Attachment No. 3		Course program for the first cycle of studies			
1.	Course title	Oral biochemistry and physiology			
2.	Code	DMMOB2			
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 Dentistry - Skopje, Department of Oral and Periodontal Diseases			
5.	Degree (first, second, third cycle)	Integrated first and second cycle studies			
6.	Academic year/semester	Year	2	Semester	3
7	Course workload expressed in ECTS credits	3			
8.	Teacher	Teacher in charge: Prof. Dr. Kjiro Ivanovski; Prof. Dr. Katarina Dirjanska Prof. Dr. Snezhana Peshevska Prof. Dr. Stevica Ristoska			
9.	Language in which the curriculum is conducted	English			

10.	Necessary prerequisites for listening and taking the class	Listened to all compulsory subjects from the first year
11.	Course objectives (competences) and learning outcomes:	By studying the subject, students will master the basic postulates of oral biochemical and physiological processes, which will greatly facilitate their understanding of complex interactions between oral biofilms and the defense capacities of oral tissues and saliva. At the same time, students will gain a basis for understanding the complex etiopathological developments of periodontal disease, caries, and other bacterial, fungal, and viral diseases in the mouth.
12.	Detailed course content by chapter and units, with the learning outcomes for each chapter	Theoretical teaching - lectures 1. Chapter - Oral homeostasis, salivary glands, regulation, secretion mechanism and salivary biochemical composition - Introduction to the subject program, oral homeostasis and its meaning……1 class - Salivary glands and control of salivation, stimulated and unstimulated salivation.....2 class - Mechanism of saliva secretion….....1 class Results from chapter 1: After studying this chapter, students will gain a deep understanding of the concept of oral homeostasis and the importance of saliva in maintaining oral health. Students will be able to describe the anatomo-histological characteristics of salivary glands, as well as their function, vascularization and innervation. They will also understand the complex regulation of saliva secretion and be able to explain the influences of various factors on the quantity and quality of excreted saliva. Students will also master the mechanism of secretion of water, electrolytes, calcium and phosphates, as well as the biochemical composition of saliva and its role in maintaining oral homeostasis. Additionally, they will understand the relationship between saliva and the perception of taste stimuli, as well as the significance of concentrations of specific components, such as calcium and phosphates, for the function and protective role of saliva. This knowledge will enable students to interpret basic biochemical and physiological aspects of saliva and its clinical significance. 2. Chapter- Salivary Proteins -Salivary proteins: classes, meaning and their secretion……2 classes -Antimicrobial peptides.....2 classes -Other salivary proteins..... 2 classes -Salivary mucins.....1 class - Local nonspecific and specific defense in the oral cavity, sIgA…2 classes Results of chapter 2: After studying this chapter, students will gain a thorough understanding of the numerous salivary proteins and their physiological, biochemical, and immunological role in maintaining oral health. They will be able to describe the general characteristics of salivary proteins and the mechanisms through which they are synthesized and secreted in saliva. Students will be introduced to the functions of antimicrobial peptides, salivary proteins involved in nonspecific immune defense, as well as salivary proteins that are directly involved in the specific immune response. Through this chapter, students will gain knowledge with which they can explain how saliva and proteins, as one of its most significant components, participate in the complex biological processes of protection, regulation, and maintenance of oral health. 3. Chapter - Biochemical characteristics of collagen and collagen synthesis - Biochemical characteristics of collagen and collagen synthesis… 2 classes Results from chapter 3: Upon completion of this chapter, students will understand the biochemical characteristics of oral connective structures and their role in maintaining the functional and structural stability of the oral cavity. Through this chapter, students will gain knowledge about the molecular mechanisms behind the synthesis and organization of collagen, its biochemical significance, and the role it plays in the stability and integrity of tissues. Students will be able to relate molecular processes to clinical aspects of oral health and understand how disorders in these processes can lead to pathological conditions in the supporting structures of teeth. 4. Chapter - Biological mineralization and biochemical characteristics of dental tissues -Biological mineralization of oral tissues.....1 class

