1. BASIC INFORMATION

Course	Biochemistry
Degree program	Degree in Dentistry
School	Faculty of Biomedical and Health Sciences
Year	First year
ECTS	6 ECTS
Credit type	Mandatory
Language(s)	English
Delivery mode	Campus-based mode
Semester	Second semester
Academic year	2025-2026
Coordinating professor	Javier Roig Arcos

2. PRESENTATION

As a natural science, biochemistry is the study of the chemical processes that drive biological systems. This course explores the basic principles of biochemistry and develops the student's appreciation and understanding of biological networks. Understanding biology at a molecular level is crucial in Biomedical Sciences.

This subject introduces the student to the main concepts of general biochemistry. Currently, biochemistry is considered to be, and therefore taught as, an essential component of the dental curriculum in almost all universities worldwide due to its connections with other subjects such as biology, biomaterials, pharmacology, physiology or pathophysiology.

The course provides basic foundational knowledge of the main biomolecules as well as the major metabolic pathways.

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies:

- **BC1**: Students must demonstrate to have gained a better knowledge in the studied field. The basis for these studies come from general secondary education and reach levels that, whilst supported by advanced textbooks, includes some aspects that imply knowledge of the forefront of their field of study.
- **BC2**: Students must use their knowledge in their work or vocation in a professional manner. Must be able to sustain arguments and solve problems within their field of study.
- **BC3**: Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection of relevant social, scientific, or ethical nature topics.
- **BC5**: Students have developed those learning skills needed to undertake further studies with a high degree of autonomy.

Cross-curricular competencies:

- **CC1**: Responsibility. Students can assume the consequences of their actions taken as well as must be held accountable for them.
- **CC4**: Communication skills: Students should be able to efficiently express concepts and ideas, including the capacity to concise and clear written communication, as well as efficiently speaking in public.
- **CC7**: Teamwork: Students will be able to participate actively in the achievement of a common goal, listening, respecting, and valuing the ideas and proposals of the other members of their team.
- **CC9**: Planning: The student will be able to determine effectively his/her goals and priorities, defining actions, deadlines and optimal resources required to achieve those goals.

Specific competencies:

- **SC01**: Know the biomedical sciences on which dentistry is based to ensure correct oral and dental care. These sciences should include appropriate contents of embryology, anatomy, histology and physiology of the human body, genetics, biochemistry, cell and molecular biology and microbiology and immunology.

- **SC02**: Know the morphology and function of the stomatognathic system, including appropriate contents of specific embryology, anatomy, histology, and physiology.

Learning outcomes:

- **LO1**: Basic study of biomolecules.
- **LO2**: Learning chemical reactions that take place in the living being.
- **LO3**: Understanding the importance of Biochemistry in the dental environment.
- **LO4**: Analysis of physiological and pathological states from the biochemical point of view.
- **LO5**: Development of general competences for the formative development of the professional future of Dentistry.

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
BC1, BC2, BC3, BC5	**LO1**: Basic study of biomolecules.
BC1, BC2, BC3, BC5	**LO2**: Learning chemical reactions that take place in the living being.
BC1, BC2, BC3, BC5, CC1, CC4, CC7, CC9, CE07, CE11	**LO3**: Understanding the importance of Biochemistry in the dental environment.
BC1, BC2, BC3, BC5, CC1, CC4, CC7, CC9, CE07, CE11	**LO4**: Analysis of physiological and pathological states from the biochemical point of view.
CC1, CC4, CC7, CC9, CE07, CE11	**LO5**: Development of general competences for the formative development of the professional future of Dentistry.

4. CONTENT

Topic 1

Unit 1. The chemical basis of life.

Introduction. Classifications of matter. Essential elements of life. Atomic and molecular structure. Intermolecular forces. Chemistry of carbon compounds. Biomolecules. Chemical reactions. Thermodynamics.

Unit 2. Water.

Introduction. Solutions. Physicochemical properties. Diffusion. Osmosis. Chemical equilibrium. Acids and bases.

Topic 2

Unit 3. Carbohydrates.

General properties and functions. Monosaccharides. Isomerism. Molecular structure. Glycosidic bond. Oligosaccharides. Polysaccharides.

Unit 4. Lipids.

General properties and functions. Categories. Fatty acids. Simple lipids. Fats. Complex lipids. Non saponifiable lipids.

Unit 5. Proteins.

General properties and functions. Amino acids. Peptide bond. Levels of protein structure. Chemical kinetics. Enzymes. Enzyme kinetics. Applications of enzymes.

Unit 6. Nucleic acids.

Introduction. Nucleotides. Phosphodiester bond. DNA. RNA. The flow of genetic information. The genetic code.

Topic 3

Unit 7. Important molecules in the human body.

Hormones. Second messengers. Vitamins and Cofactors. Biochemical Composition of Biological Membranes. Biochemical composition of the Extracellular Matrix

Unit 8: Biochemistry of saliva.

What is saliva? Chemical composition. Functions. Biochemical activity. Scientific importance of saliva.

Topic 4

Unit 9: Metabolism.

Introduction. Metabolic reactions. General overview. Oxidation-Reduction reactions. Regulation. Chemistry of foodstuffs.

Unit 10: Carbohydrate metabolism.

Introduction. Catabolism of carbohydrates. Phosphorylation. Glycolysis. Cellular respiration. Fermentation. Glycogenolysis. Anabolism of carbohydrates. Gluconeogenesis. Pentose phosphate pathway.

