Universidad de Navarra

Cell Biology & Histology (F. Ciencias)

Teaching guide 2026-27

INTRODUCTION

Course description:

The aim is for students to gain enough basic knowledge to understand cell and tissue structure and their function in the whole organism. Firstly, the programme will enable students to understand the most commonly used methods and techniques in cell biology and histology. Secondly, we will study the features of the different cell components: plasma membrane, nucleus and cytoplasmic organelles. Finally, students will learn the main characteristics of the four basic types of tissues: epithelial, connective, muscle and nervous.

Degrees: Biochemistry / Biology / Chemistry and Biochemistry / Biology and Environmental Sciences

Module in the Degree Program:

Biology/Biology and Environmental Sciences: Module 2. Development, structure and function of living beings. Subject 2.1. Development and structure of living beings.

Biochemistry/Chemistry and Biochemistry: Module 2: Cell Biology, Genetics and Microbiology. Subject 2.1: Cell Biology and Tissue Organization.

Number of credits (ECTS): 6

Academic year: First year, first semester

Type of course: Compulsory

Language: English

Lecture schedule: Monday 13-13:50, Thursday 8-8:50, Friday 8-8:50

Classroom: 17 Science Library Building (Biblioteca de Ciencias)

Practical lessons: There will be 4 groups - Tuesday or Wednesday from 15:00 to 16:30 or from 16:30 to 18:00

In Sala de Microscopía, Science Library Building (Biblioteca de Ciencias) - Start on September 8

Lecturers:

Dr. Marián Burrell (mburrell@unav.es) Profesora Titular. Course Director

Department: Pathology, Anatomy and Physiology; Schools of Medicine and Sciences

Dr. Burrell's office: 3370 Research Building (Edificio de Investigación)

Dr. Beatriz Moreno (bmbruma@unav.es) Profesora Contratada Doctora

Practicals instructor:

Dr. Teresa Ezponda (tezponda@unav.es) Profesora Asociada

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Course Learning Outcomes

BIOLOGY / BIOLOGY AND ENVIRONMENTAL SCIENCES

Code	Description	Type
RA1	Describe the principles of scientific methodology in Biology.	KNOWLEDGE / CONTENT
RA3	Explain the basic fundamentals of the structure and function of living beings: Developmental Biology, Cell Biology, Histology, Botany, Zoology, Plant and Animal Physiology, Virology, Microbiology, and Immunology.	KNOWLEDGE / CONTENT
RA10	Manipulate biological samples in the field and in the laboratory, including safety, waste disposal, annotated record of activities, and interpretation of results.	SKILLS / ABILITIES
RA16	Interpret the structural and functional organization at the level of biomolecules, cells, tissues, and organs in living beings.	SKILLS / ABILITIES
RA20	Efficiently manage resources and facilities, ensuring compliance with established protocols for waste management.	CAPACITIES / COMPETENCIES
RA23	Collaborate actively and inclusively in academic environments, respecting diversity and contributing to constructive coexistence.	CAPACITIES / COMPETENCIES

BIOCHEMISTRY / CHEMISTRY AND BIOCHEMISTRY

Code	Description	Type

RA5	Explain the similarities and differences between living organisms including the structure and function of the prokaryotic and eukaryotic cell, as well as the structure, variation, function, and transmission of hereditary material.	KNOWLEDGE OR CONTENT
RA6	Explain the structure and function of animal and human tissues, organs, and systems, understanding the regulation and integration of various body functions for application in Biomedicine.	KNOWLEDGE OR CONTENT
RA23	Interpret in a critical and reflective manner the assumptions, methodologies, and problems of the discipline itself in its connection with the rest of knowledge.	COMPETENCIES / CAPACITIES

PROGRAMME

Theoretical programme

Cell biology

1. Cell Biology and Histology: Historical evolution and relationships with other sciences.

2. Levels of organization in Biology. Prokaryotes and eukaryotes. General structure of the eukaryotic cell. Unity and cell diversity.

3. Microscopy: principles of image formation and preparation of samples in light and electron microscopes. Resolving power and orders of magnitude in biology.

4. Basic techniques in cell biology. Cell fractionation and centrifugation. Immunohistochemistry. Cell culture.

5. Plasma membrane. General structure and composition of membranes. Characteristics of membrane lipids, proteins and carbohydrates. The fluid mosaic model. Glycocalyx.

6. Functions of plasma membrane. Membrane transport. Reception of extracellular signals.

7. Endocytosis. Pinocytosis. Phagocytosis. Clathrin coated vesicles. Endosomic compartment. Exocytosis.

8. Plasma membrane specializations. Microvilli. Basal infoldings. Intercellular junctions. Tight junctions. Adherent junctions: Desmosomes. Hemidesmosomes. Gap junctions.

