Universitat Autònoma de Barcelona

2017/2018

Genetics

Code: 100853
ECTS Credits: 6

Degree	Type	Year	Semester
2500251 Environmental Biology	FB	1	2

Contact

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Use of languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: Yes

Other comments on languages

Algunas de las entregas se harán en inglés

Prerequisites

It is assumed that students have acquired the basic knowledge of Biology during high school and a revision of the baccalaureate book is recommended to those who have not studied this subject previously.

The student must have passed the laboratory safety and biosecurity test, and be knowledgeable and accept the laboratories operating regulations at the Biosciences School

Objectives and Contextualisation

This course takes place in the first year of Environmental Biology degree and discusses the fundamental principles of Genetics starting with Mendelian Genetics and concluding with Population Genetics and Evolution. This subject has its continuity the third year with the subject of Phylogeny.

The main objective of this course is that students receive a general introduction to the basic principles of Genetics and understand the inheritance principles, their cytological and molecular basis, and the variation at the molecular and populational level.

The educational objectives are the following:

1) To understand the need for the study of genetics in the context of environmental Biology and the relation of genes to the environment.

2) To know the principles of genetic information transmission, the chromosomal theory of inheritance and be able to perform genetic maps and interpret pedigrees

3) To know the structure, organization, function of the genetic material

4) To know how to use and interpret genome databases and to understand the fundamentals of bioinformatic analysis

5) To know the sources of genetic variability, how measuring and interpret it from a perspective of genetic improvement, conservation and evolution.

Content

1. Introduction

Why study Genetics? Genetics and human problems. Genetics and Biology. Genes and the environment: genotype and phenotype. Genetic analysis techniques.

2. Mendelian analysis

The Medel's experiments. Principles of segregation and independent transmission. Mendelian genetics in humans and agriculture.

3. Determination of sex and the chromosomal theory of inheritance

Sex determination. Mitosis and meiosis. The genes are on the chromosomes. Sex chromosomes and sex linkage.

4. Extension of the Mendelian analysis

Relations of dominance. Multiple alleles. Lethal genes. Gene interaction and epistasis. Penetrance and expressivity.

5. Genetic linkage: basis of chromosomal mapping in eukaryotes

The discovery of genetic linkage: recombination. Linkage maps: calculation of recombination frequency between two points. Three point maps. Interference. The chromosomal crossover.

6. Mutation

Genetic mutations: somatic and germinals. Induction of mutations. Mutation and cancer. Mutagens in genetic analysis. Chromosomal mutations: structural and numerical.

7. Population genetics.

The Darwin Revolution. Genetic variation and its sources. The selection. Balanced polymorphisms. The adaptive landscape. Artificial selection. Randomness in populations: genetic drift and founder effect. Variation and divergence in populations. Conservation genetics

8. Structure and DNA replication
Semiconservative replication. The mechanism of DNA replication: origin of replication. Replication in eukaryotes.

9. DNA Function: Transcription and Translation

RNA and RNA polymerase. Initiation, elongation and termination. Introns and exons. Messenger RNA and its processing. Genetic code. Concept of codon. The transfer RNA. Degeneracy of genetic code.Protein synthesis: the ribosome. Initiation, elongation and termination.

10. Genomics

Low and high resolution physical maps. Genome sequencing strategies. Organization of DNA sequences. Sequencing of the human genome. Functional genomics. Bioinformatics.