

## INFORMATION ABOUT THE COURSE

# Molecular biology

### 1. Basic information

<b>Field of studies</b> field of medical and health sciences, discipline: medical sciences <b>Unit responsible for the field of studies</b> Faculty of Medicine Bydgoszcz University of Science and Technology <b>Level of studies</b> Uniform master's studies <b>Profile of studies</b> General academic <b>Form of studies</b> Full-time		<b>Studies cycle</b> ..... <b>Course code</b> 17-EMS-MBI-SP2 <b>Language</b> English <b>Obligatory</b> Yes
<b>Prerequisites</b>	Basic knowledge of biology and genetics, verified in the form of entrance tests.	
<b>Introductory courses</b>	None	
<b>Coordinator</b>	Elżbieta Pietrzak, PhD	

Study period	Form of assessment Form and hours of classes	ECTS credits
Summer semester	Exam Lecture 30h Exercise 45h	4.0

### 2. Learning outcomes

Code	Description of learning outcomes	Learning outcomes reference
<b>Knowledge (student knows and understands):</b>		
K1	The graduate knows and understands the primary, secondary, tertiary and quaternary structures of proteins and post-translational and functional modifications of proteins and their significance	B.W10.
K2	The graduate knows and understands the functions of nucleotides in the cell, the primary and secondary structures of DNA and RNA and the structure of chromatin	B.W11.
K3	The graduate knows and understands the functions of the human genome, transcriptome and proteome and the methods used in their study, the processes of DNA replication, repair and recombination, transcription and translation and degradation of DNA, RNA and proteins, as well as the concepts of gene expression regulation	B.W12.
K4	The graduate knows and understands the basic methods used in laboratory diagnostics, including protein and nucleic acid electrophoresis	B.W14.

K5	The graduate knows and understands the principles of conducting scientific research for the development of medicine	B.W26.
<b>Abilities (student can do/perform):</b>		
A1	The graduate is able to use basic laboratory techniques and molecular	B.U12.
<b>Social skills (the student is ready to):</b>		
S1	The graduate is ready to use objective sources of information	O.K7.
S2	The graduate is ready to formulate conclusions from his/her own measurements or observations	O.K8.
S3	The graduate is ready to implement the principles of professional camaraderie and teamwork, including with representatives of other medical professions, also in a multicultural and multinational environment	O.K9.

### 3. Programme contents

No.	Programme contents	Form of studies	Learning outcomes covered by the programme content
1	Types, structure and functions of nucleic acids.	Lecture	K1
2	Chromosome structure, packaging of genetic material in the cell.	Lecture	K2
3	The cell life cycle and its disorders. Replication in prokaryotic and eukaryotic organisms. DNA damage and repair.	Lecture	K2, K6
4	Gene expression and its regulation in prokaryotic and eukaryotic organisms.	Lecture	K3
5	The human genome. Molecular biology techniques in the diagnosis of human diseases.	Lecture	K3, K4
6	Variability and mutations. Genome modifications. Molecular basis of genetic diseases. Gene therapy.	Lecture	K3, K5, K6
7	Molecular regulation of immune system function	Lecture	K5, K7
8	Stem cells. Principles of conducting scientific research.	Lecture	K7

9	Principles of work in a molecular biology laboratory. Collection and storage of biological material. Isolation of DNA from eukaryotic cells. Isolation of RNA from eukaryotic cells. Quantitative and qualitative analysis of macromolecules. Amplification of a DNA fragment. Application of restriction enzymes in molecular biology. Analysis and interpretation of genotyping results. Reverse transcription reaction. Real-time PCR reaction qPCR.	Exercise	A1, S1, S2, S3
10	Behavior genetics, genetic aspects of aging, hereditary cancers. Mitochondrial genome diseases, congenital malformations, genetic diseases. Experimental design using CRISPR-Cas9. Experimental design using CRISPR-Cas9.	Exercise	K1, K4, K5, K7, A1, S1, S2, S3

#### 4. Methods of verifying and assessing the learning outcomes achieved by the student

##### Winter semester

Form of studies			
<b>Lecture</b>	<b>Methods of studies form:</b>		
	Lecture, Discussion		
	<b>Methods of verification:</b>		<b>Involvement:</b>
	Written exam		100%
	<b>Conditions for passing the course:</b>		
	Obtaining a positive grade in the written exam. The condition for admission to the exam is obtaining a positive grade in the laboratory exercises. One zero term is allowed.		
<b>Exercise</b>	<b>Methods of studies form:</b>		
	Laboratory exercise, Discussion, Case study, Group work, Design thinking, Educational games		
	<b>Methods of verification:</b>		<b>Involvement:</b>
	Colloquium		50%
	Report		20%
	Entrance test		10%
	Presentation		20%
	<b>Conditions for passing the course:</b>		
	<p>During the exercises, the student must obtain a positive grade from 2 tests, 2 reports, a multimedia presentation and 4 entrance tickets. In the event that less than 60% of the points are obtained from each of the methods of verifying the effects, the student is entitled to two retakes.</p> <p>The final grade is given based on the weighted average of the grades obtained. The value of the individual weights:</p> <ul style="list-style-type: none"> <li>• tests - 0.5</li> <li>• reports - 0.2</li> <li>• multimedia presentation - 0.2</li> <li>• entry tickets - 0.1</li> </ul>		

	Based on the grade from the exercises, the student is admitted to the written exam.
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Learning outcomes	Methods of verification				
	Written exam	Report	Presentation	Entrance test	Colloquium
K1	X				
K2	X				x
K3	X				x
K4	X		x	x	X
K5	X		X		
K6	X		X		
K7	x		X		
A1		X		X	x
S1		X	x		
S2		X			
S3		x			

## 5. Student workload – balance of hours and ECTS credits

Students activity		Student workload Number of hours
Classes conducted with the direct participation of an academic teacher or other persons conducting classes	Lecture	30
	Exercise	45
Student's own work	Preparing for classes	5
	Studying literature	10
	Preparing for a test	13
	Preparing for an exam	15
<b>Total student workload</b>		<b>118</b>
<b>ECTS</b>		<b>4</b>

One (teaching) hour is 45 minutes.

## 6. Literature

The list of required and recommended literature will be provided by the lecturer at the first meeting.