

| GENERAL INFORMATION | | |
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| Course name | Molecular Biology | |
| Course director | Assoc. Prof. Stana Tokić, PhD | |
| Assistants | Asst. Prof. Teuta Opačak-Bernardi, PhD Asst. Prof. Marijana Jukić, PhD | |
| Study program | Integrated undergraduate and graduate university study program Medical Studies in German | |
| Course status | Elective | |
| Year | 2nd year, 3rd semester | |
| Credits allocated and form of instruction | ECTS student workload | 1 |
| | Number of teaching hours (L+S+E) | 15 (10+0+5) |
| COURSE DESCRIPTION | | |
| Course objectives | | |
| Acquire knowledge about the molecular mechanisms that manage the organization and maintenance of the genome, gene transcription, protein synthesis and genetic variability. Explain the function of genes and the relationship between genetic variants and inherited diseases. Familiarize students with the basic methods of molecular biology and the principles of genetic engineering through practical laboratory exercises. | | |
| Course requirements | | |
| Completed courses: Medical biology and Medical chemistry. | | |
| Learning outcomes relevant to the study program | | |
| 1.1., 2.1., 3.5. | | |
| Expected learning outcomes | | |
| Upon successful completion of the course the students will be able to: | | |
| Knowledge | | |
| <ol style="list-style-type: none"> 1. describe the organization and variability of the human genome 2. describe the method of reproduction, maintenance and transformation of genome 3. explain the relationship between DNA damage and repair mechanisms and cell death and survival 4. describe different levels of gene expression regulation and list the purpose and example of molecular analysis of gene expression 5. describe classic methods of cloning, preparation of genomic libraries, plasmid vectors and gene transfer into eukaryotic cells | | |
| Skills | | |
| <ol style="list-style-type: none"> 1. Isolate and quantify nucleic acids, DNA and RNA 2. Amplify specific RNA and DNA fragments using RT-PCR and qPCR 3. Analyze DNA fragments using agarose gel and capillary electrophoresis 4. Statistically process the results of RT-qPCR analysis | | |
| Course content | | |
| DNA and chromosomes. Organization and variability of the human genome. DNA replication and repair mechanisms. Expression of genetic material: from transcription to translation. Nuclear and mitochondrial DNA. Coding and non-coding sequences. Repetitive | | |

sequences – DNA and RNA transposons, satellite DNA, RNA genes. Single nucleotide polymorphisms, SNPs. The role of variable genome sequences and SNPs in the development of disease. Basics of genetic engineering. Recombinant DNA production, DNA cloning and genomic library production, gene transfer into eukaryotic cells and mammalian embryos, DNA amplification using PCR, DNA sequencing. Application of molecular biology methods in genetic research of an individual. Isolation of DNA and RNA molecules from peripheral blood samples. Measurement of DNA and RNA concentration using fluorometric and spectrophotometric methods. Synthesis of cDNA and analysis of gene expression with RT-qPCR method using TaqMan probe.

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| Form of instruction | <input checked="" type="checkbox"/> lectures | <input checked="" type="checkbox"/> individual assignments |
| | <input type="checkbox"/> seminars and workshops | <input type="checkbox"/> multimedia and Internet |
| | <input checked="" type="checkbox"/> exercises | <input checked="" type="checkbox"/> laboratory |
| | <input type="checkbox"/> distance learning | <input type="checkbox"/> mentoring activities |
| | <input type="checkbox"/> field course | <input type="checkbox"/> other |

Student obligations

Attending all forms of instruction is mandatory, and students must take all exams. A student can be excused from 30% of every form of instruction. Missed exercises must be compensated by sitting for an exam.

Monitoring student learning

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

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

Activity and participation of students will be assessed. Students are required to pass written and oral exam, and the final assessment includes all components of student academic performance monitoring. From all elements of monitoring and assessment, a student can earn a maximum of 100 points, which makes 100% of the grade. For a passing grade, a student must earn at least 60 points or 60% of the grade.

Mandatory reading

1.Rolf Knippers. Molekulare Genetik. Georg Thieme Verlag KG; 2015 ISBN 9783134770100

Additional reading

1. Strachnan T.& Read A. Human molecular genetics 4th edition, 2011, Garland Science
2. Reinard T. Molekularbiologische Methoden. Uni Tb Utb.; 2010. ISBN: 978-3-8252-8449-7
3. Karp Gerald. Molekulare Zellbiologie, 2005, Springer-Verlag Berlin Heidelberg. ISBN: 3-540-23857-3

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

| <i>Title</i> | <i>Number of copies</i> | <i>Number of students</i> |
|--|--|---------------------------|
| Rolf Knippers. Molekulare Genetik. Georg Thieme Verlag KG; 2015 ISBN 9783134770100 | A purchased license for online textbooks shall be used. Access will be | |

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| | granted to all students enrolled in the study program |
| Quality monitoring methods ensuring the acquisition of knowledge upon completion, skills and competences | |
| The quality of classes is monitored on the basis of anonymous, quantitative and standardized student surveys on the quality of organization and classes, course content and the work of professors. Everything is checked by the Quality Assurance Office of the Faculty of Medicine in Osijek and the unified university student survey conducted by the Quality Assurance Center of the Josip Juraj Strossmayer University of Osijek. | |