DISCIPLINE SHEET

1. Study programme

1.1.	"CAROL DAVILA" UNIVERSITY OF MEDICINE AND PHARMACY BUCHAREST
1.2.	FACULTY OF DENTISTRY
1.3.	DEPARTMENT: 1
1.4.	DISCIPLINE: Biochemistry
1.5.	STUDY DOMAIN: Health, sectoral regulated within the European Union
1.6.	STUDY LEVEL: I (Bachelor's degree) and II (Master's degree)
1.7.	STUDY PROGRAMME: DENTAL MEDICINE IN ENGLISH

2. Discipline

2.1.	Discipline name according to the study curriculum: BIOCHEMISTRY OF ORAL CAVITY				
2.2.	Discipline code: MD01S10EN				
2.3.	Discipline type (FD/SD/CD): SD				
2.4.	Discipline optionality (COD/ED/FAD): COD				
2.5.	Lectures tenure: Assoc. Prof. Dr. Daniela Miricescu				
2.6.	Practical classes / seminar tenure: Assoc. Prof. Dr. Daniela Miricescu				
2.7. Year of study	I	2.8. Semester	II	2.9. Evaluation (E/C/V)	E

3. Estimated total time (hours/ semester of teaching and training activity /individual study)

I. University training						
3.1. Number of hours per week	4	from which:	3.2. lecture	2	3.3. practical class/ seminar	2
3.4. Total hours in the study curriculum	56	from which:	3.5. lecture	28	3.6. practical class/ seminar	28
II. Preparation/ individual study						
Time distribution						hours
Study of lecture materials, textbooks, books, study of the minimum recommended bibliography						10
Additional documentation activity in the library, on online platforms						20
Specific preparation activities for projects, practical classes, preparation of assignments, and reports						20
Preparation for presentations or evaluations, preparation for the final examination						10
Tutoring activity						-
Other activities						4
3.7. Total hours of individual study						64
3.8. Total hours per semester (3.4.+3.7.)						120
3.9. Number of credits						4

4. Prerequisites (where appropriate)

4.1. curriculum	Organic chemistry and fundamental biochemistry knowledge
4.2. proficiencies	-

5. Conditions (where appropriate)

5.1. for lecture activity	The course takes place in the Biochemistry Laboratory of the Faculty of Dentistry, equipped with a projection system. Interactive exposure of the material according to the analytical program, using multimedia resources, PowerPoint presentations, and educational films
5.2. for practical class/ seminar activity	Laboratories have facilities specific to practical activities. Each student must complete his/her practical workbook with the obtained results. At each laboratory session, there is a seminar on the subject of the lecture, the practical laboratory session is performed, and students present a report.

6. Learning outcomes*

Knowledge	Skills	Responsibility and autonomy
Acquiring a minimum of practical knowledge of laboratory techniques, understanding the principles and usage of laboratory devices and utensils, gaining additional skills, the ability to interpret results, and establishing the relationship between biological constants and the etiopathogenesis of oral and systemic diseases.	Gaining the ability to handle biological fluids, understanding their properties, and utilizing materials used in dentistry.	Concern for professional development Ability to collaborate effectively within a team Ability to apply and connect acquired concepts in new contexts Development of fundamental biomedical scientific terminology Ability to implement theoretical concepts in medical practice Ability to develop interdisciplinary connections

7. Discipline objectives (correlated with learning outcomes)

7.1. General objective	Introduction to essential biochemistry concepts for understanding biochemical processes in the human body. Gaining essential knowledge about physiological and pathological processes in the oral cavity and their connection to systemic diseases. Familiarity with the most advanced biochemistry laboratory techniques used in medical practice and scientific research.
7.2. Specific objectives	•Understanding the metabolic processes in oral and dental tissues with a view to modernizing therapeutic procedures, considering that modern

	dentistry increasingly benefits from new scientific research in biochemistry. Knowledge of the latest techniques and methods for investigating oral and dental tissues. Fostering the ability to apply an interdisciplinary approach and the knowledge gained in dental practice. Acquisition of knowledge to understand the biochemical mechanisms in the oral cavity at the molecular level, as well as their relationship with systemic diseases. Ability to apply and incorporate acquired biochemical knowledge in clinical fields and medical practice. Maintaining interest in progress in dental biomedical research.