9. The cell nucleus: general traits and components. Nuclear envelope. Nuclear pores. Chromatin. Euchromatin. Heterochromatin. Nucleosomes. Chromosomes.

10. The nucleolus. Nucleolar regions. Composition. Function.

11. Cell cycle. Phases and checkpoints.

12. Rough endoplasmic reticulum. Ribosomes. Smooth endoplasmic reticulum.

13. Golgi apparatus. Structure. Location in the cell. Vesicular trafficking. Secretion. Constitutive and regulated pathways.

14. Lysosomes. Structure and function. Origin. Intracelllular digestion. Autophagy.

15. Peroxisomes. Glyoxisomes.

16. Mitochondria: Morphology and components. Function. Origin.

17. Cytoplasm. Cytoskeleton. Microtubules. Centrioles. Cilia. Actin filaments. Intermediate filaments.

Histology

18. Concept of tissue. Animal tissues.

19. Epithelial tissue. Lining epithelia. Glands. Classification.

20. Connective tissue. Cells of connective tissue. Extracellular matrix: fibers and ground substance. Types of connective tissue.

21. White adipose tissue. Brown adipose tissue.

22. Cartilage. Cells and extracellular matrix. Types of cartilage.

23. Bone. Bone cells. Bone matrix. Bone types. Osteogenesis. Bone remodelling and repair.

24. Nerve tissue. Neurones. Glia cells. Synapses. Myelinated and unmyelinated fibers.

25. Muscular tissue. Skeletal muscle. Cardiac muscle. Smooth muscle.

Practicals programme

Practical 1. How to use light microscope correctly

Practical 2. Correlating sample processing and microscopic observation: Pancreatic acinar cell

Practical 3. This practical has two parts:

- Basic techniques of cell culture

- Correlating observation at LM and TEM: Enterocyte

Practical 4. Correlating observation at LM and TEM. Hepatocyte

Practical 5. Classification of epithelial and connective tissues

Practical 6. Classification of glands I

Practical 7. Classification of glands II

Practical 8. Cartilage. White adipose tissue

Practical 9. Muscular tissue

Practical 10. Bone. Osteogenesis

Practical 11. Nerve tissue

EDUCATIONAL ACTIVITIES

Classroom teaching activities

1. Lectures: 35 hours - Lectures are given by the professor on the themes indicated in the theoretical program with the help of power point presentations, the blackboard and other resources.

2. Practical Sessions: 16,5 hours - Students must study the corresponding materials (videos, webs, theoretical notes, etc) before attending each practical session. Through the sessions they will observe the light or electron microscopic images and will have the opportunity to solve doubts. It is highly recommended that students use a practice notebook in order to describe the different samples and summarize the most important ideas of each session.

3. Assessment: 5 hours - Exams to assess the successful accomplishment of the objectives (there will be mid-term theoretical and practical exams).

Personal work

1. Self-Assessment Activities: 11 hours - The students will complete multiple choice tests before and after each practical session.

2. Personal Study: 82.5 hours

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ASSESSMENT

ORDINARY CALL (DECEMBER)

The overall grade for the course will be determined according to the following assessment components:

1. Assessment of Practicals (20% of the final grade)

The practical examinations account for **20% of the final course grade**.

- A **midterm practical examination** will be held on **26 October 2026**. This examination is **non-compensatory** and does not exempt students from taking the final practical examination. If the mark obtained in the midterm practical examination is higher than that obtained in the final practical examination, the two marks will be averaged, provided that the student has obtained a mark of at least **4/10** in the final practical examination. If the mark obtained in the midterm practical examination is lower than that obtained in the final practical examination, it will not be taken into account in calculating the practical assessment grade.

- A **comprehensive final practical examination**, covering all practical course content, will be held in **December**.
- Both examinations will consist of the diagnosis of **10 images** related to the practical course content.

2. Self-Assessment Activities (20% of the final grade)

The students will complete multiple-choice tests before and after each practical session.

The marks obtained in this continuous assessment activities will account for **20% of the final course grade**.

3. Assessment of Theoretical Component (60% of the final grade)

Two theoretical examinations will be held: a **midterm examination** and a **final examination**.

- Midterm Theoretical Examination

- It will be held on **26 October 2026**.
- The examination will consist of **25 multiple-choice questions** covering material from Cell Biology, taught in both lectures and practical sessions. Each question will have four answer options. Incorrect answers will be penalised such that every three incorrect answers will deduct the equivalent of one correct answer. The examination will also include **two short-answer questions**.
- The multiple-choice section will account for **50%** of the midterm examination grade, while each short-answer question will account for **25%**.
- The midterm theoretical examination **exempts students** from taking the corresponding part of the final examination, provided that they obtain **at least 5/10**.

