

1.	Subject	BIOCHEMISTRY 1
2.	Code	OM 212
3.	Study Program	General Medicine
4.	Organizing Institution (Unit, Institute, Chair, Department)	UKIM-Faculty of Medicine Department of Biochemistry and Clinical Biochemistry

5.	Educational degree (first or second cycle)	Integrated cycle			
6.	Study year /semester	Second year /III	7.	Number of credits	7
8.	Responsible teacher	Prof. Jasna Bogdanska The lectures are given by all members of the Department of Biochemistry and Clinical Chemistry			
9.	Preconditions:	Passed exam in Medical chemistry			
10.	Teaching goals of the study program (competencies): The students have: <ul style="list-style-type: none"> ✦ To learn and to define the different roles of the three different classes of macromolecules in the human body: proteins, carbohydrates and lipids as well as, the complex compounds build of these macromolecules: ✦ To learn the structure and the transport through the biological membranes; ✦ To define the vitamins as the enzyme cofactors and as hormones (vitamin A and D) and antioxidants (vitamin E) and as anti-hemorrhagic compound (vitamin K); ✦ To be informed about the 6 classes of the enzymes, ✦ To understand the types of enzyme catalysis and the types of the catalyses, enzyme kinetics and inhibition of the enzyme reactions; ✦ To understand the biosynthesis of the biological molecules (carbohydrates, proteins and lipids) and the catabolism to the final products; and to understand the regulation of the most important biochemical pathways; ✦ To understand the role of ATP in the body and in the biological oxidation: ✦ To understand the metabolism of haemoglobin; ✦ To understand the respiratory chain, oxidative phosphorylation and ATP synthesis. 				

11.	<p>Contents of the study program:</p> <ul style="list-style-type: none"> ✦ Theoretical course: ✦ Biochemistry of the cell ✦ Chemical structure and function of the proteins , haemoglobin, myoglobin, amino-acid derivates ✦ Carbohydrates as a compounds of the cell membrane, glycosaminoglycanes (hetero- polysaccharides of the extra cellular matrix), proteoglycanes, glycoproteins, glycolipids; ✦ Lipids as a energy storage, as a membrane components, signals, cofactors and pigments; ✦ Biological membranes and transport; ✦ Vitamins as the enzyme cofactors and as hormones (vitamin A and D)and antioxidants (vitamin E) and as anti-hemorrhagic compound (vitamin K); Michaelis-Menten- equation, Hill's equation; enzyme inhibition; alosteric and covalent modification of the enzyme activity; ✦ General metabolism ✦ Metabolism of carbohydrates: glicolisis glukoneogenesis, pentose-phosphate cycle, glycogenesis; glicogenolisis. ✦ Tricarboxylic acid cycle, oxidative decarboxylation of piruvate. ✦ Metabolisam of lipids, beta oxidation of the fatty acids, metabolism of ketone bodies, fatty acids synthesis, cholesterol synthesis, phospholipids, glicolipids, cholesterol catabolism. ✦ Protein metabolism, the fate of nitrogen, urea synthesis, the fate of carbon chain of the amino acids, synthesis of the non-essential amino acids, amino acid derivates, regulation of the metabolic pathways. ✦ Hemoglobin Metabolism ✦ Respiratory chain, oxidative phosphorylation and ATP synthesis.
	<p>Practical course:</p> <ul style="list-style-type: none"> ✦ Plasma proteins separation techniques, lipoprotein separation tecniques (electrophoresis), carbohydrates separation techniques (chromatography). ✦ Michaelis-Menten- equation, pH optimum and temperature optimum; ✦ Quantification of several biochemical parameters like vitamins, proteins, carbohydrates and lipids in human serum.
12.	<p>Methods of studying: interactive lectures, group work, exercises, seminar paper.</p>
13.	<p>Total no. of hours: 210 hours</p>

14.	Distribution of the available time			
15.	Type of educational activity	15.1	Lectures-theoretical course	45 hours
		15.2	Practicals (laboratory, clinical), seminars, team work	48 hours
16.	Other types of activities	16.1	Project assignments	12 hours
		16.2	Individual tasks	
		16.3	Home studying	105 hours
17.	Assessment of knowledge: points			
	17.1	Tests	2 Continuous tests	min.-max. total... points
			<ul style="list-style-type: none"> • Test 1 • Test 2 	6 -10 6 - 10
		Final exam	Subject: Biochemistry 1	points
			Practical exam Oral exam	min.-max. 12 - 20 21 - 35
17.2	Seminar work/project (presentation: written and oral)	Seminar works	min.-max. 1-3 points	
17.3	Active participation	Theoretical course Practical course	min.-max. points: 1-5 points: 13-17	
18.	Knowledge assessment criteria: (points/grade)	up to 59 points		5 (five) F
		60 to 68 points		6 (six) E
		69 to 76 points		7 (seven) D
		77 to 84 points		8 (eight) C
		85 to 92 points		9 (nine) B

		93 to 100 points	10 (ten) A
19.	Criteria for obtaining a signature and taking the final exam	Conditional criteria for assessment of knowledge: In order to get a signature that the course has been successfully finished the students are requested to actively participate in the theoretical course (min 1 point) practical course (the student has to be present on all the lectures) and seminars (minimum 1 point).	
20.	Language of the course	Macedonian	
21.	Method for evaluation of the quality of education	Anonymous student's evaluation of the subject, teachers and collaborators involved in the educational activities	

22.	Literature				
	Mandatory textbooks				
		Author	Title	Publisher	Year
22.1	1	Robert K. Mery and all.	Harper's Illustrated Biochemistry	ISBN-13: 9780071625913	2006
	2	David. L. Nelson	Lehninger Principles of Biochemistry	ISBN-13: 9781464126116	
	Additional literature				
		Author	Title	Publisher	Year
22.2	1	Michael Lieberman	Mark's Basic Medical Biochemistry	Lippicott Williams & Wilkins	2013