

SYLLABUS

concerning the cycle of education 2022-2028

(date range)

Academic year 2022/2023

1. BASIC INFORMATION CONCERNING THIS SUBJECT

Subject	Molecular biology
Course code *	Bm/B
Faculty of (name of the leading direction)	Medical College of Rzeszow University
Department Name	Department of Biology, Laboratory of Clinical Genetics, Molecular Biology of Cancer and Translational Research
Field of study	medical direction
level of education	uniform master's studies
Profile	practical
Form of study	stationary / extramural
Year and semester	year II, semester III
Type of course	Obligatory
Language	English
Coordinator	dr hab. n. med. Agnieszka Banaś-Ząbczyk , prof. UR
First and Last Name of the Teachers	dr hab. n. med. Agnieszka Banaś-Ząbczyk, prof. UR – Lectures dr n. med. Aleksander Myszka – Lectures, Exercises dr n. med. Marek Cieśla - Lectures, Exercises

* - According to the resolutions of Educational Unit

1.1. Forms of classes, number of hours and ECTS

Semester No.	Lecture	Exercise	Conversation	Laboratory	Seminar	Z P	Praktical	Other	Number of points ECTS
III	15	15	-	-	-	-	-	-	2

1.2. The form of class activities

x classes are in the traditional form

X classes are implemented using methods and techniques of distance learning

1.3 Examination Forms (exam, credit with grade or credit without grade)

2. BASIC REQUIREMENTS

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

3. OBJECTIVES, OUTCOMES, AND PROGRAM CONTENT USED IN TEACHING METHODS

3.1 Objectives of this course

C1	Understanding the molecular mechanisms of cell functioning
C2	Understanding the structure and principles of the functioning of the human genome and genes
C3	Understanding the process of cell division, disorders of cell division, aging and processes leading to the development of cancer
C4	Understanding the possibility of using stem cells in medicine
C5	Understanding the molecular methods, their applications and limitations
C6	Understanding the principles of conducting molecular scientific research, selection of appropriate methods
C7	Understanding the possibilities of using molecular techniques in various aspects of medicine
C8	The ability to conduct basic molecular research and database analysis

3.2 OUTCOMES FOR THE COURSE

EK (the effect of education)	The content of learning outcomes defined for the class (module)	Reference to directional effects ¹
EK_01	He knows the functions of nucleotides in the cell, the structure of I and II DNA and RNA, and the structure of chromatin	B.W13.
EK_02	He knows the functions of the genome, transcriptome and human proteome and the basic methods used in their study; describes the processes of replication, repair and recombination of DNA, transcription and translation, and degradation of DNA, RNA and proteins; knows the concepts of gene expression regulation	B.W14.
EK_03	He knows the principles of conducting scientific, observational and experimental research as well as in vitro research for the development of medicine	B.W34.

¹In the case of a path of education leading to obtaining teaching qualifications, also take into account the learning outcomes of the standards of education preparing for the teaching profession.

EK_04	Uses basic laboratory techniques, such as: qualitative analysis, titration, colorimetry, pHmetry, chromatography, electrophoresis of proteins and nucleic acids	B.U9.
EK_05	It supports simple measuring instruments and evaluates the accuracy of measurements	B.U10.

3.3 CONTENT CURRICULUM

A. Problems of the lecture

Course contents
The importance of molecular biology in medicine. Applications in clinical trials. Overview of Systems Biology and "Omics"
Stem cells - features, types, differentiation. Prospects for the use of stem cells in medicine.
Genome organization and gene expression, DNA replication, transcription, translation, regulation of gene expression.
Overview of the epigenome, transcriptome, proteome and the basic methods used in their study.
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.

B. Problems of auditorium, seminar, laboratory and practical classes

Course contents
The organization of the human genome. Structure, types and synthesis of nucleic acids, genome and human gene structure, naming of changes and sequences in the genome, types of mutations and polymorphisms.
Molecular gene research techniques - possibilities and limitations. Principle of the method and variants of the polymerase chain reaction (ASA-PCR, ARMS, PCR-Multiplex, PCR-RFLP, MS-PCR), principle of methods and applications: Reverse Transcription PCR and Real-Time PCR, the principle of DNA sequencing technique using the Sanger method.
Molecular bases of neoplastic transformation. Molecular basis of tumor development, carcinogenesis steps, disorders in signal transduction and cell cycle, suppressor genes, oncogenes, mutator genes, TP53 and Rb1 gene functions, angiogenesis and metastasis, specific mutations, tumor markers, mutagenic agents, DNA damage repair mechanisms.
Visiting a professional molecular biology laboratory.

3.4 Didactic methods

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. METHODS AND EVALUATION CRITERIA

4.1 Methods of verification of 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
EK_01	colloquium	Lecture, Exercises
EK_02	colloquium	Lecture, Exercises
EK_03	oral colloquium	Exercises
EK_04	oral colloquium	Exercises
EK_05	oral colloquium	Exercises

4.2 Conditions for completing the course (evaluation criteria)

Lectures, classes (EK_01, EK_02, EK_03, EK_04, EK_05)

Positive evaluation of final colloquium and partial colloquiums on exercises, positive evaluation of the project and reports, 90% attendance at classes.

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 required to achieve the desired result in hours and ECTS credits

Activity	The average number of hours to complete the activity
Contact hours (with the teacher) resulting from the study schedule of classes	30
Contact hours (with the teacher) participation in the consultations, exams	2
Non-contact hours - student's own work (preparation for classes, exam, writing a paper, etc.)	20
SUM OF HOURS	52
TOTAL NUMBER OF ECTS	2

** It should be taken into account that 1 ECTS point corresponds to 25-30 hours of total student workload.*

6. TRAINING PRACTICES IN THE SUBJECT

NUMBER OF HOURS	-
RULES AND FORMS OF APPRENTICESHIP	-

7. LITERATURE

<p>Basic literature:</p> <ol style="list-style-type: none"> 1. Lippincott Illustrated Reviews: Cell and Molecular Biology. Ed. 2. Nalini Chandar, Susan Viselli. Wolters Kluwer Health (JL). 2018 2. Introduction to molecular biology and molecular genetics. Tadeusz Wilczok, Magdalena Tkacz, Institute of Computer Science, University of Silesia, Katowice 2009. 3. Scientific articles
<p>Additional literature:</p> <ol style="list-style-type: none"> 1. Essential Cell Biology (fourth edition). Alberts, Bray, Hopkin, Johnson, Lewis, Raff, Roberts, Walter. Garland Science Tazlor/Francis group, 2014 2. BRS Biochemistry, Molecular Biology, and Genetics. Ed. 7. Michael A. Lieberman, Rick Ricer. Wolters Kluwer Health (JL). 2019. 3. Fundamental Molecular Biology, Lisabeth A. Allison. Blackwell publishing 2007. 4. Adipose-Derived Stem Cells Secretome and Its Potential Application in "Stem Cell-Free Therapy" . Anna Trzyna and Agnieszka Banaś-Ząbczyk. Biomolecules 11(6) 2021

Acceptance Unit Manager or authorized person