DISCIPLINE SHEET

1. Study programme

1.1.	"CAROL DAVILA" UNIVERSITY OF MEDICINE AND PHARMACY BUCHAREST
1.2.	FACULTY OF DENTISTRY
1.3.	DEPARTMENT: DENTISTRY II
1.4.	DIVISION: HISTOLOGY
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: CELL AND MOLECULAR BIOLOGY				
2.2.	Discipline code: MD01F04EN				
2.3.	Discipline type (FD/SD/CD): FD				
2.4.	Discipline optionality (COD/ED/FAD): COD				
2.5.	Lectures tenure: Assoc.Prof.Dr. Mihnea-Ioan NICOLESCU				
2.6.	Practical classes / seminar tenure: Assoc.Prof.Dr. Mihnea-Ioan NICOLESCU Assist.Prof.Dr. Iulia ROATEȘI Assist.Prof.Dr. David REMBAS				
2.7. Year of study	I	2.8. Semester	I	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	2	from which:	3.2. lecture	1	3.3. practical class/ seminar	1
3.4. Total hours in the study curriculum	28	from which:	3.5. lecture	14	3.6. practical class/ seminar	14
II. Preparation/ individual study						
Time distribution						hours
Study of lecture materials, textbooks, books, study of the minimum recommended bibliography						20
Additional documentation activity in the library, on online platforms						10
Specific preparation activities for projects, practical classes, preparation of assignments, reports						10
Preparation for presentations or evaluations, preparation for the final examination						15
Tutoring activity						7
Other activities						-
3.7. Total hours of individual study						62
3.8. Total hours per semester (3.4.+3.7.)						90
3.9. Number of credits						3

4. Prerequisites (where appropriate)

4.1. curriculum	Cell structure (biology), macromolecule structure (chemistry)
4.2. proficiencies	**Fundamental science skills:** - Basic knowledge of the structure of the eukaryotic and prokaryotic cell. - Understanding of basic concepts in chemistry: chemical bonds, pH, structure of the main classes of organic compounds (proteins, lipids, carbohydrates). **Digital skills:** - Ability to use a computer at a basic level: browsing the internet, using an e-learning platform, editing text, making presentations **Linguistic skills:** Knowledge of the English language at level B2-C1 is highly recommended.

5. Conditions (where appropriate)

5.1. for lecture activity	**Location**: Courses are held in an amphitheater equipped with modern multimedia equipment (video projector, sound system, internet connection) to allow the presentation of dynamic visual aids (diagrams, 3D animations, videos). **Attendance**: Attendance at the course is required for a thorough understanding of the subject matter and the clinical context presented by the lecturer. **Materials**: Course materials in electronic format available to students on the university's e-learning platform. **Interactivity**: Students are encouraged to actively participate in the course by asking questions and engaging in discussions based on clinical cases, to transform the lecture into an active learning experience.
5.2. for practical class/ seminar activity	**Slide preparation laboratory equipment**: Histological technique laboratory for obtaining permanent microscopic preparations, equipped with specific equipment for fixation, dehydration, embedding, sectioning, staining, mounting, labeling and accessories, including but not limited to: microscope with multiple objectives, histokinette for histological processing, histological preparation staining battery, paraffin microtome, adjustable temperature thermostat, refrigerator, histotheque, instruments, reagents, glassware and necessary consumables. **Teaching base equipment**: Permanent didactic microscopic preparations, electron micrographs, didactic 3D animations, 3D reproductions of didactic materials, optical microscope image capture and transmission system, interactive multimedia platform **Location**: Activities are carried out in a properly equipped cell biology laboratory, with enough functional optical microscopes (ideally, one microscope for every 1-2 students). **Attendance**: Attendance at all practical work is mandatory. The motivation for absences is done according to university regulations, and their recovery is necessary to participate in the final examination. **Mandatory individual equipment:** Each student must wear a white, clean lab coat and have a notebook for practical work and writing/drawing instruments. **Safety and conduct rules:**

	- Punctuality is mandatory. Access to the laboratory after the start of the work may be restricted. - Strict compliance with the labor protection rules and hygiene rules specific to the biology laboratory. - Careful use of the equipment provided (especially microscopes). Any malfunction must be reported immediately to the teaching staff. - Consumption of food and drinks in the laboratory is prohibited. **Preparation and participation**: Students are required to study the practical work protocol before coming to the laboratory. Active participation, completion of practical tasks and involvement in discussions are essential for promoting laboratory activity.

