COURSE DATA

DATA SUBJECT

Code: 36347
Name: Biological Diversity
Cycle: Undergraduate Studies
ECTS Credits: 10
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1109 - Degree in Biochemistry and Biomedical Sciences	Facultat de Ciències Biològiques	1	Annual

SUBJECT-MATTER

Degree	Subject-matter	Character
1109 - Degree in Biochemistry and Biomedical Sciences	Biología	BASIC

COORDINATION

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SUMMARY

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

Biological Diversity aims to introduce future graduates to the principles of the organization of living beings with an evolutionary approach. The subject also aims to explain the qualities of "model organisms" and species of interest for studies in biochemistry 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

There are no specified enrollment restrictions with other subjects.

COMPETENCES / LEARNING OUTCOMES

1109 - Degree in Biochemistry and Biomedical Sciences

Be able to think in an integrated manner and approach problems from different perspectives.

Be able to use new information and communication technologies.

Have capacity for analysis, synthesis and critical reasoning in the application of the scientific method.

Know how to use the different bibliographic sources and biological databases and be able to use bioinformatic tools.

Learn to work safely in the laboratory.

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.

Show initiative and leadership for multidisciplinary teamwork and cooperation.

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 be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

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 have developed the learning skills needed to undertake further study with a high degree of autonomy.

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.

Understand the natural world as a product of evolution and its vulnerability to human influence.

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. 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 and organization. Diversity. BPMO. Fungi, reproduction, organization, cycles and diversity. BPMO.

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 and applications in biomedicine.

T.14- Bilateral Animals. Protostomes I. Spiralia I. Faltworms: Characteristics. Classification. Life cycles and adaptations to parasitism. Model organisms and applications in biomedicine.

T.15- Protostomes II. Spiralia II. 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 and applications in biomedicine.

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

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

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

T.20- Deuterostomes IV. Amniotes. Non-avian reptiles: Origins and evolution. Characteristics. Classification. Model organisms and applications in biomedicine.

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 and applications in biomedicine.

3. CLASS OF PROBLEMS

1st Term: analysis and discussion of articles and scientific papers.

2nd Term: analysis and discussion of articles, scientific texts, as well as monographic topics with a comparative, evolutionary, and functional approach, and an application to the field of biomedicine.

4. TUTORIALS IN SMALL GROUP

Session 1 (1st Quarter). Partial preparation.
Session 2 (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: Lichen symbiosis. Vegetative organization. Reproductive structures: asexual and sexual.

Lab. 8.- Animal Diversity: body patterns.

Lab. 9.- Molluscs: Morphology of the shell and identification of specimens from different groups within the phylum.

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

Lab. 11.- Arthropods (I): External organization. Dissection and protein pattern of the venom gland of *Apis mellifera*.

Lab. 12.- Arthropods (II): Determination of the acute toxicity of SDS in *Artemia franciscana*.

Lab. 13.- Evolutionary adaptations and functional responses of parasites.

Lab. 14.- Vertebrates: Constructional morphology of the skull in mammals.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	4,00
Theory	55,00
Laboratory	28,00
Classroom practices	13,00
Total hours	**100,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	0,00
Preparation of lessons	90,00
Preparation for assessment activities	30,00
Resolution of case studies	0,00
Total hours	**120,00**

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 the 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.

Problems in the Classroom

Additional activities will be undertaken to expand the 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

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

Attendance to the laboratory practicals, problems in the classroom and tutorials are compulsory.

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 11-21). These exams will include both questions of the theoretical content and questions of the corresponding laboratory practices 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, questionnaires about lab/problem sessions, 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 part of the exam (theoretical and practical) 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 in each part of the exam (theoretical and practical) to pass the subject. 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

- 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).
- BRUSCA R.C.; GIRIBET G. & MOORE W. (2022). Invertebrates. 4th Edition. Oxford University Press. New York.
- 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.
- NIKLAS, K. J. (2016). Plant Evolution: An introduction to the history of life. Ed. Univ. Chicago press. Chicago.
- REVERT, R. F. & EICHHORN S. E. (2013). Raven Biology of Plants. Eighth Edition. W.H. Freeman/Palgrave Macmillan. UK.
- SOLOMON, E.P.; BERG, L.R. & MARTIN, D.W. (2008). Biología. Ed. McGraw Hill. Aravaca.
- VARGAS, P. & ZARDOYA, R. (Eds.) (2012). El árbol de la vida: Sistemática y evolución de los seres vivos. Madrid.

ADDITIONAL

- MARGULIS, L. (2002). El Planeta simbiótico. Ed. Debate. Madrid.
- MARGULIS, L. & DOLAN, F. (2002). El inicio de la vida. Editorial Bromera-PUV. Valencia.
- SOUTHWOOD, R. (2004). La historia de la vida. Grupo ILHSA S.A. Buenos Aires.
- TUDGE, C. (2001). La variedad de la vida. Ed. Critica. Barcelona.