

Degree	Type	Year
Biology	OT	4

Contact

Name: Nerea Roher Armentia

Email: nerea.roher@uab.cat

Teachers

Juan Carlos Balasch Alemany

Teaching groups languages

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Prerequisites

The knowledge areas involved in this subject are Physiology, Cell Biology, Biochemistry and Molecular Biology, Genetics, Immunology and Zoology. It is convenient for the student to have a basic knowledge and competences on the structure, organization and function of organisms, as well as general concepts of ecology and evolution.

Objectives and Contextualisation

The learning of Comparative Animal Physiology is necessarily systemic. The study of complex physiological processes, such as acclimatation to extreme environments or the acquisition of new behavioral patterns in response to selective pressures, should be evaluated through the interaction between different levels of organization: from the phenotypic expression of the genome to the functional responses of populations in a changing ecological context. This integrative approach is achieved through the exercise of biological analysis, once the student has assimilated the essential concepts for the evaluation of the organisms physiology. The subject Compared and Environmental Animal Physiology is programmed during the fourth year of the degree in Biology and increases the knowledge of the functioning of the organisms in relation to the environment, the direction of adaptations and the natural selection.

The acquisition of the basic competences of this subject will complete the view that the student has of the animal physiology throughout the previous courses in spite of giving a global and integrated vision respect to the environment, by means of the understanding and the study of the mechanisms that have been chosen evolutionarily in the different animal groups to have a good adaptation.

The general training objectives of the subject are:

To acquire a comprehensive and integrated view of the interrelations of the different physiological systems of the organism respect to the environment in which they live.

To integrate the knowledge of Physiology with those acquired in other basic subjects, which deal with the structure and the cellular and molecular aspects of the organism, in order to achieve a global vision of the functioning of the animal body and the mechanisms that allow the colonization of different niches.

To apply all the physiology knowledge in deducing the consequences of pathological alterations of the organism, and of the changes in the ecosystems and the consequences that they may have in the life cycle of the organisms living there.

Acquire the practical skills needed to carry out functional studies.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Analyse and interpret the development, growth and biological cycles of living beings.
- Analyse and interpret the origin, evolution, diversity and behaviour of living beings.
- Be able to analyse and synthesise
- Be able to organise and plan.
- 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.
- 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.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Understand the processes that determine the functioning of living beings in each of their levels of organisation.

Learning Outcomes

1. Analyse the sex- or gender-based inequalities and the gender biases present in one's own area of knowledge.
2. Be able to analyse and synthesise.
3. Be able to organise and plan.
4. Critically analyse the principles, values and procedures that govern the exercise of the profession.
5. Identify, enumerate, describe, interpret, explain and summarise evolutionary functional animals.
6. Identify, enumerate, describe, interpret, explain and summarise the indicators and the meaning of animals' biological cycles.
7. Identify, enumerate, describe, interpret, explain and summarise the physiological bases of adaptation to the environment.
8. Propose projects and actions that incorporate the gender perspective.
9. 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.
10. 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.
11. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.

12. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
13. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.

Content

Master classes

1. Animal Ecophysiology: Concepts and Mechanisms.

Evolutionary trends, phenotypic plasticity, innovations and evolutionary transitions, domestication. Ecophysiology of the integrative response: the influence of the environment on the evolution of nervous systems. Case studies: (i) salmon migration, (ii) neuroendocrine control of metamorphosis in desert toads, (iii) thermoreception in snakes, (iv) echolocation in bats and odontocetes.

2. Comparative Ecophysiology: Respiration/Circulation, Thermoregulation, Metabolic Management, and Reproductive Patterns.

- Respiratory Ecosystems: Aquatic and terrestrial respiration. External and internal respiratory surfaces. Chemical properties and distribution of respiratory pigments. Circulation: open and closed systems. Implication of cardiorespiratory physiology in bird flight. Cardiorespiratory physiology during immersion.
- Feeding, Energy, and Temperature: Feeding strategies, digestion, and nutrient absorption. Adaptive solutions to environmental conditions. Nutritional physiology during development. Nutritional physiology and biological clocks. Energy metabolism. Body temperature, poikilothermy (ectothermy), and homeothermy (endothermy). Thermoregulation and endothermic phenomena in invertebrates and vertebrates. Controlled hypothermia in birds and mammals. Adaptations to life in extreme climates.
- Water and Waste Management: Mechanisms of salt and water exchange. Excretion and water relations. Osmoconformers and osmoregulators. Freshwater, marine, and terrestrial environments, regulation of hydro-saline balance. Life in deserts, special adaptations.
- Environmental Regulation of Reproduction: Estrous and menstrual cycles. Pheromonal, seasonal, and diapause regulation. Thermal and social regulation of sex determination. Case studies: (i) loss of immune components in abyssal fish, (ii) reproductive control in mammals by the *Toxoplasma* parasite.

