

## 25201 - Biology

### Syllabus Information

---

**Academic Year:** 2020/21

**Subject:** 25201 - Biology

**Faculty / School:** 201 - Escuela Politécnica Superior

**Degree:** 571 - Degree in Environmental Sciences

**ECTS:** 6.0

**Year:** 1

**Semester:** First Four-month period

**Subject Type:** Basic Education

**Module:** ---

## 1.General information

### 1.1.Aims of the course

The Biology course aims to understand and assimilate the most important and general concepts, theories and models of biology, fundamentally on the molecular, cellular and structural organization of organisms, on their genetic, physiological and reproductive mechanisms, and on the evolution and ecological interactions of living beings, with the proposal that the student acquire a global vision of the biotic environment and a basic biological training that allows him to apply this knowledge to the theoretical-practical cases of Environmental Sciences.

### 1.2.Context and importance of this course in the degree

### 1.3.Recommendations to take this course

## 2.Learning goals

### 2.1.Competences

### 2.2.Learning goals

### 2.3.Importance of learning goals

## 3.Assessment (1st and 2nd call)

### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

The evaluation of the subject will consist of a global final test to be held in the two official calls set by the EPS, which will consist of the following:

#### 1 Written test on basic knowledge of Biology

The written tests will consist of questions that require short answers (limited response tests) or that require a broad development of the topic (essay tests or free and open answer). There will also be questions where the student will have to unify, contextualize and extrapolate what was learned in the course to real biological problems. The first ones will allow a wide sampling of the student's knowledge on the subject, and the second and third ones will allow us to assess their ability to express, present and sustain arguments, and make critical judgments. The written test will be subdivided into two blocks: I, Theoretical Knowledge of Biology, and II, Practical Knowledge of Biology, which will have approximately the same length. The written test will be based on the program of programmed learning activities, both theoretical and practical.

#### 2 An experimental test with exercises in microscopy, physiology, reproduction and inheritance plus a written test of the practical part.

This test may be approved by the students during the course, without prejudice to their right to take the global final test, by preparing a laboratory practical notebook on different exercises in microscopy, karyology, physiology and reproduction of living beings. . The exercises will consist of the recognition of prokaryotic and eukaryotic cells, cellular structures, identification of bacterial, fungal, botanical and zoological groups, observation of their reproductive and embryological systems, analysis of metabolic-physiological activities and chromosomal studies.

In this case, attendance at laboratory practices is recommended, since in this way it will be guaranteed that students know how biology activities that are exportable to environmental science subjects are designed and developed.

The exercises will be individual and the student must prepare a report at the end of each session, which will constitute their practice notebook, following the guidelines and presentation format that will be marked at the beginning of the practical sessions. The exercises will be corrected at the end of each session and the requests for review will be attended during the tutoring hours of the teachers responsible for the practices.

## 4. Methodology, learning tasks, syllabus and resources

### 4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, laboratory sessions and tutorials.

The proposed activities are focused on understanding and assimilation of the main foundations of Biology and knowledge of Biodiversity.

### 4.2. Learning tasks

This course is organized as follows:

- **Lectures** (30 hours). 15 sessions. At the beginning each topic provides the student the theoretical content according to the syllabus.
- **Laboratory sessions** (30 hours). 5 sessions. Before starting the practice sessions period the student will have a practice sessions guide, including the fifteen practical sessions he has to perform in the laboratory, as well as preliminary information on the submission of reports that shall include in his lab notebook.
- **Tutorials**. These are individually developed, in order to advise the student and solve doubts that may arise in the study of the subject.

