Study programme	MEDICAL STUDIES IN ENGLISH					
Cycle	INTEGRATED	Type	UNIVERSITY			
Study track	-	Module	-			
Year of study	1	Semester	II			
Course title	MEDICAL CHEMISTRY AND BIOCHEMISTRY I	Course code	MFMSE201			
ECTS	7.5	Status	OBLIGATORY			
Teaching hours			Lectures	Exercises	Seminars	Practice
			32	26	22	0
Teachers	Assoc. Prof. Ivana Martinović, PhD		17	0	0	0
	Assoc. Prof. Ilijana Odak, PhD		15	0	7	0
	Gloria Zlatić, s. asst.		0	0	15	0
	Ante Pušić, asst.		0	13	0	0
	Ivona Cvetković, asst.		0	13	0	0
Course objectives	- train students to apply basic knowledge about chemical structure and physicochemical processes, which are necessary for understanding biochemical and physiological processes - achieve the student's understanding of the basic principles and mechanisms of reactions of simple and complex organic/biological molecules - train students to apply classical and instrumental methods of chemical analysis - train students to interpret results and experimentally determine chemical changes using theoretical chemical laws					

Course learning outcomes	Learning outcome (LO) Student:	Course learning outcome code	LO code at the study program level
	Explains the theory of aqueous solutions, electrolytes, non-electrolytes, and physical laws.	IU-MFMSE201-1	IU-MSE1
	Analyzes chemical processes according to the concepts of chemical thermodynamics, kinetics, and equilibrium	IU-MFMSE201-2	IU-MSE1
	Solves calculation problems in chemistry and interprets results using theoretical chemical laws	IU-MFMSE201-3	IU-MSE1
	Classifies organic molecules important for the construction of biological macromolecules, and correlates the properties of molecules (based on chemical structure) and the mechanisms of chemical changes.	IU-MFMSE201-4	IU-MSE1
	Applies physicochemical quantities and methods used in biomedical sciences.	IU-MFMSE201-5	IU-MSE1
	Independently calculates and explains the results of chemical analysis.	IU-MFMSE201-6	IU-MSE1

Prerequisites for the course enrolment	In accordance with the Rulebook on the Integrated Studies at the School of Medicine University of Mostar	
Course content	Week / shift	Topic
	L2	Molecular structure and chemical bond, bioelements, chemical bonds between biomolecules, basic elements of living matter
	L4	Water as the solvent. The distribution of the substance in solution. Electrolytes. The acids and base. Buffers.
	L6	Colligative properties. The osmotically active particles. Colloid-dispersed systems. Precipitation reactions. Colloids and macromolecules.
	L8	Thermodynamics and thermochemistry. Thermodynamic Laws. Internal energy. Enthalpy. Entropy. Gibbs's energy.
	L10	Energy of biological systems. Energy balance of biochemical systems.

