BIOLOGY	
GENERAL INFORMATIONS	
Course coordinator	Asst. Prof. Vedrana Ivić, PhD
Assistant/Associate	Prof. Marija Heffer, PhD, MD Prof. Jasenka Wagner Kostadinović, MMedBiochem, PhD Marta Balog, MBiol, PhD
Study Programme	Undergraduate University Study of Medical Laboratory Diagnostics
Status of the course	mandatory
Year of study, semester	1st year, 1st semester
ECTS	**6**
Workload (hours)	Lectures: 30 ; Seminars: 5 ; Laboratory exercises: 30
Expected number of students	30-35
COURSE DESCRIPTION	
Course objectives	
Acquiring knowledge, skills and attitudes related to the basic settings of medical biological science as a basis for understanding laboratory diagnostics. Application of knowledge about evolution, basics of cell biology, molecular biology, developmental biology and genetics in understanding everyday phenomena, normal physiological processes and modern diagnostic methods.	
Enrolment requirements and entry competencies	
Acquired requirements for enrollment in the Medical Laboratory Diagnostics study program.	
Learning outcomes at the Programme level	
1.1, 2.1, 2.2, 2.7, 3.2	
Learning outcomes at the course level	
After completing lectures, seminars and exercises, independent study and passing the exam, students will be able to: 1. present the structure of a eukaryotic cell and compare it with the structure of prokaryotes. 2. define basic genetic concepts such as homologous chromosomes, allele, locus, homozygote, heterozygote, genotype, phenotype and Mendel's laws. 3. acquire the ability to observe cause-and-effect relationships in molecular interactions and biological processes. 4. connect the mechanisms of storage and use of hereditary information with metabolic processes, physiological mechanisms and behavioral adaptations. 5. develop the skills of preparing microscopic preparations. 6. independently use the microscope and other laboratory devices in the biological laboratory. 7. critically assess the obtained results . 8. comment on the results in a reasoned manner.	
Course content	
Lectures: Origin and evolution of the cell. Cellular composition and metabolism. Cells as experimental models. The central role of enzymes as biological catalysts. Genome organization - the complexity of eukaryotic genomes. Chromosomes and chromatin. Genomics and proteomics. DNA replication. DNA repair. Recombination between homologous DNA sequences. DNA rearrangement. DNA synthesis and processing. Transcription in prokaryotes. Eukaryotic RNA polymerases and general transcription factors. Regulation of transcription in eukaryotes. Processing	

and turnover of RNA. Protein synthesis, processing and regulation. Translation of mRNA. Protein folding and processing. Regulation of protein function. Core. Nuclear envelope and transport between nucleus and cytoplasm. Internal organization of the core. Nucleus and processing of rRNA. Sorting and transport of proteins. Endoplasmic reticulum. Golgi apparatus. Mechanisms of vesicular transport. Bioenergetics and metabolism. Mitochondrion. Mechanism of oxidative phosphorylation. Peroxisomes. Cytoskeleton and cell movement. Structure and function of actin fibers. Actin, myosin and cell movement. Intermediate fibers. Microtubules. Microtubular motors and cellular movement. The structure of the cell membrane. Transport of small molecules. Endocytosis. Cell walls. Extracellular matrix and cellular interactions with the matrix. Intercellular interactions. Cellular signaling. Signaling molecules and their receptors. Action of cell surface receptors. Pathways of intracellular signal transmission. Signal transduction and the cytoskeleton. Signal networks. The cell cycle of a eukaryotic cell. Regulators of cell cycle progression. Events in the M-phase. Meiosis and fertilization. Cell death and cell renewal. Programmed cell death. Stem cells and maintenance of adult tissues. Embryonic stem cells and therapeutic cloning. Origin and causes of cancer. Tumor viruses. Oncogenes. Tumor-suppressor genes. Molecular approaches to cancer treatment.

Seminars: Fertilization. Methods of assisted fertilization. Gene therapy. Early developmental processes. Gastrulation and neurulation – genotoxicity and environmental risk factors for fetal development.

Exercises: Basics of microscopy. Permanent microscope slides preparation. Electrophoresis. Immunochemical methods I. Immunochemical methods II. Cell cultures. Karyotyping. Chromosomal aberrations. Osmometry. Handling of laboratory animals. Genotyping of transgenic animals. Cell cycle – identification and proof methods. Meiosis and gametogenesis – differences between oogenesis and spermatogenesis. Tumors. Developmental processes – differentiation of developmental stages.

Mode of teaching

Lectures, Problem solving seminars, Laboratory exercises

Student obligations

The student is obliged to regularly attend and actively participate in all forms of classes. The successful performance of seminars and exercises requires prior preparation of the student. Laboratory exercises can only be attended in specific work clothes (white coat). Non-attended exercises must be tested.

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

Exam method: written and oral exam.

Teaching activity	ECTS	Learning outcome	Student activity	Assessment methods	Grade points	
					Min.	Max.
Lectures	1	1-8	Class attendance, learning for the entrance test	Attendance record and activity evaluation	9	18
Seminars	0.5	1-4	Class attendance, participation in discussion	Attendance record and activity evaluation	1	2
Exercises	0.5	5-8	Exercise active participation, performing exercises, keeping work diary	Attendance record, activity evaluation, work diary	5	10

Knowledge test (partial exams)	2	1-8	Active learning for partial exams	2 partial exams	4	15
					4	15
Final exam	2	1-8	Learning for the final exam	Written exam	10	20
				Oral exam	10	20
Total	**6**					**100**

Evaluation of the final written exam:

Percentage of correct answers (%)	Grade points
60-64.99	4
65-69.99	6
70-74.99	8
75-79.99	9
80-84.99	10
85-89.99	11
90-94.99	12
95-100	15

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, Geoffrey M.; Hausman, Robert E. „Stanica. Molekularni pristup". Medicinska naklada, Zagreb, 5th ed, 2004, selected chapters	11	
Group of authors: „Priručnik za vježbe iz medicinske biologije", script of the Faculty of Medicine Osijek, 2011		On line

Additional reading

1. Alberts B et al.: *'Molecular Biology of the Cell'*, Garland Science, 7th ed, 2022- selected chapters
2. Cox T M, Sinclair J: *'Molekularna biologija u medicini'*. Medicinska naklada Zagreb, 2000 – selected chapters.

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.