COURSE DATA

DATA SUBJECT

Code: 43014
Name: Anatomical principles of biomedical research
Cycle: Master's Degree
ECTS Credits: 15
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
2137 - Master's Degree in Biomedical Research	Facultat de Medicina i Odontologia	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2137 - Master's Degree in Biomedical Research	Fundamentals of basic research in biomedicine	ELECTIVES

COORDINATION

ZARAGOZA COLOM ROSA

SUMMARY

The main objective of the module is to provide the student with basic training in anatomical knowledge, to gain a better understanding of the development of human pathologies.

In fact, the credits that make up the subject are distributed in different sections:
1. Neuroanatomy and analgesia: Collects general and research aspects of the central and peripheral nervous system, making reference to pain pathways, neuronal circuits and analgesia.
2. Embryology: The second section describes the formation of the human body over time, as well as the different malformations that occur, studying the factors that can influence them.
3. Locomotor system and image technology: The fundamental aspects of the musculoskeletal system are discussed under the functional, biomechanical and image aspects, as well as the importance in common diseases of the spine or the morphological aspect of rare diseases.
4. Cancer and translational research: In this section, research will be developed both at the level of medicine, genetic analysis of cancer for diagnostic purposes, and advances in clinical research in different areas.
5. Introduction to histology: Concept of tissue, types of tissue, stains. Microscopic study of different tissue samples.
6. Microscopic techniques in biomedical research: Introduction to the use of the microscope in research. Confocal and fluorescence microscopy. Cell cultures.

It is intended that students who complete the Master obtain a solid foundation to begin doctoral programs oriented to biomedical research. This subject provides them with a general knowledge of the anatomy of the nervous system, embryology and the muscle-skeletal system with the general methodology and techniques for research.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

COMPETENCES / LEARNING OUTCOMES

2137 - Master's Degree in Biomedical Research

Students have the learning skills that will allow them to continue studying in a way that will be largely self-directed or autonomous.

Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.

Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.

Students should demonstrate self-directed learning skills for continued academic growth.

Students should possess and understand foundational knowledge that enables original thinking and research in the field.

To have the ability to clearly and concisely communicate conclusions, underlying knowledge and reasons to a specialised and non-specialised audience.

To master the basic techniques of experimental management in a laboratory base don biomedical research.

DESCRIPTION OF CONTENTS

1.

CLINICAL EMBRIOLOGY
1. Introduction to clinical embryology.
2. Initial stages in embryonic development.
3. Organogenesis
4. Teratology: Embryonic-fetal malformations.
5. Diagnostic strategies in pregestational and preimplantation genetic diagnosis.
6. Clinical embryology: Monitoring of fetal development by imaging and prenatal development.
7. Rare diseases: Down syndrome and oxidative stress.

2.

Neuroanatomy and Organization of the Central Nervous System
1. Organization of the central nervous system.
2. Brain electrophysiology: neuronal activity and brain oscillations.
3. Neuroanatomical methods in biomedical research: neural circuits.
4. Theta network: neural correlations of learning and memory.
5. Body senses and pain.
6. Nociceptive and antinociceptive circuits.

3.

Image anatomy
1. Biomechanics of the Spine in health and disease conditions.
2. Clinical biomechanics of the lumbar region
3. Research techniques in biomechanics of the spine.
4. New technologies in the study of the musculoskeletal system.

Seminars:
1. Locomotive System. Analyze research articles and make a reasoned discussion of the main elements.

4.

CANCER AND TRASLATIONAL RESEARCH

Theoretical topics:

1. Changes in breast tissue during pregnancy and lactation. Breast cancer associated with pregnancy.
2. Epigenetics of breast cancer.
3. Pathophysiology of ovarian cancer

Clinical seminars:
Registration and attendance at the Oncological Challenges Congress

5. Introduction to histology

1. Concept and types of human tiddues
2. Introduction to the optical microscope: Types of tissue staining
3. Pathophysiology: Pulmonary fibrosis

Seminars and practices:
1. Microscopic identification of tissue samples.
2. Image analysis and quantification with QPath software.

6.

Microscopy in biomedical research
Theoretical topics:
1. Theoretical Bases of Fluorescence Microscopy and Confocal Fluorescence Microscopy
2. Theoretical Bases of Electron Microscopy
3. Applications of microscopic techniques in biomedical research

Practical sessions:
1. Applications of in vivo microscopy in biomedical research (I): Introduction, Cell migration and Wound-Healing assays.
2. Introduction to the Leica DMI8 multi-acquisition and time-lapse in vivo microscopy platform. Visualization of the results of the Wound-Healing test.
3. Introduction to the PAULA in vivo fluorescence microscopy platform. Viewing cell death assay results. Final verification with flow cytometry.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	60,00
Laboratory	30,00
Total hours	**90,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	10,00
Individual or group project	80,00
Independent study and work	110,00
Preparation of lessons	0,00
Preparation for assessment activities	50,00
Resolution of case studies	0,00
Total hours	**250,00**

TEACHING METHODOLOGY

Establishment of theoretical bases of the different subjects.

Practical visualization of the most significant anatomical elements.

Approach to the research work in each of the modules.

Learning and development of the laboratory techniques necessary to carry out work in the respective sections.

Discussion in seminars of works related to research in the different sections

EVALUATION

A continuous evaluation will be carried out where class attendance is mandatory (minimum 80% attendance).

In each thematic block, a questionnaire will be carried out with short answer or multiple answer questions referring to the theoretical and practical contents. Group or individual projects that include an oral presentations may also be used to evaluate different blocks.

The final grade will be obtained from attendance, oral presentations and continuous evaluation questionnaires.

REFERENCES

- Referencia b1: -Haines,DE. (2013) Principios de Neurociencia. Edit. Elsevier Science Referencia b2: -Kapandji, IA. Cuadernos de Fisiología articular (2012) Edit.Panamericana. Referencia b3: -Richard Snell. Anatomia Clinica. (2012) Mc. Graw Hill. Referencia b4: - Keith L. Moore y T.V.N. Persaud. Embriología Clínica. (2013) Ed. Elsevier-Sauders. Referencia b5: Rubin, M y Safdieh,J, E (Netter) Neuroanatomía esencial (2008) Edit.Elsevier/Masson Referencia b6: -Schünke, M; Schulte, E and Schumacher,U (2010) Prometheus. T.I. Anatomía general y Aparato Locomotor. Edit. Panamericana Referencia b7: -Sobota.(2012) Atlas de Anatomía Humana.T.I y III. Editorial Elsevier. Referencia b8: -Weir,J (2011) Atlas de Anatomía humana por técnicas de imagen.Edit. Panamericana.

- Referencia c1: Netter. Anatomia Clinica. Ed. Panamericana. 2012. Referencia c2: Snell. Neuroanatomia Clinica. Ed. Panamericana. 2013.