Universitat Autònoma de Barcelona

2022/2023

Comparative and Environmental Animal Physiology

Code: 100808
ECTS Credits: 9

Degree	Type	Year	Semester
2500250 Biology	OT	4	1

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Other comments on languages

La bibliografia en anglès és habitual

Teachers

Mariana Teles Pereira

External teachers

Joan Carles Balasch

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 of FACA

1.- Evolution of Physiological Integration: Neurobiology, Endocrine Control and Immunity.

Physiology of nervous and endocrine control. Nervous system: strategies in the perception, integration and response to the stimulus. Locomotor systems and locomotor bases driving behavior. Migration. Animal navigation. Ecolocation, electrolocation and magnetolocation. Endocrine system: glands, hormones and target cells. Pheromones and kairomones. Reproduction. Metamorphosis. Biological clocks

2.-Comparative ecophysiology: Respiration/Circulation. Thermoregulation. Metabolic management (Digestion, Osmoregulation and Excretion). Seasonal 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 cardio-respiratory physiology in the flight of birds. Cardio-respiratory physiology during immersion.

Food, energy and temperatura. Food, digestion and absorption strategies. Adaptive solutions to environmental conditions. Nutrition physiology during development. Nutrition physiology and biological clocks. Energetic metabolism. Body temperature, poikilothermia (ectothermy) and homeothermia (endotherm). Thermolegulation and endothermy in invertebrates and vertebrates. Controlled hypothermia in birds and mammals. Adaptations to life in extreme climates.

Management of water and waste: Mechanisms for the exchange of salts and water. Excretion and water relations. Osmoconformists and osmoregulators. The freshwater environment, the marine environment and the terrestrial environment, control of the hydrosaline balance. The life in the deserts, special adaptations.

Reproductive systems and specific adaptations to extreme ecosystems: Seasonality and reproductive patterns.

Active learning:

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

Lab course

1.- Thermoregulation: Influence of temperature in the physiology of fish

2.- Guidelines for behavior in fish: Exploratory activity and personality

Methodology

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 make 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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory course	12	0.48	6, 5, 7, 2, 3
Master classes	58	2.32	6, 5, 7
Workshops	40	1.6	6, 5, 7, 2, 3
Type: Supervised			
Supervised activities	46	1.84	6, 5, 7, 2
Type: Autonomous			
Autonomous activities	60	2.4	2, 3

Assessment

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 obligatory 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 practical part: Practices are mandatory and will be evaluated by submitting a group report once the practices have 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 practices and the part of active learning 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.

Assessment Activities

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

Bibliography

Fox, S.I. Fisiología humana. Mcgraw-hill interamericana (2013).

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Jenkins, G.W. Anatomy and physiology: from science to life, 3rd ed. John Wiley (2013).

Willmer, P., Stone,G, i Johnston,I. Environmental physiology of animals. Blackwell (2000, 2004).

Complementary references

Alcock, J. Animal behavior: an evolutionary approach. Sinauer (2009)

Carroll, Sean B. Endless forms most beautiful: the new science of evo devo and the making of the animal kingdom, London (2007).

Carlson, Neil A. Fisiologia de la conducta, 11 ed., (2014)

Guyton, A.C. Hall,J.E.. Tratado de Fisiología Médica. 11a ed. Elsevier (2011)

Hickman, C.P. et al. Principios integrales de zoologia, 14 ed. McGraw-Hill (2009).

Kandel, E.R. et al. Principles of neural science. McGraw-Hill (2012).

Moyes, C.D., i Schulte, P.M. Principios de fisiología animal. Pearson educación (2007).

Murphy, K. , Weaver, C. Janeway's Immunobiology, 2ed. Garland Science (2016).

Vila i Santasusana, M., Castellà JM., i Casas M. Secretos para hablar bien en público. Plataforma editorial (2016).

Hofmann A.H. Scientific writing and communication. Papers, Proposals and Presentations. 3rd Edition Oxford University Press (2017).

Heard S.B. The scientist's guide to writing. Princeton University Press (2016).

Electronic journals:

American Journal of Physiology- Endocrinology and Metabolism

Annual review of Physiology

BMCBiology

BMC Evolutionary Biology

BMCGenomics

Cell

Cell Metabolism

Clinical Endocrinology

Current Biology

Endocrine Reveiws

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

Neuroendicrinology

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 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/

Web per fer estadística: https://stattrek.com

Web per fer estadística: https://www.graphpad.com/quickcalcs/

Software

No specific software packages