



**UNIVERSITATEA DE MEDICINĂ ȘI FARMACIE
„CAROL DAVILA” DIN BUCUREȘTI
Facultatea de Stomatologie**



DISCIPLINE GRID

1. Programme:

1.1.	CAROL DAVILA UNIVERSITY OF MEDICINE AND PHARMACY BUCHAREST
1.2.	FACULTY OF DENTISTRY / 1st DEPARTMENT DENTISTRY
1.3.	DIVISION: Biochemistry
1.4.	STUDY DOMAIN: Health, sectoral regulated within European Union
1.5.	STUDY LEVEL: LICENCE
1.6.	STUDY PROGRAMME: DENTAL MEDICINE IN ENGLISH

2. Discipline:

2.1.	DISCIPLINE NAME: Biochemistry						
2.2.	LOCATION: Faculty of Medicine, 8 Eroii Sanitari Blvd., Ground Floor, Sector 5, Bucharest						
2.3.	Lectures tenure: Daniela Miricescu (B.S.Chem, MSc.Chem, PhD) - Lecturer						
2.4.	Practical classes tenure: Daniela Miricescu (B.S.Chem, MSc.Chem, PhD) - Lecturer						
2.5. Study year	I	2.6. Semester	I	2.7. Evaluation	Exam	2.8. Type of discipline	CD/FD

3. Estimated total time (hours/semester)

No. hours/week	3	out of which	Lectures: 1	Laboratory session: 2
Total hours out of learning schedule	42	out of which	Lectures: 14	Laboratory sessions: 28

Time distribution	hours
Textbook study, lecture support, bibliography and notes	20
Supplementary documentation activity in the library, on online platforms	10
Practical activity support material, homework, portfolio and essays	10
Tutorial activity	-
Examinations	10
Other activities	8
Total hours of individual study	58
Total hours per semester	100
Credits	4

4. Preconditions

4.1. curriculum	Organic chemistry knowledge
4.2. proficiencies	-

5. Conditions

5.1. for lecture activity	The course takes place in the "Prof. Dr. Dan Theodorescu" Amphitheatre 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, educational films.
5.2. for laboratory 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. Accumulated skills

6.1. Proficiencies <i>(knowledge and abilities)</i>	I. Knowledge (cognitive dimension) - acquiring a minimum of practical knowledge of laboratory techniques, the principle and use of devices and utensils used in the laboratory, acquiring extra craftsmanship, the ability to interpret the obtained results and to establish the relationship between biological constants and the etiopathogenesis of oral and systemic diseases. II. Abilities (functional dimension) - Acquiring the ability to use biological fluids, knowledge of the properties and use of materials used in dentistry,
6.2. Transversal skills <i>(role, professional and personal development)</i>	III. Role skills ● Concern for professional development ● Ability to work effectively in a team IV. Professional and personal development skills ● Ability to use and correlate assimilated notions in a new context ● Development of basic biomedical scientific language ● Ability to apply theoretical notions in medical practice ● Ability to establish interdisciplinary correlations

7. Objectives (based on the grid of acquired specific skills)

7.1. General Objective	Presentation of the fundamental aspects of biochemistry to understand the biochemical processes in the human body. Acquisition of fundamental knowledge on physiological and pathological processes in the oral cavity and their relationship with systemic diseases. Knowledge of the most modern biochemistry laboratory techniques used in medical practice and scientific research.
7.2. Specific Objectives	• Knowledge and understanding of the metabolic processes carried out in the oral and dental tissues with the perspective of modernizing the therapeutic procedures, considering that modern dentistry benefits more and more from the new scientific research in the field of biochemistry • Knowledge of the most modern techniques and methods of investigating the oral and dental tissues

	• Stimulating the ability to implement the interdisciplinary approach and the knowledge gained in the dental practice • Acquisition of knowledge for understanding the biochemical mechanisms in the oral cavity at the molecular level, and also, their relationship with systemic diseases • Ability to implement and integrate the acquired biochemical knowledge in clinical disciplines and in medical practice • Maintaining interest in progress in dental biomedical research
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8. Content

