Appendix No. 1.5 to the Resolution No. 7/2023
of the Rector of the University of Rzeszów

SYLLABUS

REGARDING THE QUALIFICATION CYCLE FROM 2024TO 2030

1. BASIC COURSE/MODULE INFORMATION

Course/Module title	**Molecular Biology**
Course/Module code *	**Bm**
Faculty (name of the unit offering the field of study)	**Medical College of Rzeszow University**
Name of the unit running the course	**Department of Biology,** **Department of Laboratory Diagnostics and Clinical Epigenetics**
Field of study	**Medical**
Qualification level	**uniform master's studies**
Profile	**General academic**
Study mode	**stationary / extramural**
Year and semester of studies	**year II, semester III**
Course type	**Obligatory**
Language of instruction	**English**
Coordinator	**Aleksander Myszka, PhD**
Course instructor	**Aleksander Myszka, PhD (lecture, practice)** **Marek Ciesla, PhD (lecture, practice)**

* - as agreed at the faculty

1.1.Learning format – number of hours and ECTS credits

Semester (no.)	Lectures	Classes	Laboratories	Seminars	Practical classes	Internships	others	**ECTS credits**
3	20	20						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~~)

2. PREREQUISITES

The student should know the basics of cell biochemistry and biology.

3. OBJECTIVES, LEARNING OUTCOMES, COURSE CONTENT, AND INSTRUCTIONAL METHODS

3.1. Course/Module objectives (Os)

O1	Understanding the molecular mechanisms of cell functioning.
O2	Understanding the structure and principles of the functioning of the human genome and genes.
O3	Understanding the process of cell division, disorders of cell division, aging and processes leading to the development of cancer.
O4	Understanding the molecular methods, their applications and limitations.
O5	Understanding the principles of conducting molecular scientific research, selection of appropriate methods.
O6	Understanding the possibilities of using molecular techniques in various aspects of medicine.
O7	The ability to conduct basic molecular research and database analysis.

3.2. COURSE/MODULE LEARNING OUTCOMES (LOS).

Learning Outcome (LO)	The description of the learning outcome	Learning Outcome
LO_01	The graduate knows and understands the basic catabolic and anabolic pathways, methods of their regulation and the influence of genetic and environmental factors on them;	**B.W13.**
LO_02	The graduate knows and understands the basic methods used in laboratory diagnostics, including protein and nucleic acid electrophoresis.	**B.W14.**
LO_03	The graduate knows and understands the processes: cell cycle, proliferation, differentiation and aging of cells, apoptosis and necrosis and their importance for the functioning of the body	**B.W17.**
LO_04	The graduate is able to predict the direction of biochemical processes depending on the energy state of cells;	**B.U6.**

LO_05	The graduate is able to use medical databases and properly interpret the information contained therein, which is necessary to solve problems in the field of basic and clinical sciences.	**B.U8.**
LO_06	The graduate is able to use basic laboratory and molecular techniques.	**B.U12.**
LO_07	The graduate is ready to notice and recognize his/her own limitations, make self-assessment of deficits and educational needs.	**K.05.**
LO_08	The graduate is ready to use objective sources of information.	**K.07.**
LO_09	The graduate is ready to formulate conclusions based on his/her own measurements or observations.	**K.08.**

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

A. Lectures

Course contents
Introduction to molecular biology. The structure of nucleic acids and DNA replication. Cell cycle.
Genome organization and gene expression. The structure of eukaryotic chromosomes.
Overview of the epigenome, transcriptome, proteome. Protein synthesis and post-translational modifications of proteins.
Molecular basis of cancer transformation. Mutagenesis, DNA damage and DNA repair.
Molecular biology techniques used in the routine diagnosis of human diseases. Principles of conducting scientific research.
Overview of next-generation sequencing and introduction to databases. Assessment of pathogenicity of genetic variants.
Basics of genetic engineering. DNA cloning and its applications.

B. Classes, laboratories, seminars, practical classes

Course contents
Principles of work in a molecular laboratory. Nucleic acid extraction methods.
Polymerase chain reaction.
Agarose gel electrophoresis of DNA amplification products.

Application of Sanger sequencing in molecular diagnostics. Preparation of termination reactions and capillary electrophoresis of products. Measurement of DNA concentration using the spectrophotometric method. Part 1 and part 2.
Application of next-generation sequencing - analysis of example results. Searching clinical databases.
Interpretation and reporting of molecular test results.

3.4. Methods of Instruction

Lecture: problem lecture / lecture with multimedia presentation, also using
Exercises: project method (research project, implementation, practical / group work / problem solving / discussion / experiment execution, experience design)

4. Assessment techniques and criteria

4.1 Methods of evaluating learning outcomes

Symbol of effect	Methods of assessment of learning outcomes (Eg.: tests, oral exams, written exams, project reports, observations during classes)	Form of classes
LO_01	colloquium	Lecture
LO_02	colloquium	Lecture
LO_03	colloquium	Lecture
LO_04	Report, observations during classes	practice
LO_05	colloquium , report, observations during classes	Lecture, practice
LO_06	Report, observations during classes	Lecture, practice
LO_07	observations during classes	Lecture, practice
LO_08	observations during classes	Lecture, practice
LO_09	observations during classes	Lecture, practice

4.2 Course assessment criteria

Lectures, classes (from LO_01 to LO_09)

Positive assessment of the tests, positive assessment of the report, positive assessment of the student's work during classes, 100% attendance.

Final colloquium – single-choice test.

Assessment criteria:

5.0 - has knowledge of the education content at the level of 93% -100%

4.5 - shows knowledge of the content of education at the level of 85% -92%

4.0 - shows knowledge of the content of education at the level of 77% -84%

3.5 - shows knowledge of the content of education at the level of 69% -76%

3.0 - shows knowledge of the content of education at the level of 60% -68%

2.0 - shows knowledge of the educational content below 60%
Positive evaluation of the subject can be obtained only on condition of obtaining a positive assessment for each of the established learning outcomes.

5. Total student workload needed to achieve the intended learning outcomes – number of hours and ECTS credits

Activity	Number of hours
Course hours	**40**
Other contact hours involving the teacher (consultation hours, examinations)	**3**
Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.)	**32**
Total number of hours	**75**
Total number of ECTS credits	**3**

* One ECTS point corresponds to 25-30 hours of total student workload

6. Internships related to the course/module

Number of hours	*Not applicable*
Internship regulations and procedures	*Not applicable*

7. Instructional materials

Basic literature: 1. Lippincott Illustrated Reviews: Cell and Molecular Biology. Ed. 2. Nalini Chandar, Susan Viselli. Wolters Kluwer Health (JL). 2019. 2. Introduction to molecular biology and molecular genetics. Tadeusz Wilczok, Magdalena Tkacz, Institute of Computer Science, University of Silesia, Katowice 2009.
Additional literature: 1. Essential Cell Biology (fourth edition). Alberts B., Hopkin K., Johnson A.,et al. New York: London: W.W. Norton and Company. 2019. 2. Biochemistry, Molecular Biology, and Genetics. Ed. 7. Michael A. Lieberman, Rick Ricer. Wolters Kluwer Health (JL). 2020.

Approved by the Head of the Department or an authorised person