

**COURSE DATA****Data Subject**

<b>Code</b>	33166
<b>Name</b>	Biological diversity
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	12.0
<b>Academic year</b>	2021 - 2022

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. Period year</b>
1102 - Degree in Biotechnology	Faculty of Biological Sciences	1 Annual

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1102 - Degree in Biotechnology	80 - Biology	Basic Training

**Coordination**

<b>Name</b>	<b>Department</b>
FALCO GARI, JOSE VICENTE	355 - Zoology
GUARA REQUENA, MIGUEL	356 - Botany and Geology

**SUMMARY**

*Biological Diversity* is a subject included in the matter **Biology**, belonging to the module **Fundamentals of Biology** of the **Degree in Biotechnology**. It is annual, is taught along two semesters of the first year, consists of 12 ECTS credits and has the character of Basic Training in the branch of Sciences.

*Biological Diversity* aims to introduce future graduate students to the principles of the organization of living beings, their diversity and systematics, with an evolutionary approach. It also gets special emphasis on “model organisms” for biotechnology studies and the reasons that justify both their suitability and their uniqueness. The course provides the biological foundations necessary to address issues of a biotechnological nature.



## PREVIOUS KNOWLEDGE

### Relationship to other subjects of the same degree

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

### Other requirements

## OUTCOMES

### 1102 - Degree in Biotechnology

- Ser capaz de dar una breve charla a un auditorio no especializado sobre un tema general de Biología con impacto actual en la sociedad.
- Aprender a trabajar de forma adecuada en un laboratorio con material biológico (microorganismos, plantas y animales) incluyendo seguridad, manipulación y eliminación de residuos biológicos, y con registro anotado de actividades.
- Learn, develop and apply the main techniques for the preparation, staining and observation of biological samples.
- Be able to observe and interpret the results obtained through optical microscopes.
- Identificar y describir los distintos órganos y tejidos animales y vegetales en preparaciones in situ y en preparaciones histológicas.
- Be able to place the different living beings in the phylogenetic tree.
- Ser capaz de identificar organismos eucarióticos y procarióticos a nivel de género y/o especie.
- Be able to understand the evolutionary relationships between organisms.
- Saber predecir las consecuencias de la actividad humana sobre la biodiversidad y el medio ambiente.

## LEARNING OUTCOMES

- Recognize the taxonomic categories and use the biological nomenclature rules.
- Know the common origin of all living beings and its implications.
- Relate environmental and organic diversity and the evolutionary process.
- Identify the evolutionary relationships between major groups of organisms.
- Place organisms in the Tree of Life.



- Learn to argue and to reason about the suitability of a model organism.
- Construct and interpret phylogenetic trees.
- Analyze the ecological scenario of biological processes.
- Identify organisms and associate these with different modes and types of anatomical and functional organization, and reproductive biology.
- Distinguish the different stages of life cycles.
- Develop synopses and critical overview of texts with biological and scientific contents.
- Perform work reading, understanding and writing by using scientific English.
- Acquire conservation values and environmental law enforcement.
- Acquire the respect values of the rights equality.

## DESCRIPTION OF CONTENTS

### 1. Theoretical Lessons - Part 1

- 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.
- 2.- Systematics, Taxonomy, and Phylogeny, the basic tools to organize, name and understand the diversity of life.
- 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.
- 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.
- 5.- Eukaryotic organisms, theories about their origin. Endosymbiosis, plastids diversity, evolution of eukaryotes. The sexual reproduction, advantages. Types of life cycles.
- 6.- Eukarya domain. Supergroup Excavata. Supergroup SAR (Stramenopiles-Alveolates-Rhizaria). Organization, reproduction and ways of life. Importance and uses, BPOM (Beneficial or Pathogenic Model Organisms).
- 7.- Archaeplastida supergroup (I). Red algae. The green lineage: green algae Organization, reproduction and diversity. Importance and uses, BPOM.
- 8.- Archaeplastida (II). Terrestrial plants, embryophytes. The bryophytes. Vascular plants. Anatomy of the cormophytes: the root, the stem and the leaf. The pteridophytes.
- 9.- Archaeplastida (III). The appearance of the seed and the fruit. Gymnosperms and angiosperms. Compounds of secondary metabolism. Importance and uses, BPOM.
- 10.- Unikonta Supergroup Amoebozoa: amoebas and mucilaginous molds. Organization and reproduction. Diversity. BPOM: Fungi Organization reproduction and cycles; diversity. Importance and uses, OMBP.



