

SYLLABUS

concerning the cycle of education 2023-2029

(date range)

1.1. BASIC INFORMATION CONCERNING THIS SUBJECT / MODULE

Subject / Module	Molecular biology
Course code / module *	Bm/B
Faculty of (name of the leading direction)	Medical College of Rzeszów University
Department Name	Department of Preclinical Sciences: - Biology Department
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
Coordinator	dr hab. n. med. Agnieszka Banaś-Ząbczyk
First and Last Name of the Teacher	dr hab. n. med. Agnieszka Banaś-Ząbczyk - Lectures dr n. med. Aleksander Myszką – ćwiczenia - Exercises

* - According to the resolutions of the Faculty of Medicine

1.2. Forms of classes, number of hours and ECTS

Lecture	Exercise	Conversation	Laboratory	Seminar	ZP	Practical	Self-learning	Number of points ECTS
15	15	-	-	0	-	0	-	4

1.3. The form of class activities

☒ classes are in the traditional form

☐ classes are implemented using methods and techniques of distance learning

1.4. Examination Forms / module (exam, **credit with grade** or credit without grade)

2. REQUIREMENTS

The student should know the basics of cell biochemistry and biology.
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3. OBJECTIVES, OUTCOMES, AND PROGRAM CONTENT USED IN TEACHING METHODS

3.1. Objectives of this course/module

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 of gene testing, 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 / MODULE (TO BE COMPLETED BY THE COORDINATOR)

EK (the effect of education)	The content of the learning effect defined for the subject (module)	Reference to directional effects (KEK)
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.
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 (filled by the coordinator)

A. Lectures

Course contents

The importance of molecular biology in medicine. Applications in clinical trials. Cell, tissue and their hierarchical organization in the body
Genome organization and gene expression - genome, DNA replication, transcription, translation; regulation of gene expression; creation and transformation of protein products
Basic methods of molecular biology and cell cultures
Regulation of cell growth and death - cell cycle and its regulation processes, abnormal / uncontrolled cell growth; cell death (apoptosis); basics of neoplastic transformation
Stem cells - features, types, differentiation. Current status and prospects for the use of stem cells in medicine.

B. Exercises

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 (Sanger-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 TEACHING METHODS

Lecture: problem lecture / lecture with multimedia presentation

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	Hours / student work
Hours of classes according to plan with the teacher	30
Preparation for classes	50
Participation in the consultations	2
The time to write a paper / essay	-
Preparation for tests	20
Participation in colloquia	2
Other (e-learning)	-
SUM OF HOURS	104
TOTAL NUMBER OF ECTS	4

6. TRAINING PRACTICES IN THE SUBJECT / MODUL

Number of hours	-
Rules and forms of apprenticeship	-

6. LITERATURE**READING:**

1. Biologia molekularna w medycynie Elementy genetyki klinicznej, Redakcja: Jerzy Bal, Wydawca: Wydawnictwo Naukowe PWN, 2016
2. Biologia molekularna. Krótkie wykłady. Turner P.C, .McLennan. A.D. Bałeś, M.R.H. White, 2001

Additional literature:

1. Brown TA. Genomy Wydawnictwo: PWN, 2009
2. Podstawy biologii molekularnej. Lizabeth Allison, Wydawnictwo: Wydawnictwo Uniwersytetu Warszawskiego 2009
3. Biologia molekularna komórki. B .Alberts, D. Bray, J.Lewis, M. Raff, K.Roberts, J.D. Watson. 2011
4. Biologia molekularna człowieka. Richard J. Epstein, Lublin 2010

Acceptance Unit Manager or authorized person