### 4.3. Syllabus

This course will address the following topics:

#### Lectures

- **Section A. Molecular Genetics**
  - Topic 1. The genome. Levels of organization. The prokaryotes genome and organular genomes (mitochondrial and chloroplasts). Eukaryote nuclear genome: sizes, structure, evolution. Repetitive DNAs and simple or low copy DNA. Genes and family genetics.
  - Topic 2. DNA replication. Fundamentals and mechanisms of the replication. Replisome. DNA repair and mutations due to substitution. Mutagenetic agents.
  - Topic 3. Transcription of DNA to RNA. Transcription mechanisms. Maturing process of ANN eukaryotes. Post-transcriptional alterations. Packing of ribosomal subunits.
  - Topic 4. Translation. Characteristics of the genetic code. Variations the code. Protein synthesis in prokaryote and in eukaryotes. Mechanisms and cellular localization.
  - Topic 5. Regulation mechanisms of genetic expression. Regulation of transcription in prokaryotes: the cascade of Sigma factors, operon. Regulation of transcription in eukaryotes: heterochromatinization of DNA. Editing function of ANN messenger.
- **Section B. Reproduction and development**
  - Topic 6. The eukaryote cell cycle. Phases of cell division and interphase. Mitotic cell division. Cell division in animals and vegetables. Mitotic mutagen. Mitoic cell division. Mitoic divisions I and II (meiosis I and II): phases and mechanisms. Genetic significance of meiosis: recombination and chromosome reduction in gametogenesis.
  - Topic 7. Sexual reproduction in animals. Spermatogenesis and oogenesis. Hormonal control of gametogenesis. Fertilization.
  - Topic 8. Sexual reproduction in plants. The flower. Formation of masculine and feminine gametophyte and gametes. Pollination.
  - Topic 9. Self-incompatibility. Seed development. Dormancy and germination. Asexual reproduction: vegetative reproduction and apomixis. Agamic complexes.
  - Topic 10. Animal development. Embryogenesis (blastulation, gastrulation, neurulation). Determining and differentiating embryonic cells. Genetic and hormonal control of animal development.
  - Topic 11. Plant development. Regulating hormones: Auxins, Cytokinins, Gibberellin, Abscisic acid and Ethylene. Photoreceptors: Phytochrome.
- **Section C. Inheritance**
  - Topic 12. Laws of inheritance. Phenotype y genotype. Mendelism. Principle of Uniformity of F1, Principal of Segregation), Principle of Independent Assortment. Genetic bases of the laws of Mendelism). Test Cross. Mendelian tests with multiple genes.

- Topic 13. Non-Mendelian heredity. Variations of dominance (codominance) Pluri-allelism. Genetic interaction: Epistasias. Genetic linkage. Sex linkage. Pleiotropy. cytoplasmatic inheritance.
- Topic 14. Hereditary Variation: chromosomal alterations and ploidy levels. Chromosomal deletion, inversions y translocation. Diplodia, aneuploidy, and polyploidy. Homoploid hybrids. Non-hybrid polyploidy (Autopoliploidy). Hybrid polyploids (Allopolyploidy). Inheritance in polyploidys. Evolutionary, ecological and economic importance of polyploid plants.
- **Section D. Evolution**
  - Topic 15. Evolution. Darwin?s Theory of Evolution. Speciation. Biological species. Anagenesis and cladogenesis. Allopatric and sympatric speciation. Speciation by hybridization. Microevolution and macroevolution population. Phylogenetic reconstructions. Natural phenomena such as continental drift, extinction and adaptive radiation.

#### Laboratory sessions

- Topic 1- Concepts of microscopy: Optical and electronic microscopy.
- Topic 2- Electronic microscopy: Interpretations of electronographies of animal and vegetable tissue.
- Topic 3- Observing eukaryotic cells: animal cells and plant cells.
- Topic 4- Observing and identifying plastids.
- Topic 5- Cultivation and identification of bacteria. Gram's method. Sporulating bacteria and nitrogen-fixing bacteria.
- Topic 6-Observing fungal structures. Identifying fungi.
- Topic 7- DNA isolation.
- Topic 8- The genetic code.
- Topic 9- Mitosis. Observing the phases of mitosis.
- Topic 10- Producing karyotypes.
- Topic 11-.Meiosis. Observing the phases of meiosis.
- Topic 12- Sexual reproduction and embryonic development in animals and higher plants. Observing gamete cells of animals and plants gametophytes. Observing the embryonic development in plants and animals.
- Topic 13- Mendelian Genetic Problems
- Topic 14- Non Mendelian Genetic Problems I
- Topic 15- Non Mendelian Genetic Problems II

