"Carol Davila" University of Medicine and Pharmacy in Bucharest
Quality Assurance Committee

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: REGENERATIVE DENTISTRY				
2.2.	Discipline code: MD04S06EN				
2.3.	Discipline type (FD/SD/CD): SD				
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	IV	2.8. Semester	VII	2.9. Evaluation (E/C/V)	C

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	10
Additional documentation activity in the library, on online platforms	6
Specific preparation activities for projects, practical classes, preparation of assignments, reports	6
Preparation for presentations or evaluations, preparation for the final examination	6
Tutoring activity	2
Other activities	2
3.7. Total hours of individual study	32
3.8. Total hours per semester (3.4.+3.7.)	60
3.9. Number of credits	2

4. Prerequisites (where appropriate)

4.1. curriculum	Fundamental knowledge of anatomy, biochemistry, cellular and molecular biology, embryology, physiology, general and oral histology
4.2. proficiencies	**Science skills:** - Ability to integrate knowledge of cell biology, histology and embryology to understand the complex architecture of hard and soft oral tissues (pulp-dentin complex, periodontium, alveolar bone). - Familiarity with the notions of intercellular signaling and the role of growth factors in orchestrating the cellular response. - Understanding of the cellular and molecular mechanisms underlying the processes of healing, repair and tissue regeneration (e.g. angiogenesis, osteogenesis, cementogenesis). - Knowledge of the pathophysiological basis of the main conditions requiring regenerative therapies (e.g. pulp necrosis, periodontitis, bone atrophy). **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	**Specific equipment:** The didactic portfolio is designed to support case-based learning and the development of critical analysis skills. It includes: • collection of realistic, 3D printed teaching models that reproduce various clinical scenarios (bone defects, periodontal, etc.). • conceptual visualization materials (flexible foils, sponges, granular materials) designed to simulate the physical properties of biomaterials. • relevant scientific articles (case studies, review articles) in digital or printed format, as a support for the development of literature analysis skills. • multimedia system (high-resolution screen) for viewing 3D animations, videos and CBCT scans. • basic instrumentation (probes, forceps) used exclusively for dimensional analysis and didactic manipulation of models, not for simulating surgical gestures. **Location**: Activities are carried out in a properly equipped hall with modular furniture, which allows students to be organized into teams/groups of 8. This

	structure is essential to facilitate collaboration, case discussions, and mutual learning. **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 labor protection regulations and specific hygiene rules. - Careful use of teaching equipment (especially 3D models). Any malfunction must be reported immediately to the teacher. - Consumption of food and drinks in the laboratory is prohibited. - A respectful working environment, conducive to academic debates, will be maintained. **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 passing laboratory activity.

6. Learning outcomes*

Knowledge
K1: Define and explain the fundamental principles of tissue engineering (triad: cells, scaffold, signaling) and their applicability in tissue regeneration in the OMF territory.
K2: Describe the main sources of stem cells in the OMF territory, the properties of biomaterials (membranes, grafts) and the role of growth factors in orchestrating the cellular response.
K3: Explain the biological foundations of the main regenerative therapies studied: regeneration of the pulp-dentin complex, periodontium (GTR) and bone (GBR).
K4: Understand and identify the basic structure of a scientific article, the importance of correct citation and the different methods of communicating the results of scientific research.
K5: Recognize future directions and emerging technologies in regenerative medicine (e.g. 3D printing, gene therapies) and their potential impact on dental practice.
Skills
S1: Analysis and classification of various types of tissue defects (bone, periodontal) based on three-dimensional didactic models.
S2: Applying logical reasoning to correlate a simulated clinical scenario with a conceptual regenerative strategy, selecting the appropriate types of cells, scaffolds and signals.
S3: Interpreting a scientific article abstract to extract essential information: study objective, summary methodology and main conclusions.
S4: Developing a conceptual plan for a simple regeneration case, including the justified choice of biomaterials and description of the therapeutic purpose.
S5: Structuring and synthesizing information in a scientific presentation format (e.g.: outline of a poster or a short presentation or PechaKucha)

Responsibility and Autonomy
RA1: Awareness of the importance of correlating knowledge from basic sciences with advanced clinical therapies, to substantiate an evidence-based medical practice.
RA2: Development of ethical and responsible behavior, understanding the current implications and limits of advanced regenerative therapies.
RA3: Manifestation of a critical spirit and scientific curiosity, by formulating pertinent questions and by critically analyzing the information presented in case studies and in the specialized literature.
RA4: Ability to work effectively in a team (within the framework of practical work) to analyze cases, debate solutions and achieve common learning objectives.

