulation of gene expression

7. recognize, differentiate, define and describe the basic mechanisms of developmental biology

8. recognize, differentiate, define and describe the basic genetic mechanisms, including chromosomal aberrations and non-Mendelian inheritance

9. recognize, define and describe the basic (epi)genetic mechanisms in cancer

10. relate, compare and integrate the role of (epi)genetic mechanisms in the occurrence of monogenic and polygenic diseases, as well as cancer

II. PSYCHOMOTOR DOMAIN – SKILLS

1. use a light microscope independently and correctly
2. identify the parts of the microscope and their function during microscopy
3. discover the image of the given microscope slide
4. recognize, differentiate and draw selected microscope slides
5. recognize and implement selected basic laboratory techniques in cell and molecular biology
6. draw a pedigree chart using standardized symbols
7. recognize the possible types of inheritance in the pedigree chart using the criteria for inheritance
8. determine the genotypes for individual persons in the pedigree chart
9. classify human chromosomes by size and shape
10. solve simple problems in genetics

III. AFFECTIVE DOMAIN – VALUES AND ATTITUDES

1. integrate and revise the interdisciplinary nature of biomedical sciences
2. identify, judge and argue the importance of horizontal and vertical application of medical biology knowledge and skills in modern evidence-based medical practice

Teaching:

Teaching is conducted in the form of **lectures, seminars and practicals**. Seminars and practicals will be organized interactively in small groups with the aim of practical integration of material covered in lectures. Students will be actively included in problem-based learning with the aim of developing open, investigative and critical thinking and communication skills that will facilitate the acquisition of knowledge on modern biological science.

Lectures will define, describe and explain the basic principles (learning outcomes) from each teachingunit, which will be analyzed and elaborated during seminars and practicals.

At the **seminars**, students will actively discuss the material presented in the lectures and solve assignments/problems/cases independently and in groups. Based on guided problem-based summarization, integration and revision of the content covered, students will learn how to critically discuss with clear, unambiguous arguments and evaluate the strength of other people's arguments in real-life situations of biomedical context. This includes the application of real medical cases from our clinicalpractice.

At the **practicals**, special attention will be paid to individual work in order to better understand experimental work and develop practical skills.

List of assigned reading:

1. Cooper, Geoffrey M; Hausman, Robert E. The Cell. A Molecular Approach, Massachusetts, U.S., 7th Edition, Sinauer Associates, Inc. Publishers Sunderland, 2015.

2. Ostojić, S; Pereza, N. Medical Biology: Methodical Handbook with Problem Assignments for First-Year Students of Integrated Undergraduate and Graduate University Study of Medicine in English, 1st edition, Redak, Split, 2020.

3. Turnpenny, P; Ellard, S. Emery's Elements of Medical Genetics, London, U.K., 15th Edition, Elsevier, 2017.

List of optional reading:

1. Alberts, B et al. Molecular Biology of the Cell. Philadelphia U.S., 6th edition, Garland Publishing Co, 2014.

Curriculum:

Student obligations:

The basic student obligations include mandatory attendance of all forms of classes, preparation and active participation in seminars and practicals, solving problems from the Methodical Handbook and taking tests that assess students' knowledge and skills with the aim of meeting the requirements for taking thetaking the final exam. Students are obligated to be informed on time about the course syllabus, i.e. all the relevant information presented in it.

Class attendance

Attendance at lectures, seminars and practicals is mandatory. Attendance at all forms of classes is recorded for each student. All forms of classes start at the exact time specified in the schedule. Students are not allowed to be late for classes or enter/exit the lecture room during classes. If the student is late for class, that will be considered an absence. Students must turn off their mobile phones during classes.

The student can be absent from up to 30% of classes scheduled for practicals, seminars and lectures solely due to health reasons, which is justified by a medical certificate (doctor's note). If there is a possibility within the same week of classes, the student should make up for absences from seminars and practicals in one of the parallel groups (in agreement with the coordinator of the group).

If the student is unjustifiably absent from more than 30% of classes (13 hours of lectures, 12 hours of seminars, 11 hours of practicals), they cannot continue to attend the course, i.e. they lose the right to take the final exam. In this way, the student obtains 0 ECTS credits and an F grade.

