MOLECULAR ENZYMOLOGY	
GENERAL INFORMATION	
Course teacher	Prof. Ljubica Glavaš-Obrovac, MEng Biotechnol, PhD
Associates	Asst. Prof. Marijana Leventić, MBiol, PhD Asst. Prof. Katarina Mišković Špoljarić, MEng, PhD
Study programme	Graduate University Study of Medical Laboratory Diagnostics
Course status	elective
Year of study, semester	2nd year, 4th semester
ECTS credits	**3**
Form of teaching (number of classes)	Lectures 25; Seminars: 15; Practicums: 5
Expected number of students attending the course	20
COURSE DESCRIPTION	
Course objectives	
Objective of this course is to improve the understanding of enzymatic processes by studying the structure, physical, chemical and catalytic properties of enzymes, and to acquire knowledge about phylogenetic and ontogenetic development of tissue enzymes, enzyme topology and enzyme morphometry.	
Course entry requirements and competencies needed for the course	
Completed Undergraduate Study of Medical Laboratory Diagnostics or equivalent bachelor's degree (baccalaureate)	
Learning outcomes at study programme level	
1.1, 1.2, 2.1, 2.2, 2.3, 2.4, 2.6, 2.7, 3.1, 3.2	
Expected learning outcomes at course level	
After attending lectures, completing seminars and exercises, independent study and passing the exam, students will be able to: 1. explain the relation between structures and functions of protein families 2. recommend the strategies in enzyme catalysis and methods of collecting and analysing enzyme kinetic and thermodynamic data 3. specify the enzymes significant in clinical practice 4. critically interpret the connection between epigenetic patterns, metabolism, and disease development 5. qualitatively and quantitatively analyse biological samples using appropriate pre-analytical, analytical and post-analytical methods	
Course content	
Lectures: Protein synthesis and their regulation. Relation between structures and functions of protein families. Errors in protein structures and their connection with disease development. Enzymes: nomenclature, classification, and specificity. Interaction between enzymes and coenzymes and prosthetic groups. Mechanisms of enzyme catalysis and regulation of enzyme activity. Catalytic strategies: protease, carbonic anhydrase, restriction enzymes, NMP kinases. Kinetics of enzymatic reactions – problem-solving. Metabolic relation between tissue and organs. Principles and methods of enzymatic analysis. Collecting and analysing enzyme kinetic and thermodynamic data. Clinical enzymology: enzymes, isozymes, and their significance in diagnostics. Clinical enzymology: regulation of enzyme concentration in serum and plasma. Enzymes significant in clinical practice. Connection between epigenetic patterns, metabolism, and disease development. Cytochromes P450 and NO synthases. Analytic platforms for metabolome analysis. Metabolic profiling as a tool for understanding metabolism.	

Problem-solving seminar: Kinetics of enzymatic reactions. Principles and methods of enzymatic analysis. Collection and analysis of enzymatic kinetic and thermodynamic data. Enzymes important in clinical practice. Changes in metabolic patterns associated with disease development. Metabolism of xenobiotics - clinical correlations.

Exercises: Kinetics of enzymatic reactions.

Forms of teaching

Lectures; seminars, laboratory exercises; independent assignments;

Students' responsibilities

Attendance is obligatory throughout all course forms, and the student has to attend all the exams. The student may be justifiably absent for up to 30% of each teaching form. Practical work and seminars that were not completed have to be taken in the form of colloquiums. The student has to attend all forms of exams.

Monitoring students' work *(Connecting learning outcomes, teaching methods and evaluation)*

Teaching activity	ECTS	Learning outcome	Student activity	Evaluation methods	Grade points	
					Min.	Max.
Attending classes	0.25	1-5	Attendance,	Attendance records	2	10
Seminar paper	0.5		Seminar paper – writing and presentation	Writing and presenting seminar paper	13	30
Laboratory exercises	0.25	5	Practical work	Laboratory exercises	5	10
Final exam	2	1-5	Studying for final exam	Written exam	30	50
Total	**3**				**50**	**100**

Evaluation of written part of final exam

Percentage of correct answers (%)	Grade points
>95	50
90.00-94.99	47
85.00-89.99	45
80.00-84.99	40
75.00-79.99	38
70.00-74.99	35
65.00-69.99	33
60.00-64.99	30

Formulating the final grade:
Grade points achieved in classes are combined with points achieved in the final exam. Grading in the ECTS system is absolute grading and represents one's final achievement. Grades are numerically expressed as follows: A – excellent (5): 80-100 grade points; B – very good (4): 70-79.99 grade points; C – good (3): 60-69.99 grade points; D – sufficient (2): 50-59.99 grade points

Assigned reading (available in the library and in other media)

Title	Number of copies in the library	Availability in other media
R.K. Murray, D.A. Bender, K.M. Botham, P.J. Kennelly, V. W. Rodwell, P.A. Weil. Harper's Illustrated Biochemistry, 28th edition Medicinska naklada 2010.	21	
Scientific and professional papers for particular chapters (available online)		Yes
Further reading		
1. J.M. Berg, J.L. Thymoczko, L. Stryer: Biokemija, 1st edition (Croatian), Školska knjiga, 2013 *2.* T.M. Devlin (Ed). Textbook of Biochemistry with Clinical Correlations, 5th edition, Wiley-Liss, 2002.		
Quality assurance methods that ensure the acquisition of exit competencies		
Anonymous, quantitative, standardised students' opinion survey on the course and teacher's work, carried out by the Quality Assurance Office of the Faculty of Medicine in Osijek.		