7. Discipline objectives (correlated with learning outcomes)

7.1. General objective	**RD-GO:** The course aims to provide fourth-year dental students with the fundamental conceptual knowledge and skills of regenerative dentistry, bridging the gap between the biological sciences studied in the preclinical years and advanced clinical therapies. It aims to develop reasoning based on biological principles and scientific evidence, essential for understanding and integrating future tissue regeneration technologies into modern dental practice.
7.2. Specific objectives	**RD-SO1:** To familiarize the student with the fundamental principles of tissue engineering (cell triad, scaffold, signals) and with the biological potential of oro-maxillofacial tissues. (*correlated with K1, K2*) **RD-SO2:** To ensure understanding of the biological bases, objectives and specific terminology for the main regenerative therapies in endodontics, periodontics and implantology. (*correlated with K3, K5*) **RD-SO3:** To develop conceptual analysis skills of a simulated clinical case, from 3D defect identification to justified selection of biomaterials strategy. (*correlated with S1, S2, S4*) **RD-SO4:** To contextualize the basic notions of "scientific literacy", developing the skills to interpret a cutting-edge scientific article and to structure the information for an academic presentation. (*correlated with K4, S3, S5*) **RD-SO5:** To cultivate professional responsibility, critical thinking, and autonomy in learning, by encouraging a scientific and ethical approach to advanced regenerative therapies. *(correlated with RA1, RA2, RA3, RA4*)

8. Contents

8.1. Courses	Teaching methods	Observations
RD-C1. The concept of regenerative dentistry, the regeneration triad.	**Interactive lecture with visual support** (diagrams, microscopy images). **Problem-based learning:** the course begins with a simple clinical question (e.g., "A patient loses bone after an extraction. Can we restore it? How?"), and the answer is built step by step.	Special emphasis will be placed on **conceptual clarification**. The "regeneration triad" (cells, scaffold, signals) will be presented as a "biological toolkit" that the physician can use, creating a direct analogy with the clinical toolkit.
RD-C2. Stem cells in dentistry	**Interactive lecture with visual support** (diagrams, microscopy images).	A **direct correlation** will be made with the notions of histology and embryology (year 1). The location of

	Visual demonstration: high-quality 3D animations will be used to illustrate the process of cell differentiation (e.g., a mesenchymal stem cell becoming an osteoblast).	stem cell niches will be indicated on 3D anatomical models to facilitate visual memorization and understanding of their topographical relevance.
RD-C3. Regenerative approaches – Scaffolds	**Comparative lecture** Presentation of images and videos with various types of biomaterials.	The **comparative method** will be used to make the connection with the discipline "Dental Materials" (year 3). The properties of a restorative material (e.g. composite - inert, permanent) will be juxtaposed with those of a biomaterial (e.g. collagen - bioactive, resorbable) to emphasize the paradigm shift from "replacement" to "regeneration".
RD-C4. Cell signaling – growth factors	**Lecture with logic diagrams** **Clinical case-based learning:** the protocol for obtaining PRF (fibrin-rich plasma) will be presented to provide a concrete and relevant clinical example of the use of autologous growth factors.	Excessive detailing of complex signaling pathways will be avoided. The focus will be on the functional role of the main families of growth factors (BMP, PDGF, VEGF), explaining "what they do" rather than "how they act" at the molecular level.
RD-C5. Regeneration of the pulp-dentin complex	**Problem-based learning:** the entire lecture will be built around a central clinical case: a young patient with a necrotic central incisor with an open apex. **Dialogue and active learning.**	A **direct correlation** will be made with the concepts of "Restorative Dentistry" (year 3). Pulp revitalization therapy will be presented as a logical extension of conservative pulp therapies (capping), emphasizing the common biological goal: stimulating the healing potential of the pulp.
RD-C6. Periodontal and bone regeneration	**Lecture with rich visual support** (clinical "before" and "after" images, clear diagrams). **Demonstration with 3D animations:** animations will be used to clearly illustrate the membrane barrier principle and the cellular competition between the epithelium and regenerative tissues.	The course will act as a "window to the clinical years". Even if students do not yet have a clinical background, they will be introduced to the concepts and objectives of these advanced therapies to give them a perspective on the complexity and potential of the field they will delve into in years V and VI.
RD-C7. Regeneration of salivary glands. Perspectives: 3D printing.	**Visionary, synthesis lecture** **Presentation of case studies** from cutting-edge research and videos with emerging technologies.	This final course aims to close the circle: it will present in detail 3D printing technology as a spearhead in the creation of personalized scaffolds, thus connecting theory with the technology that students have already used in the form of didactic models in practical work.
8.2. Laboratory sessions	**Teaching methods**	**Observations**
RD-LS1. From histology to regenerative potential – the map of oral tissues.	**Comparative analysis**: correlation of macroscopic 3D models with histological plots and animations. **Active learning through discovery**: Students, grouped in teams, identify and localize cell populations on models. **Guided discussion** to reactivate and deepen preclinical knowledge.	The goal is to make a smooth transition from the basic sciences to the regenerative context. The answer to the question: "Where is the biological healing potential that we are trying to stimulate?" will be constantly emphasized.
RD-LS2. The triad of regeneration – a biological puzzle.	**Conceptual modeling and gamification:** Assembling the regeneration "puzzle" (cells-scaffold-signals) on a 3D defect model. **Collaborative team learning.**	This approach transforms an abstract concept into a visual and interactive activity, facilitating an intuitive and lasting understanding of the fundamental principle of the discipline.

