

Study Programme: Doctoral Academic Studies in Biochemistry
Course Unit Title: Selected topics in biochemistry of nucleic acids
Course Unit Code: DSB707
Name of Lecturer(s): Associate Professor Marija Lešjak
Type and Level of Studies: PhD degree
Course Status (compulsory/elective): Elective
Semester (winter/summer): Winter
Language of instruction: English
Mode of course unit delivery (face-to-face/distance learning): Face-to-face
Number of ECTS Allocated: 15
Prerequisites: None
Course Aims: The aim of the course is to train students for scientific research in the field of biochemistry of nucleic acid. Also, the goal of the course is to further broaden and deepen student's knowledge in the field, previously gained during bachelor and master studies.
Learning Outcomes: Upon successful completion of the course, student should be able to: <ol style="list-style-type: none"> 1. Predict different mechanisms that can be responsible for controlling the expression of genes and proteins 2. Compare different types of mutations and predict how each of them can affect the structure and function of genes and proteins 3. Analyzes the relationship between changes in the structure and function of DNA and RNA with disorders in biochemical pathways and the aetiology of human diseases, and potential applications of DNA and RNA in the therapy 4. Critically follow scientific literature, present scientific data orally and in writing, and evaluate biochemical experiments in the field of nucleic acid biochemistry.
Syllabus: <i>Theory</i> Structure and function of DNA, RNA and chromosomes. Molecular mechanisms of DNA replication and its regulation. Molecular mechanisms of transcription and its regulation. Post-transcriptional modifications of primary transcript. Roles of functional RNAs. Molecular mechanisms of translation and its regulation. Structure of human genome and human genome project. Mechanisms of DNA mutations and repair. Epigenetics. Interactions between nucleic acids and proteins. Experimental methods used in nucleic acids research (sequencing, genotyping, RT-PCR, qPCR, southern blot, northern blot, gene silencing, DNA microarray and DNA fingerprinting, etc.). Identification of genes responsible for human diseases. Basics of molecular pathology. Basics of gene therapy. Manipulation of genetic material. <i>Practice</i> Practical instruction (study research work) includes the student's independent work on a scientific project in the field of biochemistry of nucleic acids.
Required Reading: <ol style="list-style-type: none"> 1. Strachan, T., Read, A.: <i>Human Molecular Genetics</i>, 4th ed., Garland Science, USA, 2010. 2. Blackburn, G. M., Gait, M. J., Loakes, D., Williams, D. M.: <i>Nucleic Acids in Chemistry and Biology</i>, 3rd ed., RSC publishing, UK, 2006. 3. Bloomfield, V. A., Crothers, D. M., Tinoco, I., Hearst, J. E., Pete, W. D. E.: <i>Nucleic Acids: Structures, Properties, and Functions</i>, University Science Books, USA, 2010. 4. Elliott, D., Lodomery, M.: <i>Molecular Biology of RNA</i>, Oxford University Press Inc, USA, 2011.

Weekly Contact Hours: 150 (75+75)	Lectures: 5 (75)	Practical work: 5 (75)	
Teaching Methods: Lectures, study research work, consultations			
Knowledge Assessment (maximum of 100 points): 100			
Pre-exam obligations	points	Final exam	points
written, performed in lab and defended scientific project on a given topic from the field	50	written exam	50
Practical work	/	oral exam	
Preliminary exam(s)	/	
Seminar(s)	/		
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			