Attachment No. 3		Course program for the first cycle of studies			
1.	Course title	Biochemistry			
2.	Code	DMMBC1			
3.	Study program	Dentistry - integrated first and second cycle of studies			
4.	Organizer of the study program (unit, i.e., institute, department, division)	University "Ss. Cyril and Methodius" in Skopje. Faculty of Medicine - Skopje, Department of Biochemistry and Clinical Biochemistry			
5.	Degree (first, second, third cycle)	Integrated first and second cycle studies			
6.	Academic year/semester	Year	1	Semester	1
7	Course workload expressed in ECTS credits	7			
8.	Teacher (in case of multiple teachers, designated teacher in charge)	Teacher in charge Prof. Dr. Irena Kostovska *Teaching is performed by all members of the department			
9.	Language in which the curriculum is conducted	English			
10.	Necessary prerequisites for listening and taking the class	Passing the exam in Medical Chemistry is a prerequisite for taking the final exam in Biochemistry			
11.	Course objectives (competences) and learning outcomes:	The main objective of the subject program is that after completing the lectures and passing the exam, the students should have acquired a basic understanding of biomolecules, their properties, and role in the structure of cells and organs in the human organism, as well as the metabolic processes in a healthy person. The acquired knowledge will be the basis for understanding the basic molecular processes in the cell, as well as for understanding the pathological changes.			
12.	Detailed course content by chapter and units, with the learning outcomes for each chapter	Theoretical teaching - lectures 1. Amino acids, peptides, proteins: Structure and function of proteins, protein folding and misfolding, hemoglobin, myoglobin; compounds derived from amino acids, nucleoproteins - 7 classes 2. Carbohydrates, homoglycans, heteroglycans - 3 classes			

	:	Lipids, Lipids as energy reserve, cell membrane constituents, signals, cofactors, and pigments - 3 classes 3. Hormone biochemistry - 4 classes 4. Vitamins - 3 classes 5. Enzymes and cofactors - 6 classes 6. Introduction to Metabolism 1- class 7. Protein metabolism - 4 classes 8. Carbohydrate metabolism - 4 classes 9. Lipid metabolism - 4 classes 10. Cycle of citric acid - 1 class 11. Biological oxidations and respiratory chain - 1 class 12. Metabolism of hemoglobin - 2 classes 13. Metabolism of water and inorganic elements - 1 class 14. Metabolism of body fluids - 1 class Total: .....45 classes Results of realized lectures Students, after completing the lectures: They will be able to classify the biomolecules that make up the composition and structure of the organism, proteins, carbohydrates, and lipids; They will know how to explain the differences and similarities between hemoglobin and myoglobin; They will be able to explain the structure and role of nucleoproteins; They will be able to explain the differences between liposoluble and hydro-soluble vitamins and their role in metabolic processes in the human body; They will be able to explain the structure of enzymes, enzymatic kinetics, and classify enzymes; They will be able to explain the cycles related to the metabolism of proteins, carbohydrates, and lipids; They will be able to explain the regulation of basic metabolic cycles; They will be able to calculate the energy contribution from the metabolism of proteins, carbohydrates, and lipids; Will be able to explain the mechanisms of hormone regulation and their role in the metabolic processes of carbohydrates, proteins, and lipids; They will be able to explain the mechanisms of regulation of water in the body, metabolism of electrolytes, regulation of acid-base balance. They will be able to explain the biochemical characteristics of bodily fluids; Practical teaching – laboratory exercises: 1. Introduction to biochemical laboratory analyses: operating rules, material/sample collection for biochemical analyses and its processing, basic biochemical methods, reference values, principle of photometric methods - 3 classes 2. Qualitative analyses for determining carbohydrates, lipids, and proteins - 3 classes 3. Enzymes - determining of enzymatic activity, pH, and temperature influence on the speed of the enzymatic reaction - 3 classes 4. Diagnostic significance of enzymes - 3 classes 5. Determining the concentration of total proteins in serum - 3 classes 6. Determining cholesterol and triacylglycerols concentration in serum - 3 classes 7. Determining the glucose concentration in serum - 3 classes 8. Determining the concentration of degradation products in serum: urea and creatinine - 3 classes 9. Determining the concentration of inorganic phosphorus and calcium in serum - 3 classes 10. Biochemical-laboratory analysis of urine - 3 classes Total..... 30 classes Results from the realized exercises Students, after completing the exercises: Will know how to independently prepare and work with biological samples for analysis, independently or under supervision, will know how to pipette and develop a laboratory technique of centrifugation, will know how to determine a reference interval of biochemical parameters;

