

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

Code	36351
Name	Functional Histology
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	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
GARCIA VERDUGO, JOSE MANUEL	21 - Cellular Biology and Parasitology
MORANTE REDOLAT, JOSE MANUEL	21 - Cellular Biology and Parasitology

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.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

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.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

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 evaluation of the contents of the theoretical program will be carried out by a test of each of the two parts of the subject: Histology (topics 1 to 8) and Organography (topics 9 to 16). This exam may consist on questions of various formats (quiz, true / false and/or short open answer questions) aimed to evaluate the knowledge and understanding acquired by the student on the subject and their ability to use the specific scientific language. Additionally, throughout the semester, teachers may propose the realization of evaluable tasks the grade of which will represent a percentage (not higher than 15%) of the grade of the corresponding part of the subject.

Depending on the calendar and the general organization of the course, the exam of the first part (Histology) might be carried out on a date prior to that of the first call. In that case, the second part exam (Organography) will be celebrated on the official date according to the exam schedule. The realization of the exam of any of the two parts will necessarily imply a grade in the student's record, eliminating the option of appearing as "not presented".

Theory block will be passed if the final mark between both parts is at least 5 (out of 10) but only if partial marks are equal or higher than 3.5 (out of 10).

When a student fails this block in the first exam session, but scores at least 5 in one of the two partial exams, then this mark will count towards the second exam session.

For those who did not pass this block as a whole at the first session, but secured a mark equal or higher than 5 in one of the two partial exams, this mark will be kept for the second session of the same year.

The combined final grade of the two parts (Histology and Organography) will represent 60% of the final grade.

Practical block

The evaluation of this block will include an exam where students will be asked to identify and interpret histological images (25% of the final grade) and the presentation of observation guides elaborated from photos conveniently labeled (10% of the final grade). To pass this part, it is necessary to obtain a grade equal to or greater than 5 (out of 10) in the practical exam and in the observation guides. If passed in the first call, this grade will be kept for the second one in case other parts are still pending, but under no circumstances will it be transferred to the following year, nor will exempt him/her from the obligatory attendance to the practical classes the next time she/he courses the subject.

Seminars

The student's participation in the seminar activity, which is compulsory and organized jointly with the rest of the second-year subjects, will represent 5% of the final grade.

NOTE:



In exceptional cases, the subject may be passed with a grade of less than 5 but greater than 4.5 (out of 10) in one of the blocks (theory or practice) if the teaching team agrees the student has been engaged in the course.

REFERENCES

Basic

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