COURSE DATA

DATA SUBJECT

Code: 36351
Name: Functional Histology
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1109 - Degree in Biochemistry and Biomedical Sciences	Facultat de Ciències Biològiques	2	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1109 - Degree in Biochemistry and Biomedical Sciences	Integración fisiológica y fisiopatológica	COMPULSORY

COORDINATION

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SUMMARY

Functional Histology course deals with the study of organic tissues (General Histology) and how they are organized into organs and systems (Microscopic Organography). It is based on the observation and description of the tissue components, integrates molecular and morphofunctional aspects (histophysiology), and includes basic principles of histopathology. Embryonic origin, classification, organization and morphofunctional characteristics of epithelial, connective, cartilage, bone, muscle, nervous, haematopoietic and limphoid tissues. The lectures also include fundamentals of organography, which is complemented during the practical classes with observations, interpretations and diagnosis of tissue samples and organs. The contents of this course will provide the basis for other subjects, such as Regulation of Proliferation and Cell Fate, Human Physiology, Immunology and Immunopathology, and Molecular Neurobiology and Neuropathology.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

Basic knowledge in biochemistry, genetics, molecular biology, and cell biology.

COMPETENCES / LEARNING OUTCOMES

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Acquire skills to use the methodologies of molecular biosciences and to keep an annotated record of activities.

Capacidad para la asimilación de textos científicos en inglés.

Have an integrated view of normal and altered cell function, including metabolism and gene expression.

Have an integrated view of the cellular responses to environmental effectors and changes and the alterations that cause pathologies.

Have an integrated view of the systems of intercellular communication and cellular physiology that regulate normal and pathological development and function.

Know how to design multidisciplinary experimental strategies in the field of molecular biosciences to solve complex biological problems, especially those related to human health.

Know how to work responsibly and rigorously in the laboratory, considering the safety aspects in experimentation as well as the legal and practical aspects of the handling and disposal of waste.

Know the biochemical and molecular bases of cell function.

Know the common and differential molecular and cellular elements of the different types of living organisms with special emphasis on the human being and model organisms for their study.

Know the usual procedures used by scientists in the area of molecular biosciences and biomedicine to generate, transmit and disseminate scientific information.

Show initiative and leadership for multidisciplinary teamwork and cooperation.

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

Understand experimental approaches and their limitations and interpret scientific results in molecular biosciences and biomedicine.

DESCRIPTION OF CONTENTS

The contents of the course are divided into two sections which, although not entirely independent, represent two different levels of specificity and therefore make sense within a progressive learning model of the subject. Additionally, these two sections are also developed progressively through the course¿s practical sessions. The two sections are:

- **HISTOLOGY (UNITS 1 to 8)**: Study of the morphofunctional organization of basic animal tissues.
- **ORGANOGRAPHY (UNITS 9 to 16)**: Study of the morphofunctional organization of animal organs and organ systems. In this section, the basic tissues studied in the Histology part are contextualized by placing them within a higher level of anatomical organization.

1. INTRODUCTION TO HISTOLOGY

The role of histology in Biomedical Sciences. Functional classification of cell types. Concept of tissue. Simple and complex tissues. General organization of tissues. Introduction to methodologies for the study of histology. General aspects of the embryonic development of tissues.

2. EPITHELIAL TISSUE

General characteristics of epithelia: embryonic origin, distribution and morphofunctional organization. Unity and diversity: cytokeratins. Epithelial cell polarity. Morpho-functional domains and membrane specializations. Cell adhesion systems. Basement membrane. Epithelia and glandular epithelia. Exocrine and endocrine glands: types and mechanisms of secretion. Structure of secretory epithelial cells. Histological organization of the glands.

3. CONNECTIVE TISSUE

Cellular and extracellular components. Histogenesis, functions and distribution. Mesenchyme. Morphofunctional characteristics of different connective tissues. Serous membranes. Concept of parenchyma and stroma. Adipose tissue.

4. CARTILAGE TISSUE

General morphology. Cellular and extracellular components. Structure of mature cartilage. Perichondrium. Chondrogenesis, growth and nutrition. Types of cartilage. Hyaline cartilage. Elastic cartilage. Fibrocartilage. Chordoid tissue.

5. BONE TISSUE

General histological structure of bone tissue. Bone cells: osteoprogenitor cells, osteoblasts, osteocytes and osteoclasts. Bone matrix: structure, composition and process of mineralization. Patterns of gross and microscopic organization of bone. Compact bone: concept of osteon. Spongy bone tissue. Bone structure. Periosteum and endosteum. Osteogenesis: endochondral and endomembranous ossification. Immature and lamellar bone. Growth and bone remodeling. Bone dynamics. Joints: general structure.

6. MUSCLE TISSUE

General features of muscle tissue. Histological Organization of skeletal muscle. Skeletal muscle fibers: myofibrils, myofilaments and sarcomere structure. Morphofunctional basis of muscle contraction. Muscle-tendon junction. Myogenesis and regeneration of skeletal muscle. Histological organization of cardiac muscle tissue. Types and structure of myocardial cells. Intercalated disks. Conducting tissues. Purkinje fibers. Histological organization and distribution of smooth muscle . Structure of smooth muscle fibers. Contraction mechanisms. Other contractile cell types: myoepithelial cells, myofibroblasts and pericytes.

7. NERVOUS SYSTEM

General characteristics of the nervous tissue. Cell types: morphology and basic aspects. General organization of the central nervous system and peripheral nervous system. Ependyma. Choroid plexus. Blood brain barrier.

