UAB
Universitat Autònoma de Barcelona

Applied Physiology

2026/2027

Code: 101908
Credits: 6

Degree programme	Type	Course
Biomedical Sciences	OP	4

Contact lecturer

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Teaching staff

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Group languages

You can consult this information at the end of the document.

Prerequisites

This course has no prerequisites. However, it is recommended that students have passed the courses corresponding to the first three years of the Degree, as they provide the knowledge necessary to address more specific and applied concepts. Likewise, knowledge of English is recommended for consulting the scientific literature.

Objectives

- Apply the concepts of physiology to interpret practical situations encountered in everyday life, experimental situations, and processes of physiological adaptation.
- Recognise the importance of animal experimentation in the development of biomedical sciences and understand the biological, genetic, microbiological and reproductive foundations of the main animal models used in research.
- Understand the principles of experimental design involving animals, including the selection of the most appropriate experimental model, the identification of factors that may influence experimental results, and the critical validation of animal models, assessing their limitations, translational potential and reproducibility.
- Understand the ethical and legal framework governing animal experimentation, as well as the principles of the 3Rs and animal welfare, and apply them in the design and implementation of experimental procedures.
- Understand the basic procedures used in laboratory animals, including handling, substance administration, sample collection, anaesthesia, analgesia and euthanasia, as well as the criteria for refinement, monitoring and the establishment of humane endpoints.
- Understand the physiological adaptations that enable the maintenance of homeostasis in response to environmental challenges and special physiological conditions, analysing the integrated response of the main physiological systems.
- Understand the mechanisms of functional plasticity of the different physiological systems and their

relationship to adaptation, performance and organism survival under extreme conditions.
- Understand the main experimental and functional assessment techniques used to study the function of organs and systems, including functional imaging techniques, and interpret the physiological information they provide under both normal and adaptive conditions.
- Integrate knowledge of human physiology, comparative physiology and evolutionary biology to understand the adaptations developed by different human populations in response to environmental and physiological challenges.

Learning outcomes

1. Work as part of a group with members of other professions, understanding their viewpoint and establishing a constructive collaboration.
2. Identify and apply suitable functional study methodologies for the development of research projects.
3. Identify and critically evaluate methodologies for the experimental study of diseases.
4. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
5. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
6. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
7. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
8. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
9. Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
10. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
11. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
12. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.

Contents

This course is divided into two independent thematic blocks.

Block 1. Animal Models, Animal Welfare and Biomedical Experimentation:

This block introduces the scientific, ethical and methodological principles of animal experimentation, with particular emphasis on the selection and validation of animal models, animal welfare and experimental design in biomedical research (approximately 20 hours of teaching).

1. Introduction to animal experimentation in biomedicine.
2. Ethical and legislative aspects of animal experimentation, including the principles of the 3Rs, current legislation and the functioning of ethics committees.
3. Animal models in biomedicine, including the concept, classification, selection criteria and validation of animal models, as well as the main animal model banks, collections and repositories.
4. Experimental models according to their genetic and microbiological characteristics, including genetic

and microbiological standardisation and their influence on the quality, reproducibility and translation of experimental results.
5. Reproductive physiology of laboratory animals, including the physiological basis of reproduction, reproductive cycles and their application in the planning of experimental studies.
6. Animal welfare, including the physiological and behavioural needs of laboratory animals, housing conditions, environmental enrichment and the factors that influence animal welfare and the quality of experimental results.
7. Basic experimental procedures, including animal handling, routes of substance administration, sample collection, anaesthesia, analgesia, euthanasia, and the criteria for classifying the severity of procedures, monitoring and the establishment of humane endpoints.
8. Experimental design, including the general principles of study planning, variable control, methodological quality criteria and the application of the principles of the 3Rs to ensure scientific validity and animal welfare.

