

**Información del Plan Docente**

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|-------------------------|--|
| <b>Academic Year</b>    | 2017/18  |
| <b>Faculty / School</b> | 201 - Escuela Politécnica Superior   |
| <b>Degree</b>           | 277 - Degree in Environmental Sciences<br>571 - Degree in Environmental Sciences |
| <b>ECTS</b>             | 6.0  |
| <b>Year</b>             | 1  |
| <b>Semester</b>         | First Four-month period  |
| <b>Subject Type</b>     | Basic Education  |
| <b>Module</b>           | ---  |

**1.General information****1.1.Introduction****1.2.Recommendations to take this course****1.3.Context and importance of this course in the degree****1.4.Activities and key dates****2.Learning goals****2.1.Learning goals****2.2.Importance of learning goals****3.Aims of the course and competences****3.1.Aims of the course****3.2.Competences****4.Assessment (1st and 2nd call)****4.1.Assessment tasks (description of tasks, marking system and assessment criteria)****5.Methodology, learning tasks, syllabus and resources****5.1.Methodological overview**

The learning process that is designed for this subject is based on the following:

The course is oriented basic character. The proposed activities are focused on understanding and assimilation of the main foundations of Biology and knowledge of Biodiversity.

## 5.2. Learning tasks

The program includes the following activities ...

### *Theoretical classroom sessions*

At the beginning each topic provides the student the theoretical content according to the theoretical Subject program, leaving the rest for non-contact work of the student.

### *Lab practices*

Before starting the practice period the student will have a guide practices, including the fifteen practical sessions he has to perform in the laboratory, as well as preliminary information on the submission of reports shall include in your lab notebook.

### *Tutoring sessions*

These are individually developed, in order to advise the student and resolve the doubts that may arise in the study of the subject.

## 5.3. Syllabus

### THEORY

15 sessions (30 hours of class) in which the following subjects will be studied:

#### A) Molecular Genetics

1. The genome. Levels of organization. The prokaryotes genome and organulars genomes (mitochondial and cloroplasts). Eukaryote nuclear genome: sizes, structure, evolution. Repetitive DNAs and simple or low copy DNA. Genes and family genetics.
2. DNA replication. Fundamentals and mechanisms of the replication. Replisome. DNA repair and mutations due to substitution. Mutagenetic agentes.
3. Transcription of DNA to RNA. Transcription mechanisms. Maturing process of ANN eukaryotes. Posttranscriptional alterations. Packing of ribosomal subunits.
4. Translation. Characteristics of the genetic code. Variations the code. Protein synthesis in prokaryote and in eukaryotes. Mechanisms and cellular localization.
5. Regulation mechanisms of genetic expression. Regulation of transcription in prokaryotes: the cascade of Sigma

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factors, operon. Regulation of transcription in eukaryotes: heterochromatinization of DNA. Editing function of ANN messenger.

### B). Reproduction and development

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.

7. Sexual reproduction in animals. Spermatogenesis and oogenesis. Hormonal control of gametogenesis. Fertilization.

8. Sexual reproduction in plants. The flower. Formation of masculine and feminine gametophyte and gametes. Pollination.

9. Self-incompatibility. Seed development. Dormancy and germination. Asexual reproduction: vegetative reproduction and apomixis. Agamic complexes.

10. Animal development. Embryogenesis (blastulation, gastrulation, neurulation). Determining and differentiating embryonic cells. Genetic and hormonal control of animal development.

11. Plant development. Regulating hormones: Auxins, Cytokinins, Gibberellin, Abscisic acid and Ethylene. Photoreceptors: Phytochrome.

### C). Inheritance

12. Laws of inheritance. Phenotype y genotype. Mendelism. Principle of Uniformity of F1, Principle of Segregation), Principle of Independent Assortment. Genetic bases of the laws of Mendelism). Test Cross. Mendelian tests with multiple genes.

13. Non-Mendelian heredity. Variations of dominance (codominance) Pluri-allelism. Genetic interaction: Epistasias. Genetic linkage. Sex linkage. Pleiotropy. cytoplasmatic inheritance.

14. Hereditary Variation: chromosomal alterations and ploidy levels. Chromosomal deletion, inversions y translocation. Diploidy, aneuploidy, and polyploidy. Homoploid hybrids. Non-hybrid polyploidy (Autopoliploidy). Hybrid polyploids (Allopolyploidy). Inheritance in polyploidys. Evolutionary, ecological and economic importance of polyploid plants.

### D). Evolution

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 PRACTICALS

5 sessions (30 hours of class) in which the following subjects will be studied:

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

### 5.4. Course planning and calendar

Timetable sessions and presentation of works



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|                        |          |          |          |          |          |          |          |          |          |    |            |
|------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----|------------|
| <i>Teory</i>           | 2        | 2        | 2        | 2        | 2        |          |          |          |          | 30 |            |
| <i>Lab practices</i>   | 2        | 2        | 2        | 2        | 2        | 2        | 2        |          |          | 30 |            |
| <i>Evaluation</i>      |          |          |          |          |          |          |          |          | 2        | 4  | 6          |
| Distnace a ctivity     |          |          |          |          |          |          |          |          |          |    | <b>84</b>  |
| <i>Individual work</i> | 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> |

### 5.5. Bibliography and recommended resources

|           |  |
|-----------|--|
| <b>BB</b> | Curtis, Helena. <i>Biología</i> / Helena Curtis ; N. Sue Barnes ... [et al.]. 7ª ed. en español Buenos Aires [etc.] : Editorial Médica Panamericana, 2008                |
| <b>BB</b> | Freeman, Scott. <i>Biología</i> / Scott Freeman . 31ª ed. Madrid : Pearson Educación, 2009   |
| <b>BB</b> | Solomon, Eldra Pearl. <i>Biología</i> / 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.. <i>Bioquímica</i> / 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> | <i>Biología molecular de la célula</i> / Bruce   |

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Alberts ... [et al.] ; traducido por Mercé Dufort i Coll, Miquel Llobera i Sande . 4<sup>a</sup> 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

### 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>