## 2. Theoretical Lessons - Part 2

- 11.- Rhythms and evolutionary modes. Animals vs Plants.
- 12.- Complexity and Symbiosis: compositional evolution and its impact on the Tree of Life.
- 13.- History of Animals.
- 14.- Organization of Animals.
- 15.- Unicellular eukaryotes. Choanoflagellates.
- 16.- Poriferans. Diblastic animals. Cnidarians
- 17.- Triblastic animals. Plathelminths. Molluscs. Annelids.
- 18.- Nematodes. Arthropods.
- 19.- Echinoderms. Hemichordates. Chordates: origin and evolution.
- 20.- Vertebrates: pisciforms; amphibians; reptiles; birds; mammals.
- 21.- Non-human and human primates.
- 22.- Model organisms.

## 3. Laboratory Practices

- 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 fungi. Mucoromycota. Glomeromycota: vesicular-arbuscular mycorrhizas. Ascomycota. Basidiomycota. Vegetative organization: fruiting bodies (mushrooms). Reproductive structures: exospores and endospores.
- Lab. 7.- Unikonta: Lichenic symbioses. Vegetative organization. Reproductive structures: exospores and endospores.
- Lab.8.- Animal Diversity: body plans.
- Lab.9.- Nematodes: anisakidosis. Extraction of Anisakis simplex larvae from fish contaminated. Mechanisms for prevention and control.
- Lab.10.- Molluscs : Taxonomy and ecology.
- Lab.11.- Arthropods. Dissection and protein pattern of the venom gland.
- Lab.12.- Arthropods. Toxicity test with Artemia salina.
- Lab.13.- Vertebrates: constructional morphology of the skull in mammals.
- Lab.14.- Evolutionary adaptations and functional responses.

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Theory classes	70,00	100
Laboratory practices	26,00	100
Classroom practices	20,00	100
Tutorials	4,00	100
Study and independent work	34,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	50,00	0
Preparing lectures	56,00	0
Preparation of practical classes and problem	30,00	0
Resolution of online questionnaires	5,00	0
<b>TOTAL</b>	<b>300,00</b>	

**TEACHING METHODOLOGY*****Theoretical sessions:***

Theoretical sessions are adapted to the official schedules of the corresponding academic year. The number of theoretical sessions necessary to teach each of the themes is variable. A masterful teaching-learning process is proposed but with a strong participatory nature by students. Teaching materials will be offered both in the classroom sessions and through the Aula Virtual platform.

**Practical activities:**

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

2.- Practical activities outside the laboratory have been organized: a field trip in the first semester related to botanical contents; a field trip in the second semester related to zoological contents.

**Attendance to the laboratory practicals and field trip is mandatory for both practical activities.**

**Problems in the Classroom:**

In first and second semesters exercises will be carried out to analyze and discuss articles and scientific readings related to the topics covered along the semester, providing the acquisition of solid knowledge of biodiversity.





### **Tutorials:**

In the tutorials, a multidisciplinary understanding will be carried out to allow the deepening and integrated vision of the contents addressed in the teaching-learning activities of the subject.

## **EVALUATION**

The evaluation of the subject will take into account the exams corresponding to the contents of the theory sessions and laboratory practices, with the aim of a total integration of the theoretical-practical knowledge, as well as the marks of the other activities carried out at throughout the academic year.

