

## 25201 - Biology

### Información del Plan Docente

Academic Year	2018/19
Subject	25201 - Biology
Faculty / School	201 - Escuela Politécnica Superior
Degree	277 - Degree in Environmental Sciences 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**

#### **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)**

### **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**
  - o 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.
  - o Topic 2. DNA replication. Fundamentals and mechanisms of the replication. Replisome. DNA repair and mutations due to substitution. Mutagenetic agents.
  - o Topic 3. Transcription of DNA to RNA. Transcription mechanisms. Maturing process of ANN eukaryotes. Post-transcriptional alterations. Packing of ribosomal subunits.
  - o Topic 4. Translation. Characteristics of the genetic code. Variations the code. Protein synthesis in prokaryote and in eukaryotes. Mechanisms and cellular localization.
  - o 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**
  - o Topic 6. The eukaryote cell cycle. Phases of cell division and interphase. Mitotic cell division. Cell division in animals and vegetables. Mitotic mutagen. Mitotic cell division. Mitotic divisions I and II (meiosis I and II): phases and mechanisms. Genetic significance of meiosis: recombination and chromosome reduction in gametogenesis.
  - o Topic 7. Sexual reproduction in animals. Spermatogenesis and oogenesis. Hormonal control of gametogenesis. Fertilization.
  - o Topic 8. Sexual reproduction in plants. The flower. Formation of masculine and feminine gametophyte and gametes. Pollination.
  - o Topic 9. Self-incompatibility. Seed development. Dormancy and germination. Asexual reproduction: vegetative reproduction and apomixis. Agamic complexes.
  - o Topic 10. Animal development. Embryogenesis (blastulation, gastrulation, neurulation). Determining and differentiating embryonic cells. Genetic and hormonal control of animal development.
  - o Topic 11. Plant development. Regulating hormones: Auxins, Cytokinins, Gibberellin, Absciscic acid and Ethylene. Photoreceptors: Phytochrome.
- **Section C. Inheritance**
  - o 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.
  - o Topic 13. Non-Mendelian heredity. Variations of dominance (codominance) Pluri-allelism. Genetic interaction: Epistasias. Genetic linkage. Sex linkage. Pleiotropy. citoplasmatic inheritance.
  - o 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**

- o 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:

<b>Activity Type / Week</b>	1	2	3	4	5	6	7	8	9	10
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#### **Face-to-face sessions**

Lectures	2	2	2	2	2	2	2	2	2	2
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Lab sessions			2	2	2	2	2	2	2	2
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Evaluation

Individual  
work

4      4      5      5      5      5      5      5      5      5

TOTAL	6	6	9	9	9	9	9	9	9
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Activity Type / Week	11	12	13	14	15	16	17	18	19	Total
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**Face-to-face sessions** 66

Lectures	2	2	2	2	2	30
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Lab sessions	2	2	2	2	2	2	2	30
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	2	4	6
Evaluation			

Non	84
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**face-to-face  
work**

Individual work	5	5	5	5	5	4	4	3		84
TOTAL	9	9	9	9	9	6	6	5	4	150

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**

<b>BB</b>	Curtis, Helena. Biología / Helena Curtis ; N. Sue Barnes ... [et al.]. 7ª ed. en español Buenos Aires [etc.] : Editorial Médica Panamericana, 2008
<b>BB</b>	Freeman, Scott. Biología / Scott Freeman . 31ª ed. Madrid : Pearson Educación, 2009
<b>BB</b>	Solomon, Eldra Pearl. Biología / Eldra Pearl Solomon, Linda R. Berg, Diana W. Martin . 5a ed. México [etc.] : McGraw-Hill Interamericana, cop. 2001
<b>BB</b>	Vida : la ciencia de la biología / William K. Purves ... [et al.] . 6a ed. Buenos Aires [etc.] : Editorial Médica Panamericana, 2003
<b>BC</b>	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
<b>BC</b>	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
<b>BC</b>	Evolución / Theodosius Dobzhansky...[et al.] ; [traducido por Montserrat Aguadé] . [1a ed., 3a reimp.] Barcelona : Omega, 1993
<b>BC</b>	Fisiología y bioquímica vegetal /

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BC

coordinación, J. Azcón- Bieto, M. Talón .  
1a ed. Nueva York [etc.] :  
Interamericana-McGraw-Hill, 1993  
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

### 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.

The updated recommended bibliography can be consulted in:

<http://psfunizar7.unizar.es/br13/egAsignaturas.php?id=10964>