8. HEMATOPOIETIC AND LYMPHOID ORGANS

Blood components. Structure of blood cells. Histological organization of the bone marrow. Hematopoiesis. General structure of the lymphoid system. Histological organization of lymphoid organs.

9. CARDIOVASCULAR SYSTEM

General characteristics of the cardiovascular system. Arteries. Veins. Capillaries. Arteriovenous anastomoses. Lymphatic vessels. Heart. Vasculogenesis and angiogenesis.

10. RESPIRATORI SYSTEM

General organization of the respiratory system. Wall structure of the respiratory tract. Trachea. Lung. Alveolar Histophysiology. Pleura.

11. URINARY SYSTEM

Macroscopic and microscopic organization of the kidney. Uriniferous tubule. Renal corpuscle. Structure of the urinary tract wall.

12. DIGESTIVE SYSTEM

Mouth and mouth organs. General organization of the digestive tract. Esophagus. Stomach. Small and large intestine. Salivary glands. Liver. Pancreas.

13. REPRODUCTIVE SYSTEM

Testis. Epididymis. Prostate. Ovary. Uterus. Placenta.

14. SKIN APPENDAGES

General organization of the skin. Structure of the epidermis, biology and functional alterations. Dermis. Sensory receptors in the skin. Wound healing. Skin tags. Sweat glands. Sebaceous glands. Mammary glands.

15. SENSE ORGANS: SIGHT AND HEARING

General and microscopic structure of the eye. General and microscopic structure of the ear.

16. ENDOCRINE SYSTEM

Special characteristics of endocrine cells and tissues. Histological organization of the thyroid gland, parathyroid glands, adrenal glands, pineal gland, hypothalamus, pituitary gland, and the diffuse neuroendocrine system.

17. LABORATORY PRACTICAL CLASSES

INGLÉS
1. Foundations for the study of microscopic anatomy. Epithelial lining tissue. Connective tissue.
2. Glandular epithelial tissue. Muscle tissue.
3. Mesenchyme. Cartilaginous tissue. Bone tissue.
4. Nervous tissue. Skin.
5. Tissue and lymphoid organs. Respiratory system.
6. Urinary system. Digestive system.
7. Reproductive system

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	40,00
Laboratory	20,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	17,00
Independent study and work	38,00
Preparation of lessons	35,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

Lectures. The teacher will present the basics of the subject, devoting more time to highly complex issues, and will guide the students in the integration of the contents with related issues of other subjects. Teaching and bibliographic resources will be available to students in multimedia.

Laboratory practical classes. The program of practical classes will develop coordinated and parallel to the lectures. It will consist of the microscopic analysis of histological, morphological and functional organization of mammal tissues and body organ systems.

Seminars. The participation of students in these mandatory activities consist of the preparation and presentation of a seminar during approximately 30 minutes (in groups of two students). This activity will be organized jointly with other subjects in the second year.

EVALUATION

Theoretical block

The contents of the theoretical program will be assessed through objective tests, which will together account for **60%** of the final grade for the course:

i) a written exam for each of the two parts of the course (Histology and Organography), which may include questions in various formats (multiple choice, true/false, and/or short open-ended questions), aimed at assessing the knowledge and understanding acquired by the students, as well as their ability to use the specific scientific language of the subject.

ii) the completion of individual assignments throughout the semester, in which students must demonstrate their ability to relate and apply the contents of the course. These assignments may be optional or mandatory, depending on the instructor's criteria.

To consider the theoretical block passed, it will be necessary to obtain a mark equal to or higher than 5 (out of 10) as the average of the two units of the syllabus. However, it must be specified that a minimum mark of 3.5 in each part is required in order to calculate this average. If this minimum mark is not reached, the theoretical block will be considered as not passed.

If the theoretical block is fully passed in the first examination session, the mark will be kept for the second session in case the practical block remains pending. However, under no circumstances may it be carried over to the following academic year.

Practical block

The individualized follow-up of practical activities will contribute **35%** to the final grade for the course. Students may choose between two assessment options:

A) a final exam consisting of histological image identification and interpretation, which will account for the entire **35%** of the final grade.

B) the same exam as in option A, contributing **25%** of the final grade, plus the submission of a portfolio of exercises consisting of the reproduction and labelling of a selection of histological preparations observed during each practical session, following an interpretation guide provided by the instructor. These exercises will account for **10%** of the final grade.

Submitting the exercises corresponding to the first practical session will automatically indicate that the student has chosen option B for the first exam session. If the student does not pass and attends the second exam session, they may choose either to keep the grade obtained for the portfolio (option B) or to be assessed under option A.

To pass the practical block, students must obtain a grade equal to or higher than 5 out of 10 in both the exam and the exercises (if submitted). A passing grade in the practical exam from the first session will be carried over to the second session if the theoretical block remains pending, but it cannot be carried over to the next academic year. Nor does it exempt students from attending practical sessions.

Seminars

Participation in the seminar activity, which is mandatory and organized jointly with the rest of the second-year courses, will account for 5% of the final grade.

NOTES:

Exceptionally, if the teaching team of the course agrees that the student¿s participation throughout the course has been satisfactory, the subject may be passed with a mark lower than 5 but higher than 4.5 (out of 10) in one of the blocks (theory or practical).

All theoretical/practical assignments must be original. Detection of copying or plagiarism will result in a

grade of zero for the corresponding assessment.

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