6. Learning outcomes*

Knowledge
K1: Description of the ultrastructural organization of the eukaryotic cell and the specific functions of each cellular organelle.
K2: Explanation of the molecular mechanisms of fundamental cellular processes: energy metabolism, membrane transport, the cell cycle and programmed cell death.
K3: Correlation of the structure of the main classes of biomolecules with their essential role in the formation and functioning of oral structures.
K4: Explanation of how the cytoskeleton and intercellular junctions collaborate to ensure the architecture, cohesion and dynamics of oral tissues.
K5: Differentiation between normal cellular processes and those underlying oral pathological conditions (e.g. inflammation, loss of epithelial integrity, uncontrolled proliferation).
Skills
S1: Correct and autonomous use of the optical microscope for the examination of biological preparations.
S2: Identification under the optical microscope of the main cell types and stages of cell division on standard histological preparations.
S3: Interpreting electron microscopy images (electron micrographs) to recognize cell organelles and membrane specializations.
S4: Applying logical reasoning to correlate the morphological appearance of a cell with its specific function in oral tissues (e.g., correlating an RER developed in odontoblasts with the function of collagen synthesis).
S5: Ability to search, select and use information from scientific sources (databases, articles) to understand a biological process.
Responsibility and Autonomy
RA1: Awareness of the importance of biological foundations for evidence-based medical practice and assuming responsibility for one's own training.
RA2: Developing ethical and responsible behavior during laboratory activities, respecting safety standards and the integrity of equipment.
RA3: Manifesting a critical spirit and scientific curiosity, by formulating pertinent questions and actively seeking answers.
RA4: Ability to work effectively in a team (within the laboratory) to achieve common goals.

7. Discipline objectives (correlated with learning outcomes)

7.1. General objective	**CMB-GO:** The discipline aims to provide dental students with the fundamental knowledge and skills of cellular and molecular biology necessary for understanding the structure, function, development and pathology of the stomatognathic system, thus forming the indispensable scientific basis for modern clinical thinking and evidence-based medical practice.
7.2. Specific objectives	**CMB-SO1:** Identification and description of the ultrastructural components of the cell, with the direct correlation between the structure of each organelle and its specific function in the dental context. (*correlated with K1, S3, S4*) **CMB-SO2:** Understanding the molecular mechanisms that govern dynamic cellular processes: energy metabolism, membrane transport, cell communication, cell cycle and programmed cell death. (*correlated with K2, K5*) **CMB-SO3:** Correlating the structure of the main classes of biomolecules (proteins, lipids, carbohydrates) with their essential role in the formation and functioning of oral structures. (*correlated with K3, S4*) **CMB-SO4:** Development of basic practical skills in microscopy, from the correct handling of equipment to the critical interpretation of biological images. (*correlated with S1, S2, S3*) **CMB-SO5:** Explain how cytoskeleton components and intercellular junctions collaborate to provide the architecture, cohesion, and mechanical strength of oral tissues. *(correlated with K4, S4, S5*) **CMB-SO6:** Cultivate professional responsibility and autonomy in learning, encouraging a scientific and critical approach to medical knowledge. (*correlated with RA1, RA2, RA3, RA4*)