Active learning:

Different active learning activities will be carried out in the context of Problem Base Learning (PBLs) and in supervised activities of ApS.

Lab course

- 1.- Thermoregulation: Influence of temperature in the physiology of fish
- 2.- Guidelines for behavior in fish: Exploratory activity and personality

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory course	12	0.48	6, 7, 5, 2, 3

Master classes	58	2.32	6, 7, 5
Workshops	40	1.6	6, 7, 5, 2, 3
Type: Supervised			
Supervised activities	46	1.84	6, 7, 5, 2
Type: Autonomous			
Autonomous activities	60	2.4	2, 3

The methodology used in this subject to achieve the learning process is based on the work of the student based on the information that is made available to him. The teacher's task is to give him the information or tell him where he can get it and help him in the learning process. In order to achieve the objective, teaching is based on the following activities:

Master classes:

With these classes the student acquires the basic theoretical knowledge of the subject that he / she will have to complement with the individual study of the explained subjects

Practical classes:

Practices are reinforced, through experimentation in the laboratory, those aspects that in theoretical classes usually have a special difficulty. On the other hand, in practice, the student's critical spirit, his ability to observe and the skills of analysis and evaluation of problems in the experimentation in comparative physiology are stimulated.

Active learning has the following objectives:

- (1) to transfer, compare and contrast the acquired knowledge when studying the concepts and processes of physiology based on murine / human / clinical models to the rest of animals present in the natural environment;
- (2) to discriminate and critically select the information obtained from primary sources (articles, monographs ...) and secondary (articles of generalist journals, dissemination blogs, audiovisuals ...), for the purpose of
- (3) to integrate the genomic, phenotypic, ecological and evolutionary information in the different levels of physiological analysis that facilitate the global understanding of physiological processes, close (current interactions between different organisms) and last ones (evolutionary conditioning and emergence of adaptations specific in the different lineages), finally,
- (4) to be able to communicate effectively the results of the learning, in a formal and non-formal field, identifying the quality criteria of the information that is provided.

Supervised activities will be carried out in which the student must apply the knowledge and reasoning studied from the theoretical classes, solving a specific problem or explaining the results of their analysis and finding information in the class a specific physiological topic.

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

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Lab course	10%	1	0.04	13, 4, 7, 3
PBL	40%	3	0.12	6, 7, 5, 12, 2
Problem base learning	50%	5	0.2	4, 1, 7, 8, 11, 9, 10, 2, 3

Assessment of the theoretical part, theoretical examinations: a partial exam will be carried out in which the knowledge acquired by the student in the corresponding part of the subject will be assessed individually, the students who do not pass the partial exam can recover it in the final exam. This evaluation has a global weight of 50% of the final mark, the minimum mark to pass it 5. To participate in the recovery, the students must have previously been evaluated in a set of activities the weight of the which is equivalent to a minimum of two thirds of the total grade of the subject or module. Therefore, students will obtain the "Non-Valuable" qualification when the assessment activities carried out have a weighting of less than 67% in the final grade.

Evaluation of the lab course: the lab course is mandatory and will be evaluated by submitting a group report once the course has been completed. This evaluation has a weight of 10% of the final mark.

Evaluation of active learning: work, exhibitions and problem solving will be evaluated. This evaluation has a weight of 40% of the final mark.

The lab course and the active learning activities can not be recovered.

Not submitted: it will be considered that a student will obtain the qualification of not presented if at least 50% of the assessment activities are not presented.

Final asessment: in the case of those students who request a single assessment: the lab course is mandatory (delivery of a practice report) and accounts for 10% of the final mark, the theoretical exam will account for 50% of the final mark and the delivery of works/activities related to PBLs will account for 40% of the final mark. The same recovery system will be applied as for the continuous assessment. The review of the final qualification follows the same procedure as for the continuous assessment.

Bibliography

References

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- Willmer, P., Johnston, I., & Stone, G. (2009). *Environmental Physiology of Animals* (2nd ed.). Wiley-Blackwell.

