

Level: bachelor				
Course title: Structure and function of nucleic acid (IB-504)				
Status: obligatory				
ECTS: 6				
Requirements: none				
Learning objectives The goal of the course is to provide students with the theoretical and experimental knowledge related to structure and function of nucleic acids, with special emphasis on: structure and function of DNA and RNA, genes, chromosomes and human genome, DNA replication, gene expression, synthesis of proteins, gene mutations and DNA reparation. Furthermore, during the course students will get familiar with the state-of-the-art experimental methods practised in the research related to structure and function of nucleic acids. Also, the goal of the course is to enable students to understand the molecular and genetic basis of human diseases, the ways of their diagnosis and therapy.				
Learning outcomes Upon successful completion of the course, student should be able to recognize and describe: 1. the unique role of nucleic acids in biological systems; 2. mechanisms of replication, gene expression and protein synthesis and the ways how they are controlled; 3. types of DNA mutations and repair mechanisms. Student should be able to understand and independently perform experimental methods used in the field of nucleic acid research.				
Syllabus <i>Theoretical instruction</i> Structure and function of DNA, RNA and chromosomes. Structure of human genome. Human genome project. DNA replication. Transcription and gene expression. Post-transcriptional modifications of primary transcript. Roles of non-coding RNA. Translation. DNA mutations and repair. Epigenetics. Methods for DNA sequence amplification - PCR and cloning. Nucleic acid hybridization in the identification of DNA and RNA sequences. Experimental methods used nucleic acids research (sequencing, genotyping, quantitative-PCR, southern blot, northern blot, gene silencing, DNA microarray and DNA fingerprinting, etc.). Basics of molecular pathology. Basics of gene therapy. Manipulation of genetic material. <i>Practical instruction</i> Isolation, purification and characterization of DNA and RNA. Electrophoresis of DNA and RNA on agarose gel. Application of restriction enzymes. DNA sequencing. PCR, RT-PCR and qPCR. Southern blot and northern blot. DNA microarray. Gene silencing. Heuristic database search methods (FASTA and BLAST).				
Weekly teaching load				Other: /
Lectures: 3	Exercises: 2	Other forms of teaching: /	Student research: /	