8. Contents

8.1. Courses	Teaching methods	Observations
CMB-C1. Fundamentals of Cellular and Molecular Biology for Dentistry	- **Lecture with rich visual support** in logic diagrams, clear definitions and high-quality images - **Demonstration with visual aids** (3D animations, videos and optical and electron microscopy images) - **Problem-based learning:** introduction of theoretical concepts through short clinical scenarios: the teacher launches a clinical question (e.g. "why is anesthesia less effective in an abscess?") and the answer is built step by step by	A particular emphasis will be placed on the **comparative method**, constantly juxtaposing the structure of the human eukaryotic cell with that of the bacterial prokaryotic cell, to set the dental context from the outset.
CMB-C2. Barriers and Signals: Functional Roles of the Cell Membrane in the Oral Cavity		**High-quality 3D animations** will be used to demonstrate membrane fluidity, the mechanism of the sodium-potassium pump, and, most importantly, the blocking of ion channels by anesthetic molecules.
CMB-C3. Cell Factories: Energy Metabolism and Oral Matrix Biosynthesis		-

CMB-C4. The Cytoskeleton: Architecture and Dynamics of Cells in Oral Tissues	explaining relevant notions (e.g. pH, membrane structure) - **Dialogue and active learning**: the lecture will include questions to students to increase interactivity and actively involve them in the learning process	-
CMB-C5. From Cell to Tissue: Intercellular Junctions and Oral Epithelial Integrity		**3D diagrams and models** will be used to illustrate the complex architecture of junctions (desmosomes, tight junctions), directly correlating their structure with the mechanical and chemical barrier function of the oral epithelium.
CMB-C6. Cellular Cleansing and Defense Systems: Lysosomes, Proteasomes, and Peroxisomes		The teaching method will include **comparative analogy**.
CMB-C7. Cell Fate Control: Cell Cycle, Apoptosis, and Tissue Regeneration		The teaching method will include **conceptual mapping** and visualizing homeostatic balance.
8.2. Laboratory sessions	**Teaching methods**	**Observations**
CMB-LS1. Introduction to microscopy: human cell structure vs. bacterial cell structure	- **Formative demonstration:** the teacher performs a technique in front of the students (e.g. correct manipulation of the optical microscope), explaining each step and highlighting critical points where errors could occur - **Learning by doing:** the student performs individually or in small work teams the practical tasks in the work protocol (e.g. focusing an image under the microscope, drawing the structures observed) - **Guided observation:** during the examination under the microscope, the teacher guides the student, drawing their attention to the relevant structures and helping them interpret the images through questions such as "What do you think this darker structure represents?" - **Collaborative learning:** students are encouraged to work in small teams to interpret the images and discuss observations, stimulating communication and mutual learning.	The emphasis is on **formative demonstration** and **guided practical action**, with the teacher ensuring that each student correctly learns the basic manipulation of the optical microscope.
CMB-LS3. Cell membrane: selective barrier and target of local anesthetics		A balanced proportion is used between **individual practical action** (each student works on his own microscope or studies his own electron microscopy image) and **guided observation**, where the teacher circulates among the students to provide personalized feedback.
CMB-LS3. Ultrastructure of secretory cells: role in extracellular matrix production		
CMB-LS4. The cytoskeleton in action: cell shape and membrane specializations		
CMB-LS5. From cell to tissue: junctions, digestion and tissue remodeling		
CMB-LS6. The cell cycle in oral tissues: from regeneration to pathology		
CMB-LS7. Colloquium: verification of concepts and skills acquired in practical work.		-

8.3. Bibliography for lectures and laboratory/practical sessions

Basic notions:

- Lectures and practical sessions explanations (digital versions available via e-learning platform)
- Alberts B et al. **Essential Cell Biology**. 6th ed. W.W. Northon & Company, 2023, ISBN 978-1324033356
- Mescher AL. **Junqueira's Basic Histology, Text & Atlas.** 17th ed., McGrawHill/Lange, 2013, ISBN 978-1264932146
- Whawell SA, Lambert DW. **Basic Sciences for Dental Students**. 1st ed. Wiley Blackwell, 2018, ISBN 978-1118905579