Unit 11: Lipid metabolism.
Introduction. Catabolism of triacylglycerols. Fatty acid catabolism. Anabolism of triacylglycerols. Metabolism of ketone bodies.

Unit 12: Nitrogen metabolism.
Introduction. Protein catabolism. Amino acid catabolism. Amino acid anabolism. Catabolism of nucleic acids. Catabolism of nucleotides. Anabolism of nucleotides.

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Masterclass
- Cooperative Learning
- Problem-based Learning (PBL)

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

Learning activity	Number of hours
Tutorials	18 h
Master Classes	25 h
Virtual Master Classes	12 h
Problem solving	12 h
Practical Exercises	16 h
Laboratory Practices	20 h
Study and autonomous work	45 h
Face-to-face knowledge tests	2 h
TOTAL	**150 h**

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Campus-based mode:

Assessment system	Weight
Knowledge Tests	60%
Oral Exposition	10%
Laboratory Practice	15%
Learning Folder	15%

Within the **learning folder, questionnaires,** a percentage of 7,5% is determined for the preparation of the activities, as well as 2.5% for the evaluation questionnaires corresponding to the **Digital Experience Resources of the Learning** of the subject.

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

7.1. Ordinary assessment period

To pass the course in the first exam period, you must obtain a grade greater than or equal to 5.0 out of 10.0 in the final grade (weighted average) of the course.

In any case, it will be necessary to obtain a grade greater than or equal to 5.0, independently, in each of the evaluation systems that make up the course (including the knowledge tests separated into partials). It may be assessed that a grade equal to or greater than 4 is needed in the knowledge tests when separated into partial exams.

The Universidad Europea de Valencia establishes continuous assessment as a system of evaluation of knowledge, skills and core, general, cross-curricular and specific competences of the degree in Dentistry, in accordance with the provisions of the Regulations for the evaluation of undergraduate degrees. In this regard and for the purposes of the use of calls the student should be aware that, if any evaluation system provided in the Learning Guide, in the ordinary call (first exam period the student will have an overall grade of the subject, thus using up one call.

According to the aforementioned Regulations, students taking face-to-face degree courses are required to justify at least 50% of class attendance, as a necessary part of the evaluation process and in the case of theoretical or practical classes determined as mandatory by the teacher in the schedules of the subject, the student must register an attendance of 90%, whether the absence is justified or not. The lack of accreditation by the means proposed by the University will entitle the professor to grade the subject as failed in the ordinary call, according to the grading system.

Punctuality will be required, 3 delays of more than 15 minutes or departures before class will be counted as a lack of attendance.

The student must consult in the schedule of the course in the Virtual Campus the sessions of compulsory attendance in the classroom.

The mention of "Matrícula de Honor" will be awarded to students who have obtained a grade equal to or higher than 9.0. Their number may not exceed 5% of the students enrolled in each subject in the corresponding academic year, unless the number of students enrolled is less than 20, in which case only one honorary registration may be awarded.

7.2. Extraordinary assessment period

To pass the course in the second exam period, you must obtain a grade higher or equal to 5.0 out of 10.0 in the final grade (weighted average) of the course.

In any case, it will be necessary to obtain a grade greater than or equal to 5.0 in the final test, so that it can be averaged with the rest of the activities.

The activities that were not handed in or passed in the first exam period must be submitted, after having received the corresponding corrections from the teacher.

The Universidad Europea de Valencia establishes the continuous evaluation as a system of assessment of knowledge, skills and core, general, cross-curricular, and specific competences of the degree in Dentistry, in accordance with the provisions of the Regulations for the evaluation of undergraduate degrees. In this regard and for the purposes of using calls, the student should be aware that in the extraordinary call the Objective Test of Knowledge (OTK) which determines whether or not the call was used. In the exceptional case that the student only needs to pass evaluation system /s that are not the OTK, it will be considered NP if not presented and will obtain a numerical grade if the student was examined of, at least, one of them.

Pursuant to the aforementioned Regulations, students taking face-to-face degree courses are required to justify at least 50% of class attendance, as a necessary part of the evaluation process, and in the case of theoretical or practical classes determined as mandatory by the teacher in the schedules of the subject, the student must register an attendance of 90%, whether the absence is justified or not. Those students who, due to non-compliance with this requirement, must take the extraordinary call (second exam period), need to perform as many activities or knowledge tests determined by the teacher to recover this part successful completion will be based on the specified rubric.

SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

Assessable activities	Deadline
First partial	Week 6
Second partial	June, First period exam
Questionnaires	During the sessions
Oral exposition	Check in Blackboard
Laboratory practices	Check in Blackboard
Problems	Check in Blackboard

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate. **The student must consult the mandatory face-to-face sessions in the classroom in the course schedule on the Virtual Campus.**

8. BIBLIOGRAPHY

The main reference work for this subject is:

- BERG JM, TYMOCZKO JL, STRYER L. (2007) **Biochemistry** (8th edition).
- NELSON, D. L., LEHNINGER, A. L., COX, M. M., OSGOOD, M., & OCORR, K. (2009). **Lehninger principles of biochemistry**: New York, W.H. Freeman. (5th edition)

9. EDUCATIONAL GUIDANCE, DIVERSITY AND INCLUSION UNIT

From the Educational Guidance, Diversity and Inclusion Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities.

From this unit we offer to our students:

1. Accompaniment and follow-up by means of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms of methodology and assessment for those students with specific educational needs, pursuing an equal opportunities for all students.
3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.
4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

Students in need of educational support can write to us at:
orientacioneducativa.uev@universidadeuropea.es