Biological Diversity is an annual subject. The contents of the topics offered along the First Part of the course will be evaluated in a theoretical-practical exam corresponding to the first call that will take place at the end of the first semester. The contents of the topics offered along Part Two of the course will be evaluated in a theoretical-practical exam corresponding to the first call that will take place at the end of the second semester. If one or both parts have not been passed in the first call for not achieving the minimum grade, they may or may be passed in the exam of the second call of the course.

Each part of the subject, contents and matters of each one of the semesters, must be passed with a minimum grade of 5.0 out of 10 points, separately and will not be compensable. The average mark of the two exams will constitute 80% of the Final Mark of the subject.

The remaining activities, Problems, Tutorials, Field Trips, will contribute 20% of the Final Mark of the subject, with a maximum of 1 point grading the activities of each one of the two parts of the subject.

Attendance at practice and problem sessions is compulsory.

The note of any activity will not be saved for the following course.

## **REFERENCES**

### **Basic**

- CAMPBELL N.A.; URRY, L.A.; CAIN, M.L.; WASSERMAN S.A.; MINORSKY, P. V.; REECE, J.B. (2020). *Biology: A Global Approach*. eBook, Global Edition. 12 th Edition. Pearson (Intl).
- DORIT, R.L.; WALKER, W.F.; BARNES, R.D. (1991). *Zoology*. Saunders College Publishing. Philadelphia.
- HICKMAN, C.P.; KEEN, S.L.; EISENHOUR, D.J; LARSON, A.; LANSON, H. (2021). *Principios Integrales de Zoología*, 18ª ed. Servet/Edra (Grupo Asis Biomedica), Zaragoza. Edición en español; 924 páginas; ISBN: 9788418339486.



NIKLAS, K.J. (1997). The Evolutionary Biology of Plants. Ed. Univ. Chicago press. 470 pp.

REVERT, R.F.; EICHHORN S.E. (2013). Raven Biology of Plants. Eighth Edition. Ed. W. H. Freeman and co.

SOLOMON, E.P.; BERG, L.R.; MARTIN, D.W. (2014). Biología. 9ª edición. Cengage Learning Editores. México. 1416 pp.

VARGAS, P.; ZARDOYA, R. (Eds.) (2012). El árbol de la vida: Sistemática y evolución de los seres vivos. Madrid.

#### **Additional**

- MARGULIS, L. (1985). Cinco Reinos. Ed. Labor.

MARGULIS, L. (2002). El Planeta simbiótico. Ed. Debate.Madrid.

MARGULIS, L. & DOLAN, F. (2002). El inicios de la vida. Editorial Bromera-PUV

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.

#### **ADDENDUM COVID-19**

**This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council**

The teaching plan distribution and the relationship between in-class and non presential activities may be modified throughout the course period if it is required because of the health emergency conditions by Covid-19.

#### **First Semester**

##### ***Teaching methodology.***

Theoretical, problems and tutorials activities that are not possible in face-to-face manner, in order to maintain sanitary hygiene in Covid conditions, will be carried out using online tools in the Virtual Classroom.

Laboratory practices. There will be a time of 30 minutes between two consecutive groups of students attending the same laboratory to ensure the facility hygiene.



Practices at the field. The practical activity of Visit the Botanist will only be carried out in person with the use of a mask or if the appropriate interpersonal distance is ensured in the visited facilities. Otherwise, virtual alternatives with a similar theme to the original objectives will be chosen, or they will be replaced by bibliographic works.

## **Second Semester**

### ***Teaching methodology.***

Teaching methodology.

Theoretical, problems and tutorials activities that are not possible in face-to-face manner, due to impediment of Covid conditions, will be carried out using online tools in the Virtual Classroom.

Laboratory practices. Lab sessions will be suitable for a maximum of 8 students per session. There will be a time of 30 minutes between two consecutive groups attending the same laboratory to ensure the facility hygiene.

Practices at country. The practical activity of Country Trip will be replaced by a classroom activity session in the laboratory included in the set of laboratory practices.

If the laboratory practices could not be face-to-face because of the impediment of Covid conditions, then virtual alternative activities similar to the original objectives would be chosen or they would be replaced by bibliographic works.