VNIVERSITAT DE VALÈNCIA

Course Guide
36347 Biological Diversity

COURSE DATA

Data Subject	
Code	36347
Name	Biological Diversity
Cycle	Grade
ECTS Credits	10.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1109 - Degree in Biochemistry and Biomedical Sciences	Faculty of Biological Sciences	1	Annual

Subject-matter

Degree	Subject-matter	Character
1109 - Degree in Biochemistry and Biomedical Sciences	4 - Biología	Basic Training

Coordination

Name	Department
GUARA REQUENA, MIGUEL	356 - Botany and Geology
MONTERO ROYO, FRANCISCO ESTEBAN	355 - Zoology
PEREZ DEL OLMO, ANA	355 - Zoology

SUMMARY

Biodiversity is one of the subjects included in Module 1: General Scientific Basis of the Degree in Biochemistry, Biomedical Sciences and Biotechnology Grade, included in Foundations of Biology basic discipline of the branch of science, which is taught in the first year of both degrees.

Biological Diversity aims to introduce the future graduates in the knowledge about the complexity and evolution of living organisms. With special attention to the model organisms of the major lineages of the Tree of Life for its application in biochemical and biomedical sciences.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

"No enrollment restrictions are specified with other subjects of the curriculum"

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1109 - Degree in Biochemistry and Biomedical Sciences

- Have capacity for analysis, synthesis and critical reasoning in the application of the scientific method.
- Be able to think in an integrated manner and approach problems from different perspectives.
- Understand the natural world as a product of evolution and its vulnerability to human influence.
- Be able to use new information and communication technologies.
- Know how to use the different bibliographic sources and biological databases and be able to use bioinformatic tools.
- Recognise biological diversity and know the organisation of living beings and the position of human beings and model organisms in biomedical experimentation amid this diversity.
- Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.
- Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.
- Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.
- Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.
- Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.
- Learn to work safely in the laboratory.
- Show initiative and leadership for multidisciplinary teamwork and cooperation.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

-Recognize the taxonomic categories and use the rules of biological nomenclature.
-To know to base the common origin of all living beings and their repercussions.
-Relate environmental diversity, organic diversity and the evolutionary process.
-Identify the evolutionary relationships between the main groups of organisms.
-Situate the organisms in the tree of life.
-Know how to discuss and reason about the suitability of a model organism.
-To interpret phylogenetic trees.
-Analyze the ecological scenario of biological processes.
-Identify organisms and associate these to the different modes and types of anatomical, functional and reproductive organization.
-Distinguish the different phases of life cycles.
-Develop synopsis and criticism on texts of biological and scientific content.
-Make reading, comprehension and writing jobs using, in addition, scientific English.
-Acquire conservation values and compliance with environmental legislation.
-To acquire values of respect for equal rights.

DESCRIPTION OF CONTENTS

1. BIOLOGICAL DIVERSITY LECTURES. PART I

T.1- Concept of Biological Diversity. Types: intraspecific diversity, interspecific diversity, diversity of ecosystems. Diversity of organisms: complexity and multicellularity. How many species are there? The tree of life: current classification of the diversity of organisms.

T.2- Systematics, Taxonomy, and Phylogeny, the basic tools to organize, name and understand the diversity of life.

T.3- The history of life on earth. Conditions of the earth that made the appearance of life possible. The fossil record. Key events in the history of life. The colonization of the terrestrial environment. Extinctions.

T.4- The domains of life: prokaryotic organisms; Archaea and Bacteria. The cyanobacteria. Functions of prokaryotes in the biosphere: recycling of organic matter, ecological interactions. Symbiosis. Impact of prokaryotes on human beings.

T.5- Eukaryotic organisms, theories about their origin. Endosymbiosis, plastids diversity, evolution of eukaryotes. The sexual reproduction, advantages. Types of life cycles.

T.6- Eukarya domain. Excavata supergroup. Supergroup SAR (Stramenopiles-Alveolates-Rhizaria). Organization, reproduction and ways of life. Importance and uses, BPMO (Beneficial or Pathogenic Model Organisms).

T.7- Archaeplastida supergroup (I). Red algae. The green lineage: green algae Organization, reproduction and diversity. BPMO.

T.8- Archaeplastida (II). Terrestrial plants, embryophytes. The bryophytes. Vascular plants. Anatomy of the cormophytes: the root, the stem and the leaf. The pteridophytes.

T.9- .Archaeplastida (III). The appearance of the seed and the fruit. Gymnosperms and angiosperms. Compounds of secondary metabolism.