		- Biochemical characteristics of enamel, dentin, cement, and alveolar bone……2 classes - Changes in the composition of hydroxyapatite, adsorption, isoionic, and heteroionic changes.....1 class Results of chapter 4: After studying this chapter, students will understand the process of biological mineralization and its role in maintaining the structure and function of solid oral tissues. They will be introduced to the structure, biochemical composition, and metabolic activity of the alveolar bone, as well as the mechanisms of apposition, resorption, and remodeling, through which they will be able to describe the dynamic changes that occur in bone tissue in physiological, clinical, and pathological conditions. Students will be able to explain the basic biochemical characteristics of enamel, dentin, cement and dental pulp, with special emphasis on the role of hydroxyapatite and salivary electrolytes in the protection and stability of enamel, which will allow students to relate clinical aspects to biochemical processes in dentistry and better understand the importance of electrolyte balance in maintaining oral health. 5. Chapter - Dental pellicle, biochemical characteristics, and biofilm processes - Dental pellicle, creation, composition, and its imporance.....1 class - Biochemical characteristics of dental plaque creation (biofilm).....1 class - Protein matrix and extracellular polysaccharides in dental plaque (biofilm).....1 class -Metabolic processes in dental plaque (biofilm): anabolic, catabolic and transport of simple sugars in the bacterial cell ..... 1 class -Metabolic processes in dental plaque (biofilm): glycogenesis, glycogenolysis, glycolysis, lipogenesis, amino acid synthesis and toxic amines in dental plaque (biofilm).....3 classes - Changes in the pH in the microenvironment of the biofilm…….1 class Results from chapter 5: Students will acquire knowledge to explain the composition of the acquired dental pellicle, as well as its physiological and pathophysiological significance for all interactions that occur between the tooth and saliva. The student will be able to understand and explain the significance of the acquired dental pellicle for numerous processes that occur in the oral cavity, such as: remineralization and demineralization, lubrication of the tooth surface, as well as bacterial aggregation. In addition, students will learn about the formation of the biofilm, the creation of extracellular polysaccharides and their importance for the metabolic activity of bacteria, they will be able to describe the biochemical processes that take place in the biofilm, as well as the dynamics of the change of the pH value in the microenvironment of the biofilm. Through this chapter, students will understand the complexity of biofilm as a microsystem, including its importance for the occurrence of the most common dental diseases - caries and periodontopathy. 6. Chapter - Biofilm and oral homeostasis - Biofilm and oral homeostasis……3 classes Results from chapter 6: Students will understand the concept of salivary clearance and its significance in removing harmful and protective substances from the oral cavity, as well as the significance of salivary clearance for oral health. After studying the chapter, students will be able to explain the harmful effects of biofilm on periodontal tissues, as well as solid dental substances, and additionally understand the preventive measures for the harmful effects of biofilm, with an emphasis on the application of fluoride as a successful measure for the prevention of dental caries. Total: .....30 classes Practical teaching - exercises 1. Introduction to the subject, familiarization with the work and the rules of operation in the biochemical laboratory.....1 class 2. Laboratory equipment and apparatus for performing experiments in the biochemical laboratory, pipetting, and preparation of solutions.....1 class 3. Collection and processing of unstimulated and stimulated saliva . 2 classes 4. Demonstration of the effect and determining the activity of salivary amylase.....2 classes 5. Influence of various factors on the activity of salivary amylase.....1 class 6. Buffer capacity of saliva..... 1 class

		7. Viscosity of saliva..... 1 class 8. Mucin precipitation, Molisch test, and qualitative determination of proteins in saliva, colored reactions for proteins.....2 classes 9. Quantitative determination of proteins in saliva, spectrophotometry.1 class 10. Quantitative determination of electrolytes in saliva (colorimetric determination of total calcium and phosphates in saliva) .....2 classes 11. Salivary clearance and oral homeostasis.....1 class Total.....15 classes			
13	Interrelation of subjects	- Biology; - Biochemistry; - Preventive dentistry; - Preclinical cariology and restorative dentistry; - Basics of periodontology - Oral medicine and pathology.			
14.	Detailed description of the teaching and working methods for the subject	- Presentation of the methodological units by the professor; - Discussion of classes for the methodological units; - Activities at the end of each lecture to check the acquired knowledge; - Solving homework tasks that will be set once a week using the Forms tool, through Microsoft Teams; - Interactive practical teaching – performing experiments by students, making calculations, recording results, and drawing conclusions; - Training the student to perform various salivary tests.			
15.	Total Available Time	90 classes			
16.	Forms of teaching activities	16.1.	Lectures - theoretical teaching. Classes	30	
		16.2.	Exercises (laboratory, auditorium), seminars, teamwork	15	
		16.3.	Practice: classes		
17.	Other forms of activities	17.1.	Project assignments: classes	5	
		17.2.	Independent assignments: classes	5	
		17.3.	Home study - assignments	35	
18	Signature requirements Example:	- Attendance at 80% of lectures - Attendance at exercises and performing all practical exercises provided by the method units			
19	Method of grading				
	19.1.	Tests: points	2 tests of 20 points each		
	19.2.	Seminar work/project, written and oral presentation: points	20		
	19.3.	Final exam: points	40		
20	Evaluation criteria (points/grade)	up to 59 points	5 (five) (F)		
		from 60 to 68 points	6 (six) (E)		
		from 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.	Ivanovski Kj. Peshevska S. Dirjanska K.	Oral biochemistry and physiology	Faculty of Dentistry - Skopje,	2023
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year

		1.	Mohammad A. et al.	Saliva as a diagnostic tool for oral and systemic diseases	Elsevier	2016
		2.	Douglas A., Marcus K.	Salivary Bioscience	Elsevier	2020
		3.	Swati K. et al.	A Review on Saliva-Based Health Diagnostics: Biomarker Selection and Future Directions	Springer	2023