RD-LS3. From dental materials to biomaterials	**Comparative analysis** of classical vs. regenerative materials. **Interactive short lecture** on the structure of a scientific article. **Task-based learning:** Teams immediately apply knowledge to extract essential information from a real scientific article.	The first component of the "scientific ABC" is integrated. The ability to "scan" an article is not taught separately, but as a necessary tool to solve a concrete problem within the seminar.
RD-LS4. The scaffold challenge	**Scenario-based problem solving:** Teams must choose the most appropriate simulated scaffold to solve a conceptual clinical problem. **Short lecture** on citation ethics and formatting. **Immediate practical application:** Writing a simple conclusion, supported by a correct citation.	The second component of the "Science ABC" is taught practically. Students learn that a scientific statement (e.g., "I chose material X...") must be supported by evidence (citation), reinforcing the principle of evidence-based medical practice.
RD-LS5. The potential of the dental pulp	**Case-based learning:** Analysis of 3D models with various stages of lesions. Development of critical thinking through **guided discussions** about the limits and perspectives of therapies **Information synthesis:** Outline the structure of a presentation.	A more advanced form of academic thinking is introduced, moving from "what is it?" to "what does it mean?", "what are its limits?", and "where are we going?", mimicking the "Discussion" section of a scientific article.
RD-LS6. Synthesis seminar: integrated analysis of a complex clinical case.	**Case-based learning:** the seminar is dedicated to the analysis of a single complex clinical case, from diagnosis to conceptual plan (e.g. a severe periodontal defect or major bone atrophy). **Teamwork based on structured worksheet:** teams receive a worksheet that guides them to apply all the knowledge and skills acquired in LS1-LS5 (morphological analysis, biomaterial selection, critical risk analysis, etc.). **Moderated debate and collective construction:** the teacher moderates a final discussion, building the ideal treatment plan on the board/screen, by integrating the best ideas from each team.	This seminar represents **the final bridge to the colloquium project.** It is the most complex practical application during the semester and has the role of consolidating and integrating all the disparate notions into a unified clinical thinking process. It ensures that, at the time of receiving the final case in LS7, students already have a working model and a clear methodology to successfully approach the project.
RD-LS7. Launch of the colloquium project and consultancy session.	**Official case assignment:** Each group of students receives the sealed envelope containing the final and unique case for the colloquium. **Detailed presentation of the requirements:** The teacher explains in detail the rules, the presentation formats of choice (Poster, PPT, PechaKucha), the grading structure and the logistics of the evaluation session. **Initial, supervised work session:** For 60-75 minutes, the teams unseal the case and begin the process of analyzing, brainstorming and outlining the project plan under the guidance of the teachers. **Dedicated Q&A session:** The final 30 minutes are allocated for each team to ask specific questions about the case received, ensuring that everyone sets off with a clear understanding of the task.	This seminar is the **ground zero of the final assessment.** Although not graded, participation is crucial. It provides a formal and fair framework for starting the project, allowing students to benefit from direct guidance from faculty before continuing to work independently. It ensures that all teams start from a solid foundation and understand the expectations correctly.