T.10-Unikonta Supergroup. Amebozoa: amoebas and mucilaginous molds, reproduction, organization. Diversity. BPMO: Fungi, reproduction organization and cycles, diversity. OMBP

2. BIOLOGICAL DIVERSITY LECTURES. PART II

T.11-Clade Opistokonta: Animal Kingdom. Origins of Animals. Animal Architecture: Body Plans. Protostomes and Deuterostomes.

T.12-Reproduction and development. Taxonomy and Phylogeny of Animals.

T.13-Sponges and Cnidarians: Characteristics. Classification. Model organisms.

T.14-Bilateral Animals. Protostomes I. Faltworms: Characteristics. Classification. Life cycles and adaptations to parasitism.

T.15-Protostomes II. Lophotrochozoans. Mollusc and Annelids: Characteristics. Classification. Functional significance of coelom and metamerism. Model organisms and applications in biomedicine.

T.16-Protostomes III. Ecdysozoans. (I) Arthropods: Characteristics. Major groups. Health importance. (II) Nematodes: Characteristics. Parasites of humans. Model organisms.

T.17-Deuterostomes I. Echinoderms and Chordates: Characteristic. Classification. Origins and evolution. Model organisms.

T.18-Deuterostomes II. Pisciform vertebrates: What is a fish? Classification. Major groups of fishes. Model organisms.

T.19-Deuterostomes III. The early tetrapods and modern Amphibians: Characteristics. Model organisms.

T.20-Deuterostomes IV. Amniotes. Non-avian reptiles: Origins and evolution. Characteristics. Classification and model organisms.

T.21-Deuterostomes V. Amniotes. (I) Birds: Origins and phylogenetic relationships. Structural and functional adaptations for flight. Model organisms. (II) Mammals: Origin and evolution. Structural and functional adaptations. Model organisms.

3. CLASS OF PROBLEMS

1st Term:
Analysis and discussion of articles and scientific papers. A class will be held at the Botanical Garden of Valencia University during the 1st quarter, with the aim of expanding knowledge of the theme 2. It will mainly consist of a visit to live collections, ex situ conservation collections, the germplasm bank and the DNA bank.

2nd Term:
a.-Parasite life cycles: biological, ecological and health relevance.
b.-Animals in action.
c.-Model Organisms in Biomedical Research.

4. TUTORIALS IN REDUCES GROUP (16 studens)

Session 1 (1st Quarter). Partial preparation.
Sessions 2 and 3 (2nd Quarter). Final exam preparation.

6. LABORATORY PRACTICALS

Lab. 1.- Prokaryotes: Cyanobacteria. Eukaryotes: Excavata, Chromoalveolata and Archaeplastida (Streptophyta). Examples in freshwater and marine plankton.

Lab. 2.- Eukaryotes. Chromoalveolata: Phaeophyceae (brown algae). Archaeplastida:Rhodophyta (red algae). Streptophyta: Zygnematales and Charales. Chlorophyta (green algae). Examples of vegetative organization and reproductive structures.

Lab. 3.- Embriophyta: Bryophytes. Tracheophyte: Pteridophytes. Biological cycles Vegetative organization. Reproductive structures: sporangia and spores.

Lab. 4.- Seed plants (1). Gymnosperms. Vegetative organization. Reproductive structures: strobili; pollen.

Lab. 5.- Seed plants (2). Angiosperms. Vegetative organization. Reproductive structures. Flowers and fruits.

Lab. 6.- Unikonta: The true fungi. Mucoromycota. Glomeromycota: arbuscular vesicle mycorrhizae. Ascomycota. Basidiomycota. Vegetative organization: fruiting bodies (mushrooms). Reproductive structures: exospores and endospores.

Lab. 7.- Unikonta: Lichene symbiosis. Vegetative organization. Reproductive structures: asexual and sexual.

Lab. 8.- Animal Diversity: body patterns.

Lab. 9.- Molluscs: Morphology of the shell and dissection of a Cephalopod.

Lab. 10.- Nematodes: Anisakidosis. Extraction of Anisakis simplex larvae (Phylum Nematodes, F. Anisakidae) from contaminated fish. Mechanisms for its prevention and control.

Lab. 11.- Arthropods: External organization. Dissection and protein pattern of the venom gland.

Lab. 12.- Toxicity test with Artemia salina.

Lab. 13.- Evolutionary adaptations and functional responses.