Preparation for seminars and practicals

The student is obligated to look over the material covered in classes according to the plan and program presented in the Methodical Handbook with problem assignments (page 8 of the Methodical Handbook contains basic literature guidelines for reviewing the material covered). Preparation is necessary so that students can be actively involved in problem-oriented learning for which prior knowledge is necessary. The above implies active use of information technology, including active search and use of materials available on the internet and critical assessment of their value.

Active solving of problem assignments from the Methodical Handbook

Coordinators of the seminar and practical groups (along with student demonstrators) will guide students in active problem-solving during classes. The completed Methodical Handbook is the basis of quality reviewing of the material covered and a prerequisite for taking the practical exam. Students are required to submit the completed Methodical Handbook at the 10th practical to the coordinator of the practical group. If the assignments are not fully completed, at the beginning of the 11th practical, the coordinators will explain to the students what was not completed and give them the opportunity to make the requested changes.

Assessment of knowledge and skills

Student work will be assessed and evaluated during the course (3 midterm exams and a practical exam) and at the final exam.

Obligation to provide continuous information

All additional teaching materials will be available on the Merlin e-learning platform. All information about the course and student obligations will also be available at the INP application and on the Merlin e-learning platform. Students are obligated to regularly check the mentioned platforms regarding all relevant information or changes made in the INP.

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

Evaluation of students is carried out according to the current University of Rijeka Study Regulations and the Ordinance on Student Assessment and Evaluation at the Faculty of Medicine in Rijeka (adopted by the Faculty Council of the Faculty of Medicine in Rijeka). Students are evaluated according to the ECTS (%/A-F) and numerical grading system (1–5).

Student work is assessed and evaluated during the course and on the final exam. Out of a total of 100 grade points, the student can obtain 70 points during classes and 30 points on the final exam.

Overview of assessment of students' work during the course with the corresponding distribution of grade points:

Assessment during the course	Grade points
First midterm exam (Cell Biology)	12-24
Second midtermexam (Molecular Biology)	12-24
Third midtermexam (Developmental Biologyand Genetics)	11-22
Practical exam	+ / -
Finalexam	
Written finalexam	7-14
Oral finalexam	8-16

I. Assessment during the course (maximum of 70 grade points):

Midterm exams

During the course, the acquired knowledge from the theoretical part of classes (lectures, seminars and practicals) will be assessed with mandatory written midterm exams (Midterm exams I, II and III). At each midterm exam, the student must have a minimum of 50% of correct answers to meet the criteria for obtaining grade points.

Midterm exams I and II contain 40 questions and are worth 24 grade points (range 12–24 grade points, if the student solved ≥50% of the test). Midterm exam III has 40 questions and is worth 22 grade points (range 11–22 grade points, if the student solved ≥50% of the test). Passed midterm exams are not transferable, i.e. they are valid only for the current academic year. The duration of writing each midterm exam is 45 minutes.

Overview of course content by types and weeks of classes included in individual midterm exams:

Written test	L	S	P	Week	Questions	Grade points
Midterm examI	2–12	1–6	1–4	1–5	40	12-24
Midterm examII	13–24	8–10	5, 6	5–8	40	12-24
Midterm examIII	25–38	11–16	7–11	9–14	40	11-22

The points obtained on midterm exams are converted into grade points as follows:

Correct answers on midterm exams	Midterm exam I	Midterm exam II	Midterm exam III
0-19	0	0	0

20	12	12	11
21	13	13	11
22	14	14	12
23	15	15	13
24	16	16	14
25	17	17	15
26-27	18	18	16
28-29	19	19	17
30-31	20	20	18
32-33	21	21	19
34-35	22	22	20
36-37	23	23	21
38-40	24	24	22

Midterm exam dates:

Midterm exam I: April 11, 2025

Midterm exam II: May 2, 2025

Midterm exam III: June 13, 2025

Midterm exam retakes

Midterm exams can be retaken by students who did not successfully solve (threshold: ≥50% of correct answers) one or more midterm exams (I or II or III) or those who were justifiably absent during midterm exams (e.g. due to illness, with medical certificate).

Also, students who are not satisfied with the positive grade obtained on one or more midterm exams (I or II or III) can retake a midterm exam, and the final grade taken into account is the one the student receives on the retaken midterm exam.

Each midterm exam can be retaken only once after regular classes are finished. There are three dates offered, one for each midterm exam retake.

