

SYLLABUS

concerning the cycle of education 2019 - 2025

Academic year 2020/2021

**1. BASIC INFORMATION CONCERNING THIS SUBJECT**

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

\* - 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<br>P | Praktical | Other | Number<br>of points<br>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 <sup>1</sup> |
|------------------------------|--|---|
| 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   | B.U10.  |

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<sup>1</sup>In 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.

|  |                          |  |
|--|--------------------------|--|
|  | accuracy of measurements |  |
|--|--------------------------|--|

### 3.3 CONTENT CURRICULUM

#### A. Problems of the lecture

|   |
|---|
| Course contents   |
| The importance of molecular biology in medicine. Applications in clinical trials. Cell, tissue and their hierarchical organization in the body                                |
| Overview of Systems Biology and "Omics". Genome organization and gene expression, DNA replication.  |
| Transcription, translation; regulation of gene expression.  |
| Regulation of cell growth and death - cell cycle and its regulation processes, abnormal / uncontrolled cell growth; cell death (general); basics of neoplastic transformation |
| Stem cells - features, types, differentiation. Prospects for the use of stem cells in medicine.   |

#### 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  | 20   |

|  |    |
|--|----|
| (preparation for classes, exam, writing a paper, etc.) |    |
| 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

|  |
|--|
| Basic literature:  |
| <ol style="list-style-type: none"> <li>1. Nalini Chandar, Susan Viselli. Lippincott Illustrated Reviews: Cell and Molecular Biology. Ed. 2. Wolters Kluwer Health (JL). 2018</li> <li>2. Scientific articles</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Michael A. Lieberman, Rick Ricer. BRS Biochemistry, Molecular Biology, and Genetics. Ed. 7. Wolters Kluwer Health (JL). 2019.</li> <li>2. Berk A, Kaiser CA, Lodish H, et. al. Molecular Cell Biology. Ed. 8. Macmillan International Higher Education (JL). 2016.</li> <li>3. Introduction to molecular biology and molecular genetics. Tadeusz Wilczok, Magdalena Tkacz, Institute of Computer Science, University of Silesia, Katowice 2009.</li> </ol> |

Acceptance Unit Manager or authorized person