Advanced notions:

- Alberts B et al. **Molecular Biology of the Cell** 7th ed. W.W. Northon & Company, 2022, ISBN 978-0393427080
- Gromley Z and Gromley A. **Biochemistry, Cell and Molecular Biology, and Genetics: An Integrated Textbook**. 1st ed. Thieme, 2021, ISBN 978-1626235359
- Lodish H et al. **Molecular Cell Biology** 9th ed. WH Frieman & Co Ltd (Macmillan Learning), 2021, ISBN 978-1319365486
- Pawlina W. **Ross's Histology, a Text and Atlas.** 9th ed., Lippincott Williams & Wilkins, 2023, ISBN 978-1975181512

Scientific journals (optional):

- Biochemistry and Molecular Biology Education (ISSN: 1539-3429)
- Cell (ISSN: 1097-4172)
- Cell & Tissue Research (ISSN 1432-0878)
- Journal of Cellular and Molecular Medicine (ISSN: 1582-4934)

Online resources (optional): **Khan Academy, Osmosis, Ninja Nerd, PubMed**

9. Assessment

Activity type	a. Evaluation criteria	b. Evaluation methods	c. Percentage of final grade
9.1. Lecture	- Correctness and completeness of theoretical knowledge - Ability to correlate information and apply it in image interpretation - Correct use of specialized terminology	Final written exam, consisting of multiple-choice questions, short answer/correlation questions and image interpretation)	**60%**
9.2. Practical classes/ seminar	- Level of understanding of theoretical concepts related to practical work - Accuracy of identifying structures under the microscope and on electron micrographs - Degree of completion and correctness of the lab notebook	Continuous assessment	**20%**
		Final practical colloquium (conditioned on the lab notebook)	**20%**
9.3. Individual project (if any)	N/A	N/A	N/A

Minimum performance standard
In accordance with the university regulations in force, passing the subject is conditional on the **cumulative** and **mandatory** fulfillment of the following requirements: - passing the laboratory activity, a mandatory condition for participating in the final exam. Passing requires full attendance at the practical work and obtaining an average of at least 5 in the mid-term and colloquium assessments. - obtaining a minimum grade of 5 in the final written exam. Failure to comply with **any** of these conditions automatically leads to failure to pass the subject. The student must demonstrate a basic familiarity with the concepts of cellular and molecular biology, be able to recognize terms and perform simple tasks, even if he has difficulty correlating and explaining mechanisms in depth. **Knowledge (reflected in the final exam and in laboratory tests):** - **recognition and memorization**: the student can define central concepts (e.g. what is a mitochondrion, what is apoptosis) and list components (e.g. cell organelles). - **simple identification**: the student can recognize main structures on clear, pre-labeled or simple diagrams and images (e.g. can identify the nucleus in a cell diagram). - **answers to factual questions**: the student can correctly answer questions of the type "what?" and "where?" (e.g. "what type of biomolecule is the main component of the cell membrane?"). - **exam performance**: the student obtains a result of approximately 50-55% on the final exam, answering mainly factual MCQ questions and the simplest image recognition questions correctly. **Skills (reflected in the laboratory work and the practical colloquium):** - **guided use of the microscope**: the student can bring a slide into the focal plane (clear) with the help of the teacher and can use low and medium magnification objectives. - **basic visual identification**: in the practical colloquium, the student can recognize an obvious cell structure or a phase of mitosis on a pre-selected slide or recognize an organelle on an electron micrograph. - **completion of the minimum tasks**: the student has completed the practical workbook (mandatory condition), but the drawings are schematic, and the descriptions are superficial, often copied without demonstrating their own understanding. - **performance in continuous assessment**: the student obtains an average result of 50-60% in laboratory tests and manages to pass the minimum threshold in the practical colloquium (correct identification, laconic answer to the question).