8.3. Bibliography for lectures and laboratory/practical sessions
Minimal bibliography (recommended): • Course notes and seminar support materials • Berkovitz BKB et al. **Oral Anatomy, Histology and Embryology.** 6th edition. Elsevier, 2024, ISBN 978-0323935210 • Hosseinpour S et al. **Regenerative Approaches in Dentistry**. Springer, 2021, ISBN 978-3030598112 *Additional bibliography (optional):* • Vishwakarma A et al. **Stem cell biology and tissue engineering in dental sciences**. Academic Press, 2014, ISBN 978-0123971579 • Waddington RJ, Sloan AJ. **Tissue Engineering and Regeneration in Dentistry: Current Strategies.** Wiley Blackwell, 2017, ISBN 978-1118741108 *Scientific journals (optional):* o International Journal of Oral Science (ISSN: 2049-3169) o Journal of Dental Research (ISSN: 0022-0345) o Dentistry Journal (ISSN: 2304-6767) o Frontiers in Dental Medicine (ISSN: 2673-4915) *Online resources for searching and further study:* o PubMed: the fundamental database for searching the scientific medical literature o Educational platforms (for reviewing and deepening fundamental concepts): Khan Academy, Osmosis, Ninja Nerd.

9. Assessment

Activity type	a. Evaluation criteria	b. Evaluation methods	c. Percentage of final grade
9.1. Lecture	***For the team component:*** • scientific rigor and complexity of the project • quality of documentation and sources used • quality and coherence of presentation and support materials ***For the individual component:*** • clarity of presentation, mastery of the subject and the role assumed in the project • critical thinking, argumentation and quality of answers to questions.	**Final colloquium**, focused on the presentation and defense of a team project. The colloquium grade is made up of a team component **(60%)** and an individual component **(40%).** Each component is calculated as follows: • 75% of the score is awarded by the teacher. • 25% of the score represents the average of the anonymous peer review, carried out by the other teams based on the specified criteria. *The peer review process will be carried out through an electronic form to ensure anonymity and objectivity*	**90%**
9.2. Laboratory sessions/ seminar	- quality of case analyses and deliverables - collaboration, task management and teamwork efficiency - active involvement in discussions, contribution of ideas and constructive feedback	**Continuous assessment** throughout the semester by monitoring and grading each team's activity in the practical work (LS1-LS6). The final grade for this component reflects the progress, consistency, and quality of the team's contributions throughout all practical applications.	**10%**

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 seminar activity**, a mandatory condition for participating in the final colloquium. Passing requires **full attendance at the laboratory sessions** and obtaining an average of at least 5 in the mid-term assessments.
- **obtaining a minimum grade of 5 in the final colloquium**.

Failure to comply with **any** of these conditions automatically leads to failure to pass the subject.

The student demonstrates a basic familiarity with the fundamental notions of regenerative dentistry. They can reproduce information, recognize key terms and perform simple analysis tasks on a clinical case, although he/she has difficulty in arguing in depth the therapeutic choices.

Knowledge (reflected in the final colloquium):

• **Reproduction of information:** the student correctly defines the central notions (e.g.: regeneration triad, scaffold), lists types of biomaterials and recognizes anatomical structures or obvious defects on visual supports (images, 3D models).

• **Factual answers:** the student correctly answers factual questions, such as "what is it?", "where is it applied?" and "what are the steps?".

Skills (reflected in the final colloquium):

• **Application of a standard protocol:** within the project, the student contributes to a simple case analysis, which correctly follows a given scheme, but without exploring multiple perspectives.

• **Project completion at a satisfactory level:** the group project meets the minimum requirements, being coherent, but lacking in originality. The presentation is schematic and strictly follows the prescribed structure.

• **Performance in the Q&A session:** the student answers factual, direct questions about the project, but has significant difficulty explaining the reasoning (“why?”) or the implications of the decisions.

- **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).