	L12	Chemical equilibrium. The influence of concentration, temperature and pressure on the chemical balance. The equilibrium constant and Gibbs energy.
	L14	Chemical kinetics. The speed of reaction. Order and molecularity reaction. Factors affecting the rate of reaction. Enzymes. Complex reactions.
	L16	Electrochemistry. Electrode potential and electrochemical cells.
	L17	Gibbs energy of redox reactions. The biological redox systems.
	L18	Introduction to Organic Chemistry. Classification of organic compounds. The functional groups.
	L19	Alkanes and cycloalkanes. Stereochemistry.
	L20	Alkenes and alkynes.
	L21	Aromatic compounds.
	L22	The alkyl halides. Nucleophilic substitution at saturated carbon. Elimination reactions.
	L23	Alcohols, ethers, thiols, sulfides. Classification and physical properties of alcohol. Biologically important alcohols and phenols.
	L24	Oxidation and reduction of carbonyl compounds.
	L25	Aldehydes and ketones. Nucleophilic addition reaction.
	L26	Carboxylic acid and derivatives. Physical Properties. The acidity of the carboxylic acid. The carboxylic acid derivatives. Nucleophilic acyl substitution.
	L28	Carbohydrates. Nucleosides, nucleotides and nucleic acids. Classification. Fisher's formula. Epimers. Redox reactions of monosaccharides. Straight-chain and cyclic forms. Anomeric carbon atom. Mutarotation. Haworth formula. Glycosides. Reducing and non-reducing sugars. Disaccharides. Polysaccharides. Nucleosides, nucleotides and nucleic acids.
	L30	Amino acids and proteins. Relative configuration. Zwitterion. Peptide bond. Primary, secondary and tertiary protein structure. Enzymes. Lipids. Physico-chemical properties of lipids.
	S3	Calculation problems in chemistry -solutions.
	S6	a pH of acids, bases and salts
	S9	pH of buffers
	S11	Colligative properties
	S14	Thermodynamics and thermochemistry
	S15	Electrochemistry.
	S17	Nomenclature. Isomerism.
	S18	Stereochemistry. Chirality. Stereoisomers: enantiomers and diastereomers. Fisher projection formula. CIP system nomenclature.
	S19	Substitution, elimination, oxidation, reduction.
	S20	Addition at carbonyl carbon.
	S21	Acyl substitution.
	S22	Bioorganic compounds.
	V1	Laboratory equipment and basic laboratory techniques.
	V2	Preparation of the solutions.
	V3	Optical methods
	V4	Colloids
	V5	Osmotic resistance of erythrocytes
	V6	Buffers; The buffer capacity; The influence of the addition of a strong acid / base to buffer pH value
	V7	Volummetry: Acid-base titration
	V8	Classification tests of functional groups
	V9	Synthesis of aspirin
Language	English	
E-learning	Classes are conducted in person (live). If necessary, lectures, seminars and part of the exercises can be combined (live and online) or completely online via e-learning platforms (Google Meet) up to a maximum 20%.	

Teaching methods	- lecture, presentation - free and guided conversation, dialogue, discussion - work in the laboratory

Types of assessment (indicate - **Bold**)							
Type of pre-examination obligation					Type of exam		
midterm	seminar paper	essay/report	practical/project task	Other	**written exam**	oral exam	practical

Allocation of ECTS credits and share in the grade				
Student obligations	Learning outcome code	Hours of workload	Share in ECTS	Share in grade
Attending classes	-	80	2.7	0%
Midterm (exercises)	IU-MFMSE201-5 IU-MFMSE201-6	20	0.8	10%
Pre exam/written exam	IU-MFMSE201-1	25	0.8	90%
	IU-MFMSE201-2	20	0.7	
	IU-MFMSE201-3	30	1.0	
	IU-MFMSE201-4	45	1.5	
In total		220	7.5	100%

Method of calculating the final grade

Midterm
Max. points:10
1-4 - insufficient (1)
5-6– sufficient (2)
6-7 – good (3)
8-9 – very good (4)
10 – excellent (5)

Written exam:
Max. points:100
< 55 insufficient (1)
55 - 66 - sufficient (2)
67-78 – good (3)
79-90 – very good (4)
91-100 – excellent (5)

Example of final grade calculation:
Student gets:
-4 from the written exam, **(4x0.9)**
-3 from Midterm , **(3x0.1)**

Final grade = (4x0.9)+ (3x0.1) = 3.6 + 0.3 = 3.9 (very good)

Literature (indicate)	Title (title, author, year)	Edition		Language				Type of literature			
		own	other	croatian	english	other	multilingual	book	article	script	other
Compulsory	K. J. Denniston, J. J. Topping, R. L. Caret, General, Organic, and Biochemistry, 4th Edition, McGraw Hill, New York, 2004.		x		x			x			
	Calculation problems in chemistry, G. Zlatić, I. Martinović, 2019.	x			x					x	
	Laboratory Manual for Medical Chemistry (I. Mikulić and co.), 2019	x			x					x	
Additional	P. W. Atkins and J. de Paula, Physical		x		x			x			

	Chemistry For The Life Sciences, 2nd edition, Oxford University Press, 2011.										
	D. J. Hart, C. M. Hadad, L. E. Craine, H. Hart, Organic Chemistry – A Short Course, 13th Ed, Brooks/Cole, Cengage Learning, Belmont, 2012.		x		x			x			
Additional course information											