		Photometry - to become familiar with the basic principles of the method and to know how to calculate the concentration of and present the results of quantitative analyses of biochemical parameters; Will be able to independently perform qualitative methods for proving proteins, carbohydrates, lipids normally or pathologically present in biological material; Will be able to independently determine the concentration of lipid status parameters, total proteins, urea, creatinine, glucose in samples of biological material; To independently apply knowledge about the role of enzymes from the hydrolase group; To monitor the degradation of starch under the influence of alpha amylase, and to examine the influence of temperature and pH on the activity of the enzyme; Will know how to independently determine the catalytic concentration of enzymes in a sample of biological material; Will be able to independently determine the concentration of electrolytes (total calcium and inorganic phosphorus) in a sample of biological material; Will know how to independently do qualitative analysis of urine with classical chemical reactions and test strips and interpret the obtained results;			
13	Interrelation of subjects	Passing the exam in Medical Chemistry is a prerequisite only for taking the final exam in Biochemistry, not for listening to the subject of Biochemistry			
14.	Detailed description of the teaching and working methods for the subject	Interactive teaching, laboratory or clinical exercises, working in small groups, presenting and performing laboratory procedures, demonstrating used instruments and methods, and teamwork.			
15.	Total Available Time	210 classes			
16.	Forms of teaching activities	16.1.	Lectures - theoretical teaching. Classes	45	
		16.2.	Exercises (laboratory, auditorium), seminars, teamwork: classes	30	
		16.3.	Practice: classes	/	
17.	Other forms of activities	17.1.	Project assignments: classes	/	
		17.2.	Independent assignments: classes	30	
		17.3.	Home study - assignments	105	
18	Signature requirements	Theoretical teaching - attendance - min.-max. 1-3 points *The student must attend 60% of the lectures to get a signature and a minimum points from attending lectures. Practical teaching (attendance and active participation) - min.-max. 10-12 points *The student has the right to be absent from two exercises			
19	Method of grading				
	19.1.	Tests: points	Test 1 - 12-20 points		
	19.2.	Seminar work/project, written and oral presentation: points	/		
	19.3.	Final exam: points	Practical teaching test 9- 15 points Final theory exam (test) 30 - 50 points		
20	Evaluation criteria (points/grade)	up to 59 points	5 (five) (F)		
		60 to 68 points	6 (six) (E)		
		69 to 76 points	7 (seven) (D)		
		from 77 to 84 points	8 (eight) (C)		
		from 85 to 92 points	9 (nine) (B)		
		from 93 to 100 points	10 (ten) (A)		
21.	Method of monitoring the quality of teaching	Self-evaluation by students, assistant control during the practical teaching and assessment of the achieved student success, as well as the pass rate of students who have passed the subject			
22.	Literature				
	22.1.	Required literature			
		Ord. number	Author	Title	Publisher	Year
		1.	Sloboda Djekova – Stojkova et al.	Biochemistry	Faculty of Medicine, UKIM Skopje	2010

		2.	Labudovikj Danica, Topuzovska Sonja, Bogdanska Jasna, Efremova Aaron Snezana, Cekovska Svetlana, Tosheska Trajkovska Katerina, Kavrakova Julijana, Kostovska Irena	Biochemistry practicum for students of dentistry	Faculty of Medicine - Skopje	2019
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year