GENERAL INFORMATION		
Course name	**Medical Biology**	
Course director	**Prof. Marija Heffer, MD, PhD**	
Assistants	Prof. Branimir Hackenberger Kutuzović, PhD	
Study program	**Integrated undergraduate and graduate university study program Medical Studies in German**	
Course status	Mandatory	
Year of study, semester	1st year, 1st semester	
Credits allocated and form of instruction	ECTS student workload	**7**
	Number of teaching hours (L+S+E)	**110** (50+40+20)

COURSE DESCRIPTION

Course objectives

Acquisition of knowledge, skills and attitudes related to the basic settings of medical biological science as a basis for understanding the diagnostics and therapy of human diseases. Application of knowledge about evolution, basics of cell biology, molecular biology, developmental biology, genetics and ecology in the analysis of normal physiological processes and mechanisms of disease.

Course requirements

No specific requirements.

Learning outcomes relevant to the study program

1.1., 2.1., 3.4., 3.5.

Expected learning outcomes

Knowledge

1. Describe the structure of a eukaryotic cell and compare it with the structure of a prokaryote
2. Define and describe cellular compartments and connect them into a functional whole
3. Analyze and describe individual phases of the cell cycle
4. Describe the basic genetic mechanisms and the consequences of their deregulation
5. Analyze new information in the field of molecular biology and then define inheritance and possible mechanisms of disease
6. Define fertilization, early embryonic development and the impact of harmful environmental factors on the human genome from a molecular point of view
7. Explain the molecular basis of neoplastic processes
8. Identify, explain, analyze and finally connect and integrate the basics of cell biology, molecular biology, developmental biology and genetics with special emphasis on human biology

Skills

1. Acquire the skills of microscopic examination with a light microscope
2. Analyze the human karyogram
3. Acquire basic skills of working in a laboratory

Course content

Molecular biology:
Gene expression: DNA structure; DNA analysis: sequencing, restriction analyses, PCR amplification, hybridization; DNA replication, mutations, repair; structure and organization of genes, chromosomes, centromeres, telomeres; recombination, inserted sequences, transposons; mechanisms of genetic material exchange, transformation, transduction, conjugation; plasmids and bacteriophages. Gene expression: transcription including disorders; DNA transcription (RNA polymerases and transcription factors); processing and splicing of pre-mRNA, alternative splicing; processing of rRNA and tRNA; regulation of transcription: cis-regulatory elements, transcription factors, enhancers, promoters, silencers, repressors; gene expression in prokaryotes, operon. Gene expression: translation including disorders; genetic code; structure and function of transport RNA; ribosome structure and function; regulation of translation, post-translational modifications; protein degradation, proteasomes.

Cell biology:
Evolution of the cell. Structure and function of the parts of the cell: nucleus, cytoskeleton, cell membrane, endoplasmic reticulum, Golgi apparatus, lysosomes, mitochondrion, peroxisomes. Cellular signaling (including basic principles, secondary messengers, pathways of intracellular signal transduction). Intercellular communication, cell junction, cell movement. Classification and transfer of proteins in the cell (signal sequences, vesicular transport, endocytosis). Cell cycle (mitosis and meiosis, structure of spindle apparatus, regulation of cell cycle and disorders), programmed cell death, apoptosis.

Developmental biology and genetics:
Fertilization, early embryonic development (cleavage, gastrulation), inductive interactions, programmed gene expression, differentiation, morphogenesis, homeotic genes and differential gene expression. Transgenic animals, 0-mutants, cloning. Teratogenesis, congenital malformations. Ecological factors, ecosystems, air, land and water pollution. Laws of inheritance, Mendelian inheritance, crossing-over, recombination, linked genes, non-Mendelian inheritance (mitochondrial DNA). Monogenic traits, multiple alleles, X-linked inheritance, free combination, linked genes, polygenic disorders (principles of pedigree analysis). Prenatal diagnostics, ethics, gene therapy. Population genetics: Hardy-Weinberg equilibrium, factors affecting the equilibrium. Changes at the chromosome level: numerical.

Form of instruction	☒lectures ☒seminars and workshops ☒exercises ☒distance learning ☐field course	☒individual assignments ☒multimedia and Internet ☒laboratory ☐mentoring activities ☐other

Student obligations

Students are required to attend classes regularly and to actively participate in all forms of instruction. For the successful conduction of seminars and exercises, a prior preparation of the student is required. Students can attend laboratory exercises only in prescribed work clothing (white lab coat). Classes are held at the prescribed time. It is not allowed to bring food and drinks to the exercises. During class as well as during exams, it is not allowed to use cell phones.

Monitoring student learning

Attendance	x	Active participation	x	Seminar paper		Experimental work	
Written exam	x	Oral exam	x	Essay		Research	
Project		Continuous assessment	x	Paper		Practical work	x
Portfolio							

Assessment and evaluation of students during class and on the final exam

A student must attend at least 70% of all forms of instruction (exercises, seminars and lectures), as well as write and present an essay, take a partial and final written exam or an oral exam. Students, whose absence from seminars and/or exercises is excused, must catch up with the lessons they missed by taking an exam.
During classes, a student can earn a maximum of 100 points. Students can earn a maximum of 30 points during classes through different types of activities. They can earn a maximum of 40 points on partial exams and a maximum of 30 points on the final exam. There are 2 mandatory partial exams. A student must achieve more than 60% on the written exam in order to be able to take the oral exam. The final grade represents the sum of the points earned during classes and on the final exam.
In the first partial exam, knowledge of the basics of cell biology, evolutionary biology, molecular methods and the principles of replication, transcription and translation is examined.
In the second partial exam, knowledge of cell biology, principles of signaling processes, cell cycle, tumorogenesis and developmental biology is examined.
Both partial exams consist of 60 questions. A student who has less than 40% of correct answers on the partial exam does not earn a single point. A result above this threshold is rewarded with points according to the attached table.

Formulation of the final grade
Points achieved in class are combined with points achieved on the final exam. The grading in the ECTS system shall be carried out by using absolute distribution, i.e. shall be based on the final achievement and compared to the numerical system as follows: A – excellent (5): 90-100 points; B – very good (4): 80-89.99 points; C – good (3): 65-79.99 points; D – sufficient (2): 50-64.99 points.

Mandatory reading

1. Buselmaier und Haussig**:** Biologie für Mediziner (Springer-Lehrbuch), 2018

Additional reading

1. Cooper and Hausman: The Cell – A Molecular Approach, 7ed, Sinauer.
1. Buselmaier und Tariverdian: Humangenetig, Springer, 2018

The number of copies of mandatory reading in proportion to the number of students currently taking this course

Title	*Number of copies*	*Number of students*
Buselmaier und Haussig: Biologie für Mediziner (Springer-Lehrbuch), 2018	20	60

Quality monitoring methods ensuring the acquisition of knowledge upon completion, skills and competences

An anonymous, quantitative, standardized student survey on the quality of the organization and conduction of classes, the course content and the work of professors conducted by the Quality Assurance Office of the Faculty of Medicine Osijek and a unified university student survey conducted by the Quality Assurance Center of the Josip Juraj Strossmayer University of Osijek.