#### 4.4.Course planning and calendar

It is estimated that a student must devote to this subject, 6 ECTS, a total of 150 hours. The weekly charge of the student, in hours, is reflected in the following schedule:

Activity Type / Week	1	2	3	4	5	6	7	8	9	10
----------------------	---	---	---	---	---	---	---	---	---	----

##### Face-to-face sessions

Lectures	2	2	2	2	2	2	2	2	2	2
----------	---	---	---	---	---	---	---	---	---	---

Lab sessions			2	2	2	2	2	2	2	2
--------------	--	--	---	---	---	---	---	---	---	---

Evaluation

##### Non face-to-face work

Individual work	4	4	5	5	5	5	5	5	5	5
<b>TOTAL</b>	<b>6</b>	<b>6</b>	<b>9</b>	<b>9</b>	<b>9</b>	<b>9</b>	<b>9</b>	<b>9</b>	<b>9</b>	<b>9</b>

<b>Activity Type / Week</b>	11	12	13	14	15	16	17	18	19	<b>Total</b>
-----------------------------	----	----	----	----	----	----	----	----	----	--------------

**Face-to-face sessions**

										<b>66</b>
Lectures	2	2	2	2	2					30
Lab sessions	2	2	2	2	2	2	2			30
Evaluation								2	4	6

**Non face-to-face work**

										<b>84</b>
Individual work	5	5	5	5	5	4	4	3		84
<b>TOTAL</b>	<b>9</b>	<b>9</b>	<b>9</b>	<b>9</b>	<b>9</b>	<b>6</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>150</b>

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty of Sciences website and Moodle (<http://moodle.unizar.es/>).

#### 4.5. Bibliography and recommended resources

- BB** Curtis, Helena. Biología / Helena Curtis ; N. Sue Barnes ... [et al.]. 7ª ed. en español Buenos Aires [etc.] : Editorial Médica Panamericana, 2008
- BB** Freeman, Scott. Biología / Scott Freeman . 31ª ed. Madrid : Pearson Educación, 2009
- BB** Solomon, Eldra Pearl. Biología / Eldra Pearl Solomon, Linda R. Berg, Diana W. Martin . 5a ed. México [etc.] : McGraw-Hill Interamericana, cop. 2001
- BB** Vida : la ciencia de la biología / William K. Purves ... [et al.] . 6a ed. Buenos Aires [etc.] : Editorial Médica Panamericana, 2003
- BC** Berg, Jeremy M.. Bioquímica / Jeremy M. Berg, John L. Tymoczko, Lubert Stryer ; contenidos web de Neil D. Clarke. . 5a ed. Barcelona [etc.] : Reverté, D.L. 2003

- BC** Biología molecular de la célula / Bruce Alberts ... [et al.] ; traducido por Mercé Dufort i Coll, Miquel Llobera i Sande . 4ª ed. Barcelona : Omega, cop. 2004
- BC** Evolución / Theodosius Dobzhansky...[et al.] ; [traducido por Montserrat Aguadé] . [1a ed., 3a reimp.] Barcelona : Omega, 1993
- BC** Fisiología y bioquímica vegetal / coordinación, J. Azcón- Bieto, M. Talón . 1a ed. Nueva York [etc.] : Interamericana-McGraw-Hill, 1993
- BC** Graur, D., Li, W.-H. (1999). Fundamentals of molecular evolution (2nd. ed.). Sunderland: Sinauer Associates
- BC** Margulis, Lynn. Cinco reinos : guía ilustrada de los phyla de la vida en la Tierra / Lynn Margulis, Karlene V. Schwartz ; [traducción de Ana Avila] . 1a ed. Barcelona : Labor, 1985
- BC** Tamarin, Robert H. Principios de genética / Robert H. Tamarin ; [versión española por Alfredo Ruiz ... (et al.)] . Barcelona [etc.] : Reverté, D.L. 1996

The updated recommended bibliography can be consulted in: <http://psfunizar10.unizar.es/br13/egAsignaturas.php?id=10964>

Network Resources

Will be posted on the web (Moodle ADD) basic reference material as the Subject program, teaching guide, summaries of the theoretical issues, scripts practices or different material.