- Final Theoretical Examination

The examination will consist of:

- **50 multiple-choice questions** covering material taught in both lectures and practical sessions: 25 questions on Cell Biology and 25 questions on Histology. Each question will have four answer options. Incorrect answers will be penalised such that every three incorrect answers will deduct the equivalent of one correct answer. This section will account for **50%** of the final examination grade.
- **Two short-answer questions**, each accounting for **25%** of the final examination grade.

The final theoretical grade will be calculated as follows: for students who obtained a grade of at least 5/10 in the theoretical midterm examination, the final theoretical grade will be the average of the grades obtained in the midterm and final examinations. For students who did not obtain at least 5/10 in the midterm examination, the final theoretical grade will be the grade obtained in the final examination.

Students who do not sit either the **final theoretical examination** or the **final practical examination** during the December examination period will receive a grade of **Absent (No presentado, NP)**.

Note: Students repeating the course must contact the course coordinator at the beginning of the semester.

General criteria to pass the course

- **Students whose practical exam grade is below 4 points out of 10 will not pass the course.**

- **Students whose theoretical exam grade is below 4 points out of 10 will not pass the course.**

In the two cases above the students will be graded as *Failed* (*Suspenso)*.

Students who do not take the final exam will not pass the course and will be graded as *Exam not taken (No presentado)*.

Exams review: Students may review their examinations with the course coordinator after the publication of the grades, at a time and place to be announced.

Students with special learning needs

Accommodation will be provided for students with special learning needs, either regarding the methodology and/or evaluation of the course, but they will be expected to fulfill all course objectives. Students with special learning needs must contact the Academic Coordination Office of the School in advance to obtain the corresponding authorization for any adaptations (for example, extra time in exams). This authorization must then be sent by the student to the professor. It is recommended that this procedure be completed at the beginning of the semester.

SPECIAL CALL (JUNE)

For those who do not pass the course in December or did not take the exam (grades “Suspenso” or “No Presentado”) there will be a re-sit exam on June.

- The theoretical and practical examinations will have the same format and characteristics as those in the ordinary examination period.
- The practical examination will account for **20%** of the final course grade, and the theoretical examination will account for **60%**.
- Students who fail the course in the ordinary examination period but obtain a mark of **5 /10 or higher** in the practical examination will not be required to retake the practical examination in the resit period, although they may choose to do so in order to improve their mark.
- The mark obtained in the continuous assessment activities will be carried forward and will account for **20%** of the final course grade. Students wishing to improve this mark should contact the course coordinator.

IMPORTANT: Please note that any attempt at fraud, cheating, plagiarism, or other misconduct constitutes a serious offence, as provided for in “Título IV: Normas de disciplina académica de los estudiantes" *Sistema de normas sobre convivencia de la Universidad de Navarra*

OFFICE HOURS

Course director: Dr. Marián Burrell

Departament of Pathology, Anatomy and Physiology

Research Building (Edificio de Investigación), 3rd floor, Office 3370

Please make an appointment with Dr. Marián Burrell

mail to: mburrell@unav.es

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BIBLIOGRAPHY AND RESOURCES

Fundamental bibliography:

- Mescher, Junqueira's Basic Histology. Text and Atlas (14th ed., 2016 or 15th ed., 2018), Mc Graw-Hill, New York. Find it in the Library
- Mescher, Junqueira's Basic Histology. Text and Atlas (17th ed., 2024), Mc Graw-Hill, New York. Find it in the Library (e-book)

For practical sessions:

- Burrell, Calvo y Sesma, Atlas de Ultraestructura Celular (2ª edición), Ed. Eunsa, 2011. Find it in the Library

Further reading:

- Alberts et al. Essential Cell Biology (3rd edition), Garland Science, 2010. Find it in the Library
- Alberts et al. Molecular Biology of the Cell (7th edition), Garland Science, 2022. Find it in the Library
- Dongmei et al. Histología con correlaciones funcionales y clínicas (2ª ed.), Barcelona: Wolters Kluwer, 2023. Find it in the Library
- Fawcett, The Cell (2nd edition), Saunders, 1981 (Atlas of electronographies) Find it in the Library

Electronic resources:

Histology Guide - A Virtual Histology Laboratory (Recommended): https://histologyguide.com/

Atlas de la Universidad de Vigo: http://webs.uvigo.es/mmegias/inicio.html English: http://mmegias.webs.uvigo.es/02-english/index.html

Electron Microscopic Atlas of Cells, Tissues and Organs (Recommended): http://www.drjastrow.de/WAI/EM/EMAtlas.html