Midterm exam retakes are registered in person at the Department’s office by June 14, 2024.

Midterm exam III retake – June 16, 2025

Midterm exam II retake – June 18, 2025

Midterm exam I retake – June 20, 2025

Practical exam

During the course, the achieved learning outcomes from the practical part of the course will be assessed by taking a mandatory practical exam.

The prerequisite for taking the practical exam is the properly completed Methodical Handbook.

The practical exam will test the knowledge and skills of microscopy, including:

1. finding an image of one slide with the required objective

2. identifying two slides on two separate microscopes (the image will already be set)

Identification of the slides implies naming of the slide, where it is important that students name the slide exactly as written in the Handbook and on the list of slides (e.g. not “female ovary” but “transverse section of the female ovary, H&E staining”).

3. the student does not get a numerical grade, but a descriptive grade “knows/doesn’t know”.

Students who do not pass the practical exam within the stipulated time will have the opportunity to retake the practical exam in agreement with the course coordinator, considering that the passed practical exam in microscopy is a prerequisite for taking the final exam.

Practical exam dates:

on the 12th practical for each practical group (15th week of classes, from June 09 to June 13, 2025)

I. Final exam

The final exam consists of a mandatory written and oral exam. To pass the final exam and get the final grade, the student must have both parts of the final exam graded positively (threshold: ≥50% of correct answers). In this way, the student can obtain additional 15–30 grade points, which are added to the previously obtained grade points during classes.

The written exam is composed of 30 questions and is worth 14 grade points (range 7–14 grade points, if the student solved ≥50% of the test). The duration of writing the final exam is 35 minutes. A passed written final exam is a prerequisite for taking the oral final exam.

The points obtained on the written exam are converted into grade points as follows:

Points obtained on the exam (15–30)	Grade points (7–14)
0-14	0
15–16	7
17–18	8
19–20	9
21–22	10
23–24	11
25–26	12
27–28	13
29–30	14

The oral final exam is considered passed if the student obtains a minimum of 8 grade points (the equivalent of the grade sufficient, i.e. if the answer meets the minimum criteria), up to a maximum of 16 grade points (the equivalent of the grade excellent).

Success on the oral final exam is converted into grade points as follows:

Grade	Gradepoints
the answer meets the minimum criteria	8
average answer	9–11
very goodanswer	12–14
excellent answer	15–16

In this way, the student obtains a final positive grade on the final exam (in the range of 15–30 grade points), which are added to the points obtained during classes (35–70).

If the student does not pass the written final exam, they can retake it after 15 days at the earliest.

The passed written final exam does not have to be retaken in the current academic year.

Who can take the final exam:

Students who obtained ≥35 grade points during classes and who have less than 30% of justifiable absences from classes (absences from less than 13 hours of lectures or 12 hours of seminars or 11 hours of practicals). Only those students who have fulfilled the specified requirements before the Midterm retakes can take the 1st exam period.

Who cannot take the final exam:

Students who obtained less than 35 grade points even after retaking the midterm exam or who have more than 30% of justifiable absences from classes (absences from more than 13 hours of lectures or 12 hours of seminars or 11 hours of practicals).

Such a student is unsuccessful (1) / F and cannot take the final exam, i.e. they must re-enroll the course in the following academic year. Passed midterm exams and the written final exam are not transferable, i.e. they are valid only for the current academic year.

I. Final grade

Final grade is the sum of grade points obtained during classes and on the final exam.

Grading in the ECTS system is based on final success and is converted into the numerical grading system as follows:

% of obtained grade points	ECTS grade	Numerical grade
90–100	A	excellent (5)
75–89.9	B	very good (4)
60–74.9	C	good (3)
50–59.9	D	sufficient (2)
0–49.9	F	insufficient (1)

The overall grade from the course is obtained according to the type of grade converted as follows:

Type of activity	ECTS workload	Learning outcomes	Specific student activity	Assessment method	Grade points (maximum)
continuous assessment	7.0	1st domain	written midterm exams I, II and III	points are converted into grade points	70 (24+24+22)
		2nd domain	practical exam	+ / -	-
final exam	3.0	1st and 3rd domain	written and oral part	points are converted into grade points	30 (14+16)
total	10.0				100

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 2022/2023

Medical Biology

List of lectures, seminars and practicals:

EXAM DATES (final exam):