Block 2. Applied Physiology: Regulation, Integration and Methods for the Study of Physiological Responses:

This block develops the concepts of applied physiology through the study of the organism's responses to situations that challenge normal physiological function, analysing the mechanisms of physiological adaptation, compensation and dysregulation. Through the analysis of situations such as life at high altitude, immersion, high-performance physical exercise, pregnancy, fasting, sleep deprivation and stress, the coordinated response of the different physiological systems is integrated. The block also incorporates the main experimental methodologies used in human physiology and animal models for the study of these processes.

1. Applied physiology in response to environmental challenges, including the study of the integrated response of the different physiological systems to situations such as high-altitude hypoxia, immersion and apnoea, extreme temperatures and microgravity, using real cases of human adaptation, such as Tibetan and *Bajau* populations, as models to understand the physiological mechanisms involved.
2. Applied physiology in situations of high functional demand, including the study of the mechanisms regulating physical performance, motor control, circadian rhythms and energy metabolism in situations such as intense physical exercise, motor control under high-risk conditions, sleep deprivation and prolonged fasting, using real cases, such as ultra-endurance athletes, free solo climbers and hunger strikes, as models to understand the integrated response of the different physiological systems.
3. Applied physiology throughout the stages of the life cycle, including the study of the integrated response of the different physiological systems during pregnancy, the postpartum period, menopause and ageing, using these physiological stages as models to understand the mechanisms regulating homeostasis in response to the hormonal, metabolic and functional changes characteristic of the life cycle.
4. Applied physiology of the nervous system, including the study of the mechanisms regulating the stress response, reward circuits, brain plasticity and neuroendocrine modulation through the analysis of situations such as extreme stress, addiction and non-pharmacological interventions. These processes will be addressed using real cases as models to understand the integrated response of the nervous, endocrine, autonomic and immune systems.
5. Experimental methodologies in applied physiology, including the main functional tests, physiological recordings, biomarkers, imaging techniques and experimental methodologies used in human physiology and in *in vitro*, *ex vivo* and *in vivo* models for the study of the mechanisms of adaptation, dysregulation and physiological plasticity.
6. Applied comparative physiology, including the study of the adaptations developed by different species in response to physiological and environmental challenges, using comparative physiology to understand human physiological mechanisms and their application in biomedical research.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Seminars - Oral presentations	4	0.16	1, 2, 3, 4, 5, 6, 7, 11, 12
Tutorials for oral presentations	3	0.12	1, 4, 6
Information analysis and preparation of the oral presentation	23	0.92	1, 2, 3, 5, 6, 7
Literature search	10	0.4	1, 2, 3
Study time	70	2.8	2, 3, 6
Lectures	33	1.32	2, 3, 4, 5, 6, 7, 11, 12
Laboratory	3	0.12	1, 2, 4, 5, 6, 12

Lectures:

Based on presentations prepared by the teaching staff and made available in advance through the Virtual Campus. Systematic presentation of the course contents, with particular emphasis on the principles of animal welfare, animal models and experimental methodology in biomedicine (Block 1), as well as on applied physiology, through the analysis of real cases that enable students to understand the regulation, integration and dysregulation of physiological responses, and the main methodologies used for their study (Block 2).

Laboratory Practical Sessions:

Laboratory practical session related to the physiology of laboratory animals and to the contents of Block 1. Attendance at the 3-hour practical session is compulsory.

Seminars:

Students will prepare a project based on an animal model for a specific pathology and an experimental design. The project will be submitted in written form, and an oral presentation will be prepared and delivered to the rest of the students and the teaching staff of the course. The study topics will be proposed by the teaching staff responsible for this part of the course.

The preparation of the projects must be based primarily on scientific bibliographic sources. If artificial intelligence tools are used, the final work must reflect a significant contribution by the student in the analysis, integration and critical reflection of the contents. Likewise, the sections of the work that have been generated or assisted by these tools must be clearly identified (see the section "Use of AI").

Independent Study:

Time devoted by the student to studying both the material presented during the lectures and any additional material provided by the teaching staff or identified independently by each student (as a complement to the material provided).