8. Contents

8.1. Lecture	Teaching methods	Observations
1. The object of oral biochemistry**.** The framework of the definition of oral health. **Tooth biochemistry**	Interactive exposure of the material following the analytical program, using multimedia resources, PowerPoint presentations, and educational films. *Lecture, systematic presentation, conversation, biochemistry-clinical aspects correlations *Exemplification, problematization, debate *The content of the course is dynamic, permanently correlated with similar courses from the Faculties of Dentistry in the country and abroad, with which we collaborate, and according to the latest discoveries in the field	Ability to understand questions related to: - organic and inorganic; major and minor compounds of tooth structures
2. **Biochemistry of dental pulp I: Carbohydrate metabolism:** anaerobic glycolysis, aerobic degradation of glucose, Krebs cycle, pentose phosphate pathway, glycogen metabolism		Ability to understand questions related to: -final products of the pathways -ATP generation -clinical significance of the pathway's products
3. **Biochemistry of dental pulp II: Lipid metabolism:** cholesterol biosynthesis, fatty acids, and triglycerides metabolism		Ability to understand questions related to: - clinical importance of cholesterol, fatty acids, and triglycerides in relation to the oral cavity. -ATP formation from fatty acids
4. **Dental plaque biochemistry I**: composition, formation, metabolic processes in the plaque		Ability to understand questions related to: -the most important metabolic processes in dental plaque
5. Dental plaque biochemistry II: carbohydrate, amino acids, and protein catabolism		Ability to understand questions related to: -clinical significance of products from carbohydrate, amino acid, and protein catabolism
6**. Dental plaque biochemistry III:** dental tartar and anti-plaque substances		Ability to understand questions related to: -differences between tartar and dental plaque -the most used anti-plaque substances

7. **Dental caries:** molecular mechanism in cariogenesis, fluoride prophylaxis		Ability to understand questions related to: -the most important factors involved in cariogenesis -fluoride's importance for the oral cavity
8. **Periodontal biochemistry I:** the chemical composition of the periodontium, scleroproteins, glycoproteins, and proteoglycans **(structures** and roles). Salivary glycoproteins - clinical significance		Ability to understand questions related to: -the most important glycoproteins and proteoglycans for periodontium
9. **Periodontal biochemistry II: b**iochemical processes in periodontium, molecular mechanisms in periodontal disease		Ability to understand questions related to: -the most important **b**iochemical processes in the periodontium
10. **Salivary biochemistry I:** composition of saliva- a dynamic process, factors influencing the composition of saliva		Ability to understand questions related to: -major salivary compounds, the main factors that influence saliva composition
11. **Salivary biochemistry II:** properties and functions of saliva		Ability to understand questions related to: -the most important properties and functions of saliva
12. **Factors influencing the integrity of oral structures**		Ability to understand questions related to: -positive and negative factors for oral structures
13. **Oxidative stress and oral pathology:** reactive oxygen species, antioxidants, oxidative stress-common biochemical mechanism of systemic and oral diseases		Ability to understand questions related to: -reactive oxygen species formation and their role in oral pathologies
14. **The biochemistry of taste**		Ability to understand questions related to: The five gustative sensations

1. Devlin, T.M., *Textbook of Biochemistry with Clinical Correlations*, John Wiley & Sons, 8th Edition, 2024
2. Lieberman, M.A., Peet, A., *Marks' Basic Medical Biochemistry, A clinical approach*, 5th edition, Wolters Kluwer, 2018
3. Ligtenberg, A.J.M., Veerman, E.C.I., Saliva: Secretion and Functions (Monographs in Oral Science Book 24) 1st Edition, S. Karger; 2014
4. Miricescu, D., Greabu, M., Ripszky Totan, A., Meleșcanu-Imre, M., Ștefani, C., Stănescu-Spînu, I.I., Spînu, T.C., *Saliva as a new diagnostic fluid for oral and systemic diseases. Current views and directions*, Lambert Academic Publishing, 2021
5. Totan, A., Greabu, M., ., Meleșcanu-Imre, M., Miricescu, D., Totan, C., Spînu, T., Stănescu, I.I., *Reactive Oxygen Species-Double Faced Companions*, Lambert Academic Publishing, 2019
6. Tvarijonaviciute, A., Martínez-Subiela, S., López-Jornet, P., Lamy, E., *Saliva in Health and Disease The Present and Future of a Unique Sample for Diagnosis*, Springer, 2020

Journals

Journal of Dental Research
Journal of Oral Pathology and Medicine
International Journal of Molecular Sciences
Molecules

