

## Karta przedmiotu / Course description

Informacje ogólne o przedmiocie / General information about the course	
<b>1. Kierunek studiów / Major of study:</b> biotechnology	<b>2. Poziom kształcenia / Study level:</b> first degree studies (undergraduate studies)
<b>4. Rok / Year:</b> II	<b>3. Forma studiów / Form of study:</b> stationary studies
<b>6. Nazwa przedmiotu / Course name:</b> Molecular biology	<b>5. Semestr / Semester:</b> IV
<b>7. Status przedmiotu / Course status:</b> obligatory	
<b>8. Jednostka realizująca przedmiot, adres, e-mail:</b> <b>Name of Department, mailing address, e-mail:</b> Department of Molecular Biology, Jedności 8 Str., 41-200 Sosnowiec, Poland e-mail: biolmolfarm@sum.edu.pl	
<b>9. Treści programowe przedmiotu / Course contents:</b> Molecular processes (with particular attention to the mechanisms of DNA replication, mutagenesis and repair, gene expression regulation), methodology of research performed in molecular diagnostics, modern achievements in the field of innovative methods of diagnostics and therapy (personalized medicine). Mastering the skills in planning and carrying out laboratory tests using molecular biology methods along with the interpretation of the obtained results and the use of biomedical databases.	
<b>10. liczba godzin z przedmiotu / Number of hours for the course</b>	<b>45</b>
<b>11. liczba punktów ECTS dla przedmiotu / Number of ECTS points for the course</b>	<b>3</b>
<b>12. Formy i tematy zajęć / Forms and topics of classes</b>	<b>Liczba godzin / Number of hours</b>
<b>12.1. Lectures</b>	<b>15</b>
1) Structure and function of DNA and RNA. Physical and genetic structure of prokaryotic and eukaryotic genomes.	3
2) DNA replication. Mutagenesis and DNA repair mechanisms. Recombination and transposition.	3
3) Molecular mechanisms of transcription in prokaryotic and eukaryotic cells.	3
4) RNA maturation, modifications and editing. Non-coding RNAs. Protein synthesis.	3
5) Molecular diagnostics in personalized medicine.	3
<b>12.2. Seminars</b>	<b>0</b>
<b>12.3 Laboratory classes</b>	<b>30</b>
1) DNA extraction methods.	3
2) Quantitative and qualitative analysis of DNA extracts. Designing PCR reaction.	3
3) DNA amplification.	3
4) Assessment of the specificity of the PCR reaction - determination of the length of amplifiers empirically and <i>in silico</i> .	3
5) Restriction fragment length polymorphism (RFLP).	3
6) RNA extraction methods.	3
7) Real-time qPCR and RT-qPCR - designing primers, chemical and thermal conditions.	3
8) Nucleic acid amplification by real-time RT-qPCR - preparation of the reaction mixture.	3
9) Analysis of the results obtained with the real-time RT-qPCR reaction. Determination of TM of amplifiers.	3
10) Protein extraction methods.	3
<b>13. Literatura / Readings</b>	
1. Brown T. A. Genomes. 4th Edition, Garland Science 2018	

2. Balasubramaniyam T, Oh KI, Jin HS, Ahn HB, Kim BS, Lee JH. Non-canonical helical structure of nucleic acids containing base-modified nucleotides. *Int J Mol Sci.* 2021; 22(17):9552.
3. Minchin S, Lodge J. Understanding biochemistry: structure and function of nucleic acids. *Essays Biochem.* 2019;63(4):433-456.
4. O'Donnell M, Langston L, Stillman B. Principles and concepts of DNA replication in bacteria, archaea, and eukarya. *Cold Spring Harb Perspect Biol.* 2013;5(7):a010108.
5. Chatterjee N, Walker GC. Mechanisms of DNA damage, repair, and mutagenesis. *Environ Mol Mutagen.* 2017;58(5):235-263.
6. Danino YM, Even D, Ideses D, Juven-Gershon T. The core promoter: At the heart of gene expression. *Biochim Biophys Acta.* 2015;1849(8):1116-31.
7. Andersson R, Sandelin A, Danko CG. A unified architecture of transcriptional regulatory elements. *Trends Genet.* 2015;31(8):426-33.
8. Ruta V, Pagliarini V, Sette C. Coordination of RNA processing regulation by signal transduction pathways. *Biomolecules.* 2021;11(10):1475.
9. Arenz S, Wilson DN. Bacterial protein synthesis as a target for antibiotic inhibition. *Cold Spring Harb Perspect Med.* 2016;6(9):a025361.
10. Merrick WC, Pavitt GD. Protein synthesis initiation in eukaryotic cells. *Cold Spring Harb Perspect Biol.* 2018;10(12):a033092.

**14. Kryteria oceny – szczegóły / [Detail evaluation criteria](#)**

Zgodnie z zaleceniami organów kontrolujących / [In accordance with the recommendations of the inspection bodies](#)

Zaliczenie przedmiotu - student osiągnął zakładane efekty uczenia się / [Completion of the course – student has achieved the assumed learning outcomes](#)

Szczegółowe kryteria zaliczenia i oceny z przedmiotu są zamieszczone w regulaminie przedmiotu / [Detail criteria for completion and evaluation of the course are specified in the course regulations](#)