

**COURSE DATA****DATA SUBJECT**

Code: 43083
Name: Special techniques in cardiovascular research
Cycle: Master's Degree
ECTS Credits: 3
Academic year: 2026-27

STUDY (S)

| Degree | Center | Acad. year | Period |
|--------------------------------------|------------------------------------|------------|----------------------------------|
| 2141 - Master's Degree in Physiology | Facultat de Medicina i Odontologia | 1 | First quarter, Second quarter |

SUBJECT-MATTER

| Degree | Subject-matter | Character |
|--------------------------------------|---------------------------|------------|
| 2141 - Master's Degree in Physiology | Cardiovascular physiology | COMPULSORY |

COORDINATION

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SUMMARY

In this Master subject, the main available techniques for cardiovascular research will be presented, from cell models, through animal models, to human 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

There are no prerequisites for taking the subject.

COMPETENCES / LEARNING OUTCOMES**2141 - Master's Degree in Physiology**

Assess the need to complete the scientific training, in languages, computer science, ethics, etc., attending



conferences or courses and/or carrying out complementary activities, self-evaluating the contribution that the performance of these activities implies for their comprehensive training.

Know how to write and prepare presentations to present and defend them later.

Search, order, analyze and synthesize scientific information (databases, scientific articles, bibliographic repertoires), selecting the pertinent to focus current knowledge on a topic of scientific interest in Physiology.

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 acquire a critical attitude that allows you to make reasoned judgments and defend them with rigor and tolerance.

To acquire specific skills to develop laboratory work in cardiovascular research.

DESCRIPTION OF CONTENTS

1. In vitro studies

In silico, biochemical and molecular biology techniques and histological techniques.
Cell culture techniques. Theoretical background and laboratory practice.

2. Ex-vivo studies

Vascular reactivity in isolated organ. Theoretical background and laboratory practice.

3. Animal research

Animal models in cardiovascular research: Description and classification, choice criteria, legislation.



4. Human research

Cardiovascular research in humans: cardiac catheterization and related techniques.

WORKLOAD

PRESENCIAL ACTIVITIES

| Activity | Hours |
|--------------------|--------------|
| Tutorials | 2,00 |
| Theory | 6,00 |
| Other activities | 0,00 |
| Laboratory | 12,00 |
| Total hours | 20,00 |

NON PRESENCIAL ACTIVITIES

| Activity | Hours |
|---------------------------------------|--------------|
| Attendance at other activities | 2,00 |
| Individual or group project | 12,00 |
| Independent study and work | 15,00 |
| Preparation of lessons | 5,00 |
| Preparation for assessment activities | 11,00 |
| Resolution of case studies | 10,00 |
| Total hours | 55,00 |

TEACHING METHODOLOGY

- Theoretical master classes with active alumni participation.
- Practical laboratory classes, including introductory seminars, conducting internships with the teacher follow-up and support, and writing a scientific report or written test.
- Conferences of experts in the different subjects.
- Discussion about the work and practices carried out.
- Face-to-face and electronic tutoring with teachers.

EVALUATION

Evaluation system:



Attendance at 80% of the practices is compulsory.

- Oral presentation of the critical analysis of the methodology of a scientific article: evaluation up to 10 points. Students must submit, in advance, the electronic document they will use in the oral presentation.

Minimum passing grade: 5 points.

REFERENCES

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- GUYTON AC, HALL JE. Tratado de Fisiología Médica. 12ª ed. Madrid. Ed. McGraw-Hill. 2011.
- POSTERKAMP G, KLEIJN D (eds). Cardiovascular Research: New technologies, methods and applications. Springer, New York. 2006.
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- DE CATTERINA R, LIBBY P (eds). Endothelial dysfunctions and vascular disease Blackwell Publishing, Oxford. 2007.
- BEVERUNG S, WU J, STEWARD R. Lab-on-a-Chip for Cardiovascular Physiology and Pathology. *Micromachines* 2020, 11, 898; doi: 10.3390/mi11100898
- DOHERTY EL, AW WY, HICKEY AJ, POLACHECK WJ. Microfluidic and Organ-on-a-Chip Approaches to Investigate Cellular and Microenvironmental Contributions to Cardiovascular Function and Pathology. *Front Bioeng Biotechnol.* 2021, 9, 624435; doi: 10.3389/fbioe.2021.624435
- LIU N, YE X, YAO B, ZHAO M, WU P, LIU G, ZHUANG D, JIANG H, CHEN X, HE Y, HUANG S, ZHU P. Advances in 3D bioprinting technology for cardiac tissue engineering and regeneration. *Bioact Mater* 2021, 6, 13881401; doi: 10.1016/j.bioactmat.2020.10.021
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- ZHANG Y, KUMAR P, LV S, XIONG D, ZHAO H, CAI Z, ZHAO X. Recent advances in 3D bioprinting of vascularized tissues. *Materials & Design* 2021, 199, 109398; doi: 10.1016/j.matdes.2020.109398
- ZHAO D, LEI W, HU S. Cardiac organoid - a promising perspective of preclinical model. *Stem Cell Res Ther.* 2021 May 6;12(1):272. doi: 10.1186/s13287-021-02340-7.