Oral Diseases Dental Materials Clinical Oral Investigations		
8.2. Practical classes/ seminar	**Teaching methods**	**Observations**
1. Biochemistry of oral cavity I: Materials used in dentistry (A): metals, alloys, polymers. Structure, composition, properties	* At each laboratory session, there is a seminar on the subject of the lecture, the practical laboratory session is performed, and students present a paper. * Presentation of papers by students, competitions * Practical and theoretical applications (biological tests, chemical and biochemical techniques) * Interactive programmed education * Use of multimedia resources, didactic films, presentations of analysis bulletins, and their discussion with students, and practical demonstrations	To understand the most essential characteristics of the dental materials
2. Biochemistry of oral cavity II: Materials used in dentistry (B): dental cements, composite diacrylic resins, ceramic materials. Structure, composition, properties		To understand the most essential characteristics of the dental materials
3. Blood glucose and glycated hemoglobin: clinical significance and relationship with oral conditions. Periodontal disease, the 6th complication of diabetes		Glycemia determinations, results interpretations, and correlations with the oral cavity
4. Determination of cholesterol, triglycerides, HDL, LDL. The relationship between metabolic syndrome and periodontal disease		Cholesterol and TAG determination, results interpretations, and correlations with the oral cavity
5. Practical highlighting of molecular processes in cariogenesis		Understanding the molecular mechanism of the cariogenesis process.
6. Determination of salivary parameters I: glucose, ketone bodies, total protein, nitrites, hemoglobin, ascorbate		Saliva determinations and results interpretations.
7. Determination of salivary parameters II: uric acid, the most important antioxidant of saliva, and thiocyanate ion dosing in smokers and non-smokers		Salivary uric acid and thiocyanate determinations, and results interpretations-clinical significance
8. Determination of salivary parameters III: quantitative determination of salivary cortisol using ELISA technique. Clinical significance in oral diseases		Cortisol principle determination, and values correlation with oral diseases
9. Effects of diet on salivary pH		Role of salivary pH in cariogenesis
10. Salivary biomarkers in periodontal disease		The most important salivary biomarkers for periodontal disease
11. Salivary biomarkers in premalignant oral disorders		The most important salivary biomarkers for premalignant oral disorders

12. Salivary biomarkers in malignant oral disorders		The most important salivary biomarkers for malignant oral disorders
13. Mechanisms of cigarette smoke toxicity on oral cavity		The most dangerous components released from cigarette smoke. Impact on oral structures
14. Exemplification of the molecular mechanisms involved in the taste sensation		How taste sensations appear

1. Devlin, T.M., *Textbook of Biochemistry with Clinical Correlations*, John Wiley & Sons, 8th Edition, 2019
2. Levine, M., *Topics in Dental Biochemistry*, Springer, 2016
4. Lieberman, M.A., Peet, A., *Marks' Basic Medical Biochemistry, A clinical approach*, 5th edition, Wolters Kluwer, 2018

Journals

Journal of Dental Research
Materials
Journal of Oral Pathology and Medicine
International Journal of Molecular Sciences

9. Assessment

Activity type	9.1. Evaluation criteria	9.2. Evaluation methods	9.3. Percentage of final grade
9.4. Lecture	**A. Knowledge for mark 5:** - Participation in the written exam is conditioned by passing the practical exam (minimum mark 5) - tooth biochemistry; -molecular mechanisms in cariogenesis; -fluoride prophylaxis; -composition of saliva- a dynamic process; -factors influencing the composition of saliva; -properties and functions of saliva. **B. Additional knowledge for mark 10** Knowledge are taken into consideration - tooth biochemistry -periodontal biochemistry; -biochemistry of dental pulp; -oxidative stress and oral pathology;	**Exam**: -60 **multiple-choice test** -30 **correct answers represent mark 5** -50 **correct answers represent mark 10**	70%

	-biochemistry of dental plaque; -salivary biochemistry; -biochemistry of taste		
9.5. Practical classes/ seminar	**A. Knowledge for mark 5:** Periodic evaluation of the student through seminars and tests during the semester (2 tests) - The presentation of papers in seminars and participation in student scientific sessions are appreciated - normal values for all the studied parameters **B. Additional knowledge for mark 10:** - Knowledge of the principles of all the methods of determination presented in the laboratory sessions work -The correct interpretation of laboratory test results	**Practical assessment** The semestrial test papers consist of 9 written questions (2-3 are essay questions) with different degrees of difficulty. The practical exam is an oral exam	30% (20% semestrial tests paper + 10% practical exam)
9.5.1. Individual project (if any)	-	-	-
Minimum performance standard			
Knowledge and understanding of the basic notions of oral biochemistry (theoretical and practical) from the analytical program, knowledge of normal values, and the importance of determining the biochemical parameters in blood and saliva			