Universitat Autònoma de Barcelona

2017/2018

Genetics

Code: 101963
ECTS Credits: 6

Degree	Type	Year	Semester
2500890 Genetics	OB	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

Prerequisites

- The own requirements of access to the degree.
- It is convenient that the student review the basic processes of cell division of the subject of Cellular Biology and Histology
- The foundations of probability that have been seen in the subject of Mathematics, and know the statistical distributions binomial, Poisson and normal.
- In order to attend the practical sessions it is necessary that the student justifies having passed the biosafety and safety tests that will find in the Virtual Campus and to be knowledgeable and accept the working rules of the laboratories of the Faculty of Biosciences.

Objectives and Contextualisation

The subject of Genetics is taught in the 1st year of the Degree of Genetics (2nd semester). It is the first subject with specific content of genetics, and that is why they will provide the basic foundations of the hereditary transmission, that is, how genetic information is transferred between generations in both individuals and populations. Molecular genetics is looked very briefly, since it will be treated in depth in the second course. The contents of this course include the transmission of chromosomes and genes, the development of genetic maps, the mutation of the genetic material, the inheritance of characters of continuous variation, the genetics of populations, and the genetic properties and characteristics of the model organisms.

Each class of this course wants to be a unique opportunity to meet the new and fascinating ideas of Genetics. From the very beginning we want to convey an overview of the problems and the scope of this Science. We want to motivate you, creating a contagious interest and enthusiasm, promoting critical inquiry and developing curiosity about the issues of genetics. We are fortunate that we can talk about the excitement and vitality of this science realistically, without the need to pretend. The subject wants to be a lasting guide, a continuous reference, to which you can turn mentally over and over again.

From the point of view of learning to acquire, students are expected to understand the power of inquiring of the genetic analysis, which has opened the door to many of the great discoveries of genetics, and how this powerful methodological tool is applied in current genetics. It is also intended to acquire a historical perspective of the great milestones of genetics, from the experiments of Mendel to the sequencing of the human genome.

As a complement to face-to-face training this course has an online learning platform that implements the new and powerful learning and knowledge technologies (LKT) in the course. This resource aims to facilitate personalized work, individual discovery, integration of different sources of information, as well as enhancing

originality and the development of innovative skills, all with the ultimate goal that the student acquires new perspectives for the construction and understanding of the knowledge and skills required for the training of a professional geneticist. Many of the exercises and tasks to be done during the course emphasize the multidisciplinary nature of Genetics. Among other tools, the online Portfolio of works, tasks and activities either assigned or self-created by the student, is a featured element for the monitoring and evaluation of the learning acquired by the student throughout the course.

The formative objective is to acquire a solid understanding of the bases and mechanisms of inheritance and the method of genetic analysis: to be able to explain and interpret the principles of the transmission of genetic information, to analyze genealogies and to apply it to genetic counseling, to elaborate and work with genetic maps, to understand what is and how genetic variation is measured in populations, to design and obtain relevant information from genetic experiments and to interpret the results obtained. Explanations will be contextualized historically for the student to visualize how the conceptual building of genetics has been constructed and to appreciate the importance of the current moment of this science, vibrant and full of promises and challenges.

Content

Theoretical contents

Part I. Introduction

Topic 1: The science of genetics. Fundamental concepts. Genetic analysis. Model organisms of genetics.

Part II. Mendelism

Topic 2: Mendelian Principles. Equal segregation and independent assortment. Types of inheritance. Examples of Mendelian inheritance in humans.

Topic 3: Mitosis and meiosis. Chromosomal theory of heredity. Biological cycles.

Topic 4: Inheritance of sex. Determination of sex. Inheritance linked to sex. Inheritance influenced by sex. Inheritance limited to one sex. Compensation of dosis.

Topic 5: Analysis of genealogies and genetic counseling.

Topic 6: Extensions of the Mendelian analysis. Relations of dominance. Multiple Alelism. Lethal allele and essential gene. Penetrance and expressiveness. Genotypic interactions. Epistasis. Biochemical genetics. Hypothesis a gene-an enzyme. Test of complementation.

Part III. Recombination and genetic maps

Topic 7: Linkage, crossing-over and recombination.

Topic 8: Genetic maps. Genetic mapping: two points cross; three points cross. Cytological and nucleotide demonstration of crossing-over. Analysis of tetrads. Mitotic recombination. Genetic maps in humans.

Part IV. Quantitative inheritance and non-Mendelian inheritance

Topic 9: Quantitative inheritance. Traits controled by several loci. Meaning of polygenic inheritance. Heritability. Metrics of heritability.

Topic 10: Non-Mendelian inheritance. Cytoplasmic inheritance: mitochondria, chloroplasts. Transposable genetic elements.

Part V. DNA and mutation

Topic 11: The double helix.

Topic 12: Mutation. Spontaneous mutation and induced mutation. Types of mutation. Repair.

Topic 13: Numerical and structural chromosomal changes. Deletions and Duplications. Inversions and their effects. Translocations. Variation in chromosome number: euploidy and aneuploidy. Aneuploidy in man. Polyploidy: self and alopoliploidy.

Part VI. Population genetics

Topic 14: Population genetics. The Mendelian population. Allelic and genotypic frequencies. Hardy-Weinberg equilibrium. Non-random mating. Evolutionary factors: mutation, migration, genetic drift and natural selection

Contents of the lab practices

Session 1. Introduction to the biology and morphology of Drosophila melanogaster (1 session) (Integrated Laboratories)
Session 2. Analysis of a mutant and assignment to its linkage group (1 session) (Integrated Laboratories)
Session 3. Elaboration of a genetic map of three markers (1 session) (Integrated Laboratories)
Session 4. Observation of chromosomes and mutations (somatic recombination, chromosomal alterations, micronuclei) (1 session) (Integrated Laboratories)