Use of AI:

The use of artificial intelligence (AI) tools is permitted in this course as support for the preparation of assignments, provided that the final work reflects a significant contribution by the student in the analysis,

integration of the contents and critical reflection. Students must clearly identify the parts of the work in which these tools have been used, specify which technology has been employed, and briefly describe how it has contributed to the development of the activity. Lack of transparency in the use of AI will be considered a breach of academic integrity and may result in a penalty in the assessment of the activity or, in more serious cases, the application of the disciplinary measures established by the current regulations.

Tutorials:

Tutorial sessions may be held if requested by the student, either individually in the teaching staff's office (at a mutually agreed time) or collectively at scheduled times. Their purpose is to clarify questions and concepts.

Note: Fifteen minutes of one class, within the timetable established by the School or Degree Programme, will be reserved for students to complete the teaching staff evaluation surveys and the course evaluation survey.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Presentation Block 1	30 %	1	0.04	1, 2, 3, 5, 7, 8, 9, 10, 11, 12
Test Part 1 (with laboratory)	20 %	1	0.04	2, 3, 4, 5, 6, 7
Test Part 2	40%	1	0.04	2, 3, 4, 5, 6, 7, 9
Reasonimg test - Block 2	10 %	1	0.04	1, 2, 3, 5, 6, 7, 9, 11, 12

Students must pass both blocks of the course with a mark of ≥ 5.0 in order to pass the course.

Block 1: This block accounts for 50% of the final course mark. It is considered passed with a mark of ≥ 5.0. This mark is determined by:

a. Theoretical exam, which may include multiple-choice questions and/or essay questions and/or practical case studies involving the application of the knowledge acquired. This examination will include questions related to the practical session. 20% of the final course mark (40% of the block mark).

b. Project and oral presentation (in pairs). Selection, presentation and defence of an animal model of interest in biomedicine and an experimental design. 30% of the final course mark (60% of the block mark).

Block 2: This block accounts for 50% of the final course mark. It is considered passed with a mark of ≥ 5.0. This mark is determined by:

a. Theoretical exam, which may include multiple-choice questions and/or essay questions and/or practical case studies involving the application of the knowledge acquired. 40% of the final course mark (80% of the block mark).

b. Reasoning activity (in pairs). Based on a real physiological situation, students must identify a relevant physiological question and explain an experimental or clinical methodology that has made it possible to study this phenomenon. 10% of the final course mark (20% of the block mark).

The final course mark is calculated as the weighted average of the two blocks (Block 1: 50%; Block 2: 50%).

Students obtaining a mark of < 5.0 may sit a resit examination for the part(s) not passed. To be eligible for the resit examination, students must have completed at least 75% (3/4) of the assessable activities. Students who complete less than 75% (3/4) of the assessable activities will receive the final grade of "Not Assessable".

Single Assessment:

This course may be assessed through a single assessment system. In this case, assessment will consist of an on-site examination, according to the schedule established by the Degree Coordination. The examination will consist of multiple-choice questions and/or essay questions covering all the course content taught during the semester (theory and practical sessions). The minimum mark required to pass the course is 5.0 (out of 10.0).

Students who choose the single assessment system must notify the teaching staff responsible for the course in writing, or by following the instructions provided, within the established deadline. Failure to comply with this requirement will mean that students will, by default, follow the continuous assessment system designed for this course, as specified above.

Bibliography

- Ciencia y Tecnología del Animal de Laboratorio. Textos Universitarios, UAH, 2008.
- Revista on line: JoVE (Jounal of Visualized Experiments) - http://www.jove.com/
- Suport bibliogràfic addicional (articles científics) es proporcionarà durant el curs i es part del treball autònom de l'estudiantat (recerca bibliogràfica).

Software

This course does not use any specific softwar.

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through

this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	54	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	541	Catalan/Spanish	second semester	afternoon
(SEM) Seminars	541	Catalan/Spanish	second semester	morning-mixed