8.1.1. Lecture	No. hrs/topic	Teaching method	Obs.
1. The subject of Biochemistry. Correlation of biochemistry with other biomedical sciences. Proteins I: structure, properties, immunoglobulins	2	*Interactive exposure of the material according to the analytical program, using multimedia resources, PowerPoint presentations, 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	*At the end of each course, there are discussions with the students regarding the presented material *The most interesting aspects that need to be further detailed are highlighted *The focus in on the aspects specific for dentistry *Encouraging the students to participate in the research activity of the discipline
2. Proteins II: myoglobin, hemoglobin, cytochrome c, collagen, elastin, keratins	2		
3. Liposoluble vitamins: A, D, K, E, F (structure, role)	2		
4. Hydrosoluble vitamins: B1, B2, PP, B6, B12 (without structure), C, pantothenic acid, folic acids (without structure), biotin. Structure, biological active form, role	2		
5. Enzymes: structure, nomenclature, classification, specificity, kinetics, inhibition and activity regulation, isoenzymes	2		
6. Energetic metabolism: free energy, endergonic and exergonic reactions coupling, ATP use, the respiratory chain and oxidative phosphorylation	2		
7. Nucleic acids: DNA, RNA (structure, biosynthesis) genetic code, protein biosynthesis, mutations	2		

8.2.1. Laboratory Session	No. hrs/topic	Teaching method	Obs.
1. Notions of labor protection and conduct in the biochemistry laboratory. Presentation of the laboratory and the student activity sheet. Solution concentrations	2	* 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, practical demonstrations	* At each laboratory session the focus is on: -presentation of the analysed biochemical parameter, highlighting the specific aspects of dentistry -principle of determination -effective execution of the experiment -processing the obtained results -normal values -discussion and interpretation of the results of the experiment from the perspective of the biochemical mechanisms involved -the importance of determining the biochemical parameter and the clinical significance
2. pH and buffer systems: definition, properties, biological importance	2		
3. Protein analysis: colour reactions, precipitation, denaturation, and determination the isoelectric point of proteins	2		
4. Modern methods for the determination of biochemical compounds in biological fluids: electrophoresis, chromatography, HPLC, ELISA, chemiluminescence: principle, importance	2		
5. Metabolism of mineral compounds I: sodium, potassium, chlorine, magnesium: the principle of determination, normal values, clinical significance. The relationship with the biochemical processes in the oral cavity	2		
6. Metabolism of mineral compounds II: calcium, fluorine, phosphorus, hydroxyapatite: the principle of determination, normal values, clinical significance. The relationship with the biochemical processes in the oral structures	2		
7. Metabolism of mineral compounds III: iron, copper, and other mineral elements: principle of determination, normal values, clinical significance. The involvement in the antioxidant defense of the oral cavity	2		
8. Vitamin analysis. Sources, roles. Hypovitaminosis and oral diseases. Students' presentations and competitions. The role of hydrosoluble and liposoluble vitamins in maintaining the integrity of periodontal tissues	2		
9. Enzymatic kinetics: variation of the speed of an enzymatic reaction depending on the substrate concentration, determination of K_M	2		
10. Clinically important enzymes: transaminases, phosphatases, CPK, LDH: Brief presentation, principle of determinations, normal values, and clinical significance	2		
11. Clinical significance of plasma protein electrophoresis. Examples of electropherograms	2		
12. Molecular biology techniques and their clinical importance: PCR- principle, importance. Didactic film	2		
13. Oxidative phosphorylation	2		
14. Tissue biochemical functions and their clinical significance: stomach, gallbladder, pancreas, intestine, liver, brain, red blood cells, adipose tissue, skeletal muscle, myocardium, kidneys	2		

8.3. Bibliography for lectures and laboratory/practical sessions
1. Baynes, J., Dominiczak, M.H., <i>Medical Biochemistry</i> , 5th Edition, USA, 2018 2. Bishop, M.L., Fody, E.P., Shoeff, L.E., <i>Clinical Chemistry. Techniques, Principles, Corellations</i> , 7th ed., Lippincott Company, USA, 2018

