MOLECULAR BIOLOGY WITH LABORATORY TECHNOLOGIES	
GENERAL INFORMATIONS	
Course coordinator	Asst. Prof. Teuta Opačak-Bernardi, MMolBiol, PhD
Assistant/Associate	Prof. Ljubica Glavaš-Obrovac, MscBiotechnol, PhD Asst. Prof. Stana Tokić, MMolBiol, PhD
Study Programme	Undergraduate University Study of Medical Laboratory Diagnostics
Status of the course	mandatory
Year of study, semester	2nd Year /4th semester
ECTS	**5**
Workload (hours)	Lectures: 30; Seminars: 15; Exercises: 15
Expected number of students	30

COURSE DESCRIPTION

Course objectives

Acquiring knowledge about the basic concepts and laws of molecular biology and their application in medicine and diagnostics. Mastering the basic methods of molecular biology and their practical application in the laboratory.

Enrolment requirements and entry competencies

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Learning outcomes at the Programme level

1.1, 1.2, 2.1, 2.2, 2.3, 2.6, 3.1

Learning outcomes at the course level

After completing lectures, seminars and exercises, independent study and passing the exam, students will be able to:

1. link DNA structure and function.
2. compare molecular mechanisms in prokaryotes and eukaryotes .
3. judge the impact of individual genetic variations on gene expression.
4. explain the connection between an individual's phenotype and genotype.
5. review theories of tumor formation.
6. choose appropriate molecular methods for sample analysis

Course content

Lectures: *DNA.* Structure and shape of DNA. A, B and Z forms. DNA replication (leading strand, Okazaki fragments). Differences in replication in eukaryotes and prokaryotes. DNA repair. Molecular dogma. The genetic code. Synthesis of RNA. Transcription (transcription factors, mRNA processing). Protein translation and processing. *Gene.* Gene structure. Regulation of gene expression (operons, eukaryotic levels of regulation, methylation). *The human genome.* Chromosomes and mitochondrial DNA. Coding and non-coding sequences. Genome variability. SNPs, repetitive sequences and copy number. Inheritance of genotype and phenotype. *Molecular biology methods***.** Isolation of nucleic acids. Detection of nucleic acids and proteins. PCR. Recombinant DNA technology. Cloning and vectors. Immunochemical methods in molecular biology. Prokaryotic and eukaryotic models. Cell culture and animal models. *Molecular medicine.* Genetically determined diseases. Genetic predisposition. Molecular biology of tumors. Molecular methods in diagnostics. Gene therapy. Molecular therapeutics.

Seminars: Independent experimental work. Molecular diagnostic methods. Molecular diagnostics of diseases. Drug development with a molecular biological approach. Cell culture methods.

Laboratory exercises: Isolation of RNA. Measurement of RNA concentration and transcription into cDNA. Amplification of cDNA by polymerase chain reaction with TaqMan probes. Quantification of gene expression using the ΔΔCt method.

Mode of teaching

Lectures, Problem solving seminars, Laboratory exercises

Student obligations

Attendance at all forms of classes is mandatory and the students are obligated to attend all knowledge tests. The students may be absent from 30% of each of the forms of classes, provided that the absence is justified. An exercise or a seminar which has not been completed must be made up through a midterm exam.

Monitoring student work *(Connectivity of learning outcomes, teaching methods and grading)*

Teaching activity	ECTS	Learning outcome	Student activity	Assessment methods	Grade points	
					Min.	Max.
Attending classes	0.5	1-6	Class attendance	Attendance record	-	-
Seminars	1.5	4-6	Preparation of seminar	Seminar presentation	4	16
Exercises	1	6	entrance exams, performing exercises, keeping work diary	Entrance quiz, Laboratory diary	4	24
Knowledge test (partial exams)	1	1-6	Studying for partial exam	Partial exam	5	15
Final exam	2	1-6	Studying for the final exam	Written exam	15	25
				Oral exam	1	20
Total	**5**				**50**	**100**

Evaluation of the final written exam:

Percentage of correct answers (%)	Grade points
60,00-64,99	15
65,00-69,99	17
70,00-74,99	19
75,00-79,99	20
80,00-84,99	21
85,00-89,99	22
90,00-94,99	23
95,00-100	25

Calculation of final grade:

Grade points earned in the final exam are added to the grade points earned during the course. Grading in the ECTS system is done by absolute distribution, i.e. based on total achievement and is compared to the numerical system in the following manner: A - excellent (5): 90-100 grade points; B - very good (4): 80-89.99 grade points; C - good (3): 65-79.99 grade points; D - sufficient (2): 50-64.99 grade points.

Required reading (available in the library and through other media)		
Title	Number of copies in the library	Availability through other media
Cooper G.M i Hausman R.E.: Stanica., III izdanje, Medicinska naklada Zagreb, 2004.	10	
Nives Pećina-Šlaus i sur. Odabrane metode molekularne biologije, Medicinska naklada, Zagreb, 2009.	12	
Cox T.M i Sinclair J: Molekularna biologija u medicini, Medicinska naklada Zagreb, 2000.	10	
Additional reading		
1. Ambriović Ristov A. i sur. Metode u molekularnoj biologiji, Zagreb, Institut Ruđer Bošković, 2007 2. Alberts B et al.: Molecular Biology of the Cell, Philadelphia, fourth edition, Garland Publ. Co, 2002. 3. Strachnan T.& Read A. Human molecular genetics 4th edition, 2011, Garland Science		
Course evaluation procedures		
Anonymous, quantitative, standardised student survey on the course and the teacher's work implemented by the Quality improvement office of the Faculty of Medicine Osijek.		