Complementary references

- Alcock, J. (2009). *Animal behavior: an evolutionary approach* (9th ed.). Sinauer Associates.
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- Commins, S. (2018). *Behavioural Neuroscience* (1st ed.). Cambridge University Press.

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- Hickman, C. P. (2024). *Integrated principles of zoology* (19th ed.). McGraw-Hill LLC.
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- Murphy, K., Weaver, C., & Berg, L. (2022). *Janeway's immunobiology* (10th ed.). W. W. Norton & Company.
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Communication & graphic design

- Hagen, R. & Golombisky, K. (2013). *White Space is Not Your Enemy: A Beginner's Guide to Communicating Visually through Graphic, Web and Multimedia Design*. Taylor and Francis.
- Heard, S. B. (2016). *The scientist's guide to writing: how to write more easily and effectively throughout your scientific career*. Princeton University Press.
- Hofmann, A. H. (2017). *Scientific writing and communication: papers, proposals, and presentations* (3rd ed.). Oxford University Press.
- Vilà, M., Castellà, J. M., Casas, M., Mestre Nogué, J. V., & Porrata-Doria Botey, E. de. (2018). *Secretos para hablar bien en público: guía práctica*. Plataforma Editorial.

Electronic journals:

- American Journal of Physiology- Endocrinology and Metabolism
- Annual review of Physiology
- BMC Biology
- BMC Evolutionary Biology
- BMC Genomics
- Cell
- Cell Metabolism
- Clinical Endocrinology
- Current Biology
- Endocrine Reviews
- Endocrinology
- European Journal of Endocrinology
- Evolutionary Biology
- Frontiers in Neuroendocrinology
- Frontiers in Immunology
- Frontiers in Microbiology
- General and Comparative Endocrinology
- Genome Biology
- International Journal of Dev. Biology
- Journal of Endocrinology
- Journal of Endocrinology investigation
- Journal of Experimental Biology
- Journal of Immunology
- Journal of Neuroendocrinology
- Molecular Genetics and Metabolism
- Molecular Metabolism
- Nature
- Nature Communications
- Nature Immunology
- Nature Genetics
- Nature Reviews series
- Neuroendocrinology

- Plos Biology
- PlosOne
- PNAS
- Proceedings of the Royal Society Edinburgh B
- Science
- Scientific Reports
- Trends in Cell Biology
- Trends in Endocrinology and Metabolism

Web pages:

- Trobador biblioteques UAB <http://sfx.cbuc.cat/uab/az>
- Scopus <https://www.scopus.com/search/form.uri?display=basic>
- The National Center for Biotechnology Information <http://www.ncbi.nlm.nih.gov/>
- ENSEMBL genome browser: <https://www.ensembl.org/index.html>
- The Bioinformatics Resource Portal <https://www.expasy.org/>
- The Uniprot database of [protein sequence](https://www.uniprot.org/) and functional information <http://www.uniprot.org/>
- The Protein Data Bank <https://www.rcsb.org/>
- Journal of Visualized Experiments <https://www.jove.com/>
- Portal to Cell and Molecular Animation <https://clarafi.com/>
- Khan Academy <https://www.khanacademy.org/>
- AK Lectures <https://www.youtube.com/channel/UCFJyaHVyWkb2y-HkIAEPIdA>
- Biology online dictionary https://www.biology-online.org/dictionary/Main_Page
- Biology online dictionary <https://biologydictionary.net/>
- Centre de terminologia especialitzada en català <http://www.termcat.cat/>
- TED Talks: <https://www.ted.com/talks>
- Google scholar: <http://scholar.google.es/>
- Statistics: <https://stattrek.com>, see also: <https://www.graphpad.com/quickcalcs/>

Software

No specific software packages.

For this course, the use of Artificial Intelligence (AI) is permitted exclusively for support tasks, such as bibliographic or information searches, text correction, or translations. The student must clearly identify which parts have been generated using this technology, specify the tools used, and include a critical reflection on how these tools have influenced the process and the final outcome of the activity. Lack of transparency in the use of AI in this graded activity will be considered a breach of academic honesty and may result in a partial or total penalty in the grade for the activity, or more severe sanctions in serious cases.

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PLAB) Practical laboratories	141	Catalan	first semester	afternoon
(SEM) Seminars	141	Catalan	first semester	morning-mixed
(TE) Theory	14	Catalan	first semester	morning-mixed