3. Devlin, T.M., *Textbook of Biochemistry with Clinical Correlations*, John Wiley & Sons, 8th Edition, 2019
4. Ferrier, D., *Lippincott Illustrated Reviews: Biochemistry*, Seventh Edition, Lippincott Williams and Wilkins, 2017
5. Gaw, A., Murphy, M., Srivastava, R., Cowan, R.A., O'Reilly, D.St.J., *Clinical Biochemistry E-Book: An Illustrated Colour Text*, Elsevier Health Sciences, 2013
6. Karam, D.W., *Medical Biochemistry Principles for Medical Students*, Trafford Publishing, 2011
7. Lee, M., *Basic Skills in Interpreting Laboratory Data*, Sixth Edition, ashp publications, 2017
8. Lehninger, A.L., Nelson, D.L., Cox, M.M., *Principles of Biochemistry and eBook*, Seventh Edition, W.H. Freeman, 2017
9. Lieberman, M.A., Peet, A., *Marks' Basic Medical Biochemistry, A clinical approach*, 5th edition, Wolters Kluwer, 2018
10. Marks, D.B., Marks, A.D., Smith, C.M., *Basic Medical Biochemistry, A clinical approach*, 4th edition, Lippincott Williams & Wilkins, 2013
11. Marshall, W.J., Lapsley, M., Day, A., Ayling, R., *Clinical Biochemistry: Metabolic and Clinical Aspects*, 3rd Edition, Elsevier, 2014
12. Marshall, W.J., Lapsley, M., Day, D., Shipman, K., *Clinical Chemistry*, Ninth Edition, Elsevier, 2020
13. Meisenberg, G., Simmons, W.H., *Principles of Medical Biochemistry*, 4th Edition, Elsevier, 2016
14. Murray, R.K., Bender, D.A., Botham, K.L., Kennelly, P.J., Rodwell, V.W., Weil, P.A., *Harper's Illustrated Biochemistry*, 30th Edition, McGraw-Hill Companies, Inc., 2015
15. PANINI, s.r., *Medical Biochemistry - An Essential Textbook and Review: USMLE, Tieme*, 2013
16. Tymoczko, J.L., Berg, J.M., Gatto Jr., G.J., Stryer, L., *Biochemistry: A Short Course*, Fourth Edition by WH Freeman, 2018
17. Vasudevan, D.M., Sreekumari, S., Vaidyanathan, K., *Textbook of Biochemistry for Medical Students*, Jaypee Brothers, Medical Publishers Pvt. Ltd., 2019
18. Vasudevan, D.M., *Practical Textbook of Biochemistry for Medical Students*, 2nd Edition, Jaypee Brothers, Medical Publishers Pvt. Ltd., 2013
19. Stryer, L., Berg, J., Tymoczko, J., Gatto, G., *Biochemistry*, Ninth Edition, WH Freeman and Company, 2019
20. Voet, D., Voet, J.G., Pratt, C.W., *Fundamentals of Biochemistry: Life at the Molecular Level*, John Wiley, 2016

Journals

Annual Review of Biochemistry

Biomarkers in Medicine

Clinical Biochemistry

9. Corroborating the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and representative employers in the field related to the program

The biochemistry course for the students at the Faculty of Dentistry aims to provide a holistic and systematized approach to the set of knowledge accumulated by modern biochemistry, an extremely dynamic fundamental science. It helps to understand normal and pathological biological phenomena and, therefore, plays a central role in the study of medicine and medical practice. The course offers students the classic, fundamental notions of biochemistry, modern biochemistry techniques and the significance of their knowledge for those who practice dentistry. The course tries to create a perspective image on the functioning of the human body, in normal and pathological conditions, by synthesizing data belonging to other fundamental sciences, such as chemistry, anatomy, physiology, cell biology, embryology, histology. Biochemistry contributes to the achievement of the two major goals of medicine: 1. understanding and maintaining health and 2. treatment and monitoring of its effectiveness, providing theoretical support (description of mechanisms, control methods, signaling pathways) and practical support (laboratory tests to determine specific biochemical markers). Dentists need to change their mindset about their responsibility to maintain the overall health and detect systemic and oral conditions. The biochemistry course aims to support future dentists to meet this challenge. 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.

10. Evaluation

Activity type	Evaluation Criteria	Methods of evaluation	% out of final grade
Lecture	A. Knowledge for mark 5: -Attendance to the course, accuracy, correctness, degree of assimilation and understanding are taken into consideration - Participation in the written exam is conditioned by passing the practical exam (minimum mark 5) - Proteins: structure, properties, immunoglobulins, collagen; vitamins - role B. Additional knowledge for mark 10 -Attendance to the course, accuracy, correctness, degree of assimilation and understanding and the ability to correlate and apply the acquired knowledge are taken into consideration - Proteins: myoglobin, hemoglobin, cytochrome c, collagen, elastin, keratins - Vitamins – structure, roles - Enzymes - structure, nomenclature, classification, specificity, kinetics, inhibition and activity regulation, isoenzymes - Nucleic acids - energetic metabolism	Exam: -40 multiple choice test	70% written exam
Laboratory Sessions	A. Knowledge for mark 5: Periodic evaluation of the student through seminars and tests during the semester (1 test) - 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	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 test paper + 10% practical exam)

Minimum performance standards

Written examination:

- knowledge for mark 5: 20 correct answers
- knowledge for mark 5: minimum mark 5 for the semestrial test paper

Practical exam

- knowledge for mark 5: - knowledge and understanding of the basic notions of biochemistry (theoretical and practical) from the analytical program, knowledge of normal values and the importance of determining the biochemical parameters in blood and saliva

Date: 03.09.2024	Chair of Biochemistry Division, Prof. Alexandra Ripszky
Date of the approval in Department Board:	Department director, Prof. Marina Imre