

1.	<b>Subject</b>	<b>BIOCHEMISTRY 2</b>			
2.	<b>Code</b>	OM 221			
3.	<b>Study Program</b>	General medicine			
4.	<b>Organizing Institution ( Unit, Institute, Chair, Department)</b>	UKIM-Faculty of Medicine Department of biochemistry and Clinical Chemistry			
5.	<b>Educational degree (first or second cycle)</b>	Integrated cycle			
6.	<b>Study year /semester</b>	Second/ IV	7.	Number of credits	5.5
8.	<b>Responsible teacher</b>	Prof. Jasna Bogdanska  The lectures are given by the professors, members of the Department of Biochemistry and Clinical Chemistry.			
9.	<b>Preconditions:</b>	Signature from Biochemistry 1			
10.	<b>Teaching goals of the study program (competencies):</b>	The student has:			
		<ul style="list-style-type: none"> <li>✦ To know to recognize the basic chemical structures of the nucleic acid bases, of nucleotides and of nucleosides (both ribo- and deoxyribo-forms);</li> <li>✦ To describe the flow of genetic information (DNA → proteins); naming the three types of RNA and their roles</li> <li>✦ To learn about the digestion and absorption of nutrients;</li> <li>✦ To learn about plasma proteins, immunoglobulins, biochemistry of the blood count elements,</li> <li>✦ To learn and explain the metabolism of water and electrolytes.</li> <li>✦ To describe signal transduction</li> <li>✦ To define hormones and hormone cascade system; introducing peptide, amino acid derived hormones and steroid hormones and their role in signal transducing.</li> <li>✦ To be informed about the translocation of proteins in different cell compartments</li> <li>✦ To know to describe and explain the metabolic processes in the: kidney, liver, muscle, bone, blood, nervous system.</li> </ul>			
11.	<b>Contents of the study program:</b>				
	<b>Theoretical course::</b>	<ul style="list-style-type: none"> <li>✦ Nucleic acid bases, of nucleotides and of nucleosides (both ribo- and deoxyribo-forms);</li> <li>✦ Structure and function of the nucleic acids, protein synthesis, protein degradation, gene expression regulation;</li> </ul>			

	<ul style="list-style-type: none"> <li>✦ Signal transduction, second messengers, tyrosine kinase, G-coupled protein receptors, JAK-Stat kinase, protein kinase G.</li> </ul>
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	<ul style="list-style-type: none"> <li>✦ Hormones, definition, chemical structure, biosynthesis, transport, degradation, mechanism of action, physiological effects.</li> <li>✦ Nutrition</li> <li>✦ Water metabolism, elektrolytes and acid-bas balance.</li> <li>✦ Translocation of the proteins, importunes and exportines;</li> <li>✦ Plasma proteins, immunoglobuline(s) and biochemical processes in the erythrocytes, leucocytes, thrombocytes, hemostasis.</li> <li>✦ Biochemistry of different tissues: Liver, Kidneys, Nervous system; Extracellular matrix, collagen, elastin, laminin, bone, cartilage; Biochemistry of the muscle tissue and cytoskeleton.</li> <li>✦ Free radicals and metabolism of xenobiotics.</li>   <li>✦ <b>Practical course:</b></li> <li>✦ Qualitative determination of DNA in the tissue sample of the experimental animal(s);</li> <li>✦ Quantification of the urea, acidum uricum, creatinine in human plasma and urine samples;</li> <li>✦ Quantification of bilirubin in human serum;</li> <li>✦ Quantification of electrolytes in human serum;</li> <li>✦ Qualitative and quantitative analyzes of urine samples;</li> <li>✦ 4 – 20 % SDS-PAGE as a technique of the separation of proteins in urine.</li> </ul>
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12.	<b>Methods of studying:</b> : class room oriented lectures, interactive lectures, group work, practical training, seminar paper.		
13.	<b>Total no. of hours:</b>	180 hours	
14.	<b>Distribution of the available time</b>		
15.	<b>Type of educational activity</b>	15.1	Lectures-theoretical course 30 hours

		15.2	Practicals (laboratory, clinical), seminars, team work	39 hours + 6 hours of Seminars
16.	<b>Other types of activities</b>	16.1	Project assignments	
		16.2	Individual tasks	
		16.3	Home studying	75 hours
17.	<b>Assessment of knowledge: points</b>			
	17.1	Tests	2 Continuous tests	min.-max. points
			<ul style="list-style-type: none"> <li>• Test 1: 9-15</li> <li>• Test 2: 9-15</li> </ul>	
		Final exam	Subject: Biochemistry 2	min.-max.
			Practical exam (Test) Oral exam	9-15points 21-35 points
17.2	Seminar work/project (presentation: written and oral)	Seminar works	min.-max. 1-3 points	
17.3	Active participation	Theoretical course	min.-max. points 1-5	
		Practical course	points 10-12	
18.	Knowledge assessment	up to 59 points	5 (five) F	

criteria: (points/grade)	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	<p><b>Conditional criteria for assessment of knowledge:</b> : 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 have 100% presence) and seminars (minimum 1 point).</p> <p>In order to take the final exam the student has to fulfil the tasks for the signature as well as to pass the written exams with 60% each.</p> <p>The test for the practical examination is independent and is passed if the student has gained 60% of the total number of the points.</p> <p>The final score is formed according to the table from the score of total planned activities taken into account.</p>			
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