

**COURSE DATA****Data Subject**

Code	36351
Name	Functional Histology
Cycle	Grade
ECTS Credits	6.0
Academic year	2024 - 2025

Study (s)

Degree	Center	Acad. Period
1109 - Degree in Biochemistry and Biomedical Sciences	Faculty of Biological Sciences	2 Second term

Subject-matter

Degree	Subject-matter	Character
1109 - Degree in Biochemistry and Biomedical Sciences	11 - Integración fisiológica y fisiopatológica	Obligatory

Coordination

Name	Department
MORANTE REDOLAT, JOSE MANUEL	21 - Cellular Biology and Parasitology
PEREZ SANCHEZ, FRANCISCO	357 - Cellular Biology, Functional Biology and Physical Anthropol.

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 lymphoid 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.

1109 - Degree in Biochemistry and Biomedical Sciences

- Know the usual procedures used by scientists in the area of molecular biosciences and biomedicine to generate, transmit and disseminate scientific information.
- 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.
- Understand experimental approaches and their limitations and interpret scientific results in molecular biosciences and biomedicine.
- Know how to design multidisciplinary experimental strategies in the field of molecular biosciences to solve complex biological problems, especially those related to human health.
- Acquire skills to use the methodologies of molecular biosciences and to keep an annotated record of activities.
- 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.
- 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.
- 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 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.
- 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.
- Show initiative and leadership for multidisciplinary teamwork and cooperation.
- Capacidad para la asimilación de textos científicos en inglés.

Knowledge about the position of histology in the context of biomedical sciences and recognition of its implications.

Understanding the rationale of tissue physiology from its structural organization. Being able to solve issues and design basic experimental approaches in histology.

Developed skills of observation and of integration of structural, molecular, genetic and functional information to achieve an integrated view of the functions of tissues, organs and organ systems.

Understanding and use of the methods for histological analysis, especially microscopy and histochemistry.

Knowledge about and proper use of microscopes as basic tools for the analysis of cells and tissues, and capacity for interpreting three-dimensional microscopic images.

Understanding of the tissue bases of human pathology.

Becoming familiar with the literature in the field of histology and capacity of analysis and synthesis to organize, integrate and present information in a consistent manner.

Capacity for critical analysis of information in the field.

DESCRIPTION OF CONTENTS

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. RESPIRATORY 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 and adrenal glands.

**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

ACTIVITY	Hours	% To be attended
Theory classes	40,00	100
Laboratory practices	20,00	100
Development of group work	10,00	0
Development of individual work	7,00	0
Study and independent work	31,00	0
Readings supplementary material	7,00	0
Preparing lectures	23,00	0
Preparation of practical classes and problem	12,00	0
TOTAL	150,00	

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 tissues of mammals. The program also includes the descriptive study of the microscopic and macroscopic anatomy of the principal body organ systems, by analyzing using human normal and pathological samples.

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 two types of objective tests, which together will account for **60%** of the course grade:

- i) A written exam that may contain questions of various formats (multiple choice, true/false, and/or short essay questions) to evaluate the knowledge and understanding acquired by the students about the subject and their ability to use the specific scientific language.
- ii) The completion of individual tasks throughout the semester in which students must demonstrate their ability to relate and apply the course content.

To pass the theoretical block, it is necessary to obtain a grade of 5 (out of 10) or higher. The grade for the theoretical block passed in the first call will be carried over to the second call if the practical block is pending, but it cannot be transferred to the following academic year.

Practical Block

The individualized monitoring of practical activities will be based on a histological image identification and interpretation exam, which will account for **25%** of the final course grade.

Additionally, associated with the content of each session, students must individually complete and submit a set of exercises consisting of reproducing and labelling on paper a set of histological preparations observed in each practice, following an interpretation guide provided by the instructor. These exercises will account for **10%** of the final course grade.

To pass the practical block, it is necessary to obtain a score of 5 (out of 10) or higher in both the exam and the exercises. The grade for the practical exam passed in the first call will be carried over to the second call if the theoretical block is pending, but it cannot be transferred to the following academic year, nor will it exempt students from attending the practical sessions.

Seminars

Student participation in the seminar activities, which are mandatory and organized jointly with other second-year courses, will account for **5%** of the final grade.

NOTE:

Exceptionally, if the teaching team of the course agrees that the student's participation during the course has been satisfactory, it will be possible to pass the course with a grade in one of the blocks (theory or practice) below 5 but above 4.5 (out of 10).



REFERENCES

Basic

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