Lab. 14.- Vertebrates: Constructional morphology of the skull in mammals. Evolutionary adaptations and functional responses.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	50,00	100
Laboratory practices	26,00	100
Classroom practices	16,00	100
Tutorials	8,00	100
Preparation of evaluation activities	30,00	0
Preparing lectures	70,00	0
Preparation of practical classes and problem	20,00	0
TOTAL	**220,00**	

TEACHING METHODOLOGY

Theoretical lessons

The period required to deliver each of the topics vary. Theoretical sessions necessary for each one of them may be from 1 to 6 hours. The beginning of the theoretical sessions will be held in first week of the course.

Practical activities

We have designed - 14 practices in the laboratory , coordinated with the theoretical matter .Practices in laboratory are held in sessions of two hours duration, and these will be placed in labs assigned by the Faculty that will be communicate in advance.

Attendance to the laboratory practicals is compulsory.

Problems in the Classroom

Additional activities will be undertaken to knowledge taught in lectures and practices, doing exercises of understanding, relationship or otherwise, providing to the students the acquisition of knowledge related to diversity.

Tutorials in reduced group

Three tutoring sessions have been organized (each lasting 2 hours). One in the first quarter and two in the second. In the tutorials, students will proceed to pose problems and questions, aimed at preparing the corresponding exam.

Group Changes:

Any change from one to other activity group must be official and confirmed in the Secretariat of the Centre. Unofficial changes are not permitted.

EVALUATION

Two eliminatory subject exams will be carried out to evaluate the theoretical/practical contents. The first exam will be held in the January call and will cover the topics taught in the first semester (topics 1-10); the second exam will be held in the May/June session and will cover the topics taught in the second semester (topics 11-20). These exams will include both questions of the theoretical content and questions of the corresponding laboratory practices and problem sessions, with the aim of a total integration of theoretical and practical knowledge. These exams will constitute 80% of the final grade.

Attendance to laboratory practices is mandatory. Its contents will be evaluated through questions included in the exams of the different calls.

Attendance at tutorials and problems is mandatory. Participation in these sessions, as well as the activities that may arise throughout the course (supervised work, carrying out problems, etc.) will contribute to 20% of the overall grade.

It is essential to achieve, at least, a score of 5 out of 10 in each of the eliminatory exams of the subject to pass the subject. If this mark is not reached, or any of these exams corresponding to the first call are not carried out, that knowledge will be evaluated in the second call exam. In this second call, it will also be necessary to achieve a minimum of 5 points out of 10 to pass the course. The marks of the exams that were passed in the first call (both in the January exam and in May/June) will be kept until the second call. In the event of not having passed the subject at the end of the course, the grade of any of the passed parts will not be saved for the following course.

REFERENCES

Basic

- Referencia b1: CAMPBELL, NEIL A.; LISA A. URRY; MICHAEL L CAIN; STEVEN A. WASSERMAN; PETER V. MINORSKY; JANE B. REEC, (2020). Biology: A Global Approach, eBook, Global Edition. 12th Edition, Pearson (Intl).
- Referencia b2: BRUSCA R.C.; GIRIBET G. & MOORE W. (2022). Invertebrates. 4th Edition. Oxford University Press. New York.
- Referencia b3: HICKMAN, C.P.; ROBERTS, L.S. ;KEEN, S.L.; LARSON, A.; LANSON, H. & EISENHOUR, D.J. (2009). Principios Integrales de Zoología. Mc Graw-Hill/Interamericana de España, S.A.U. 14/E. Madrid.
- Referencia b4: NIKLAS, K. J. (2016). Plant Evolution: An introduction to the history of life. Ed. Univ. Chicago press.
- Referencia b5: REVERT, R. F. & EICHHORN S. E. (2013). Raven Biology of Plants. Eighth Edition. Ed. W. H. Freeman and co.
- Referencia b6: SOLOMON, E.P.; BERG, L.R. & MARTIN, D.W. (2008). Biología. Ed. McGraw Hill.
- Referencia b7: VARGAS, P. & ZARDOYA, R. (Eds.) (2012). El árbol de la vida: Sistemática y evolución de los seres vivos. Madrid.

Additional

- Referencia c1: MARGULIS, L. (2002). El Planeta simbiótico. Ed. Debate.Madrid.

Referencia c2: MARGULIS, L. & DOLAN, F. (2002). El inicio de la vida. Editorial Bromera.-PUV

Referencia c3 SOUTHWOOD, R. (2004). La historia de la vida. Grupo ILHSA S.A. Buenos Aires.

Referencia c4 TUDGE, C. (2001). La variedad de la vida. Ed. Critica. Barcelona.