UAB
Universitat Autònoma de Barcelona

Genetics

Code: 102674
ECTS Credits: 3

2024/2025

Degree	Type	Year
2502445 Veterinary Medicine	OB	2

Contact

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

Although there are no official prerequisites, it is convenient for the student to review the basic contents of Biology and Biochemistry.

Objectives and Contextualisation

It is a subject of the second year of the Veterinary degree of a basic nature. In this subject, the student should acquire the theoretical and practical knowledge needed to understand the organization and structure of the genome in prokaryotes and eukaryotes, the mechanisms of gene expression and its regulation at the transcriptional and post-transcriptional levels, as well as being aware of the different sources of genetic variation, from point nucleotide mutations to chromosomal rearrangements, and its impact on several phenotypes of veterinary interest. The student will also become familiar with various techniques of genome analysis and genetic variability. The specific learning objectives are:

- Familiarize yourself with the basic concepts of Genetics.

- Know the mechanisms that regulate gene expression

- Understand how the transmission of phenotypic characters to offspring occurs.

- Understand the processes through which genetic and environmental factors affect phenotypic variation and the various pathologies of domestic species

- Know the techniques and methods of Molecular Genetics and Structural and Functional Genomics.

Competences

- Comunicar la informació obtinguda durant l'exercici professional de manera fluïda, oralment i per escrit, amb altres col·legues, autoritats i la societat en general.
- Demonstrate knowledge and understanding of the physical, chemical and molecular bases of the main processes in the animal organism.

Learning Outcomes

1. Analyse the chromosomal basis of inheritance and the concept of ligation between genes.
2. Apply the molecular techniques used in the genome analysis (building of maps and genotyping of polymorphisms).
3. Communicate information obtained during professional exercise in a fluid manner, orally and in writing, with other colleagues, authorities and society in general.
4. Describe the processes that regulate the expression of genes in prokaryotes and eukaryotes.
5. Evaluate the effect of chromosomal mutations and rearrangement on the appearance of different pathologies in domestic species.
6. Interpret intra locus and between-gene interactions.
7. Interpret the patterns of inheritance of Mendelian and complex characters.

Content

The global content of this subject consists of six theoretical sections:

Section 1. Organization and structure of hereditary material.

Section 2. Gene expression.

Section 3. Transmission of hereditary material.

Section 4. Genetic variation.

Section 5. Analysis of the genome and its applications.

Section 6. Immunogenetics and heredopathology.

The student will also become familiar with solving Genetics problems through a self-learning approach. This part of the course will consist of two thematic sections:

Section A. Mendelian Genetics Problems

Section B. Molecular Genetics and Linkage Problems.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			

Lectures	25	1	1, 2, 5, 4, 7, 6
Type: Autonomous			
Problem solving	17	0.68	1, 5, 7, 6
Study	24	0.96	1, 2, 5, 4, 7, 6
Work on Bioinformatic Resources	5	0.2	2, 3

The teaching methodology that will be carried out during the whole learning process is fundamentally based on the student's work. The professors will be in charge of guiding the students through this process. In accordance with the teaching objectives of the subject, the training activities that will be carried out are:

- Lectures: With these classes, the student acquires the basic scientific-technical knowledge of the subject that must be complemented with the study of the concepts explained by the professors.

- Self-learning-Problem solving: Students will be provided with a wide collection of solved problems in which the resolution is explained in a very detailed and didactic way. This material will allow students to become familiar, in an autonomous but guided way, with this practical aspect of the subject.

- Self-learning-Group work: This activity aims to promote group work, as well as enhance the ability to use computer resources to resolve issues of a biological nature. The student will be given a questionnaire with a series of questions related to the bioinformatic analysis of genetic data (data search, in silico analysis of sequences, navigation through genetic databases, etc.). Likewise, the student will be provided with information necessary to become familiar with the bioinformatics tools needed to solve the questionnaire. For example, if the student is asked to build a restriction map of a DNA sequence, instructions will be given about how to find the online bioinformatics tool to do it. Moreover, some general notions about how to use such tools will be provided. This bioinformatic work will be done in groups of 4 students.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Practical Session of Problem Solving	35%	2	0.08	1, 4, 7, 6
Theoretical Exam	50%	2	0.08	1, 2, 5, 4, 7, 6
Work	15%	0	0	2, 3

Continuous evaluation

The evaluation will be individual and will be carried out continuously in the context of the different training activities that have been scheduled. A Practical Problem-Solving Session will be held in the middle of the course, in which each student will have to solve, in the classroom and individually, a series of practical problems posed by the teachers. This evaluation activity will represent 35% of the final grade. Later, a Theoretical Exam will be held that will represent 50% of the final grade. Anyone who has failed any (or both)

assessment activities may take a Retake Exam. Anyone who has passed the exam and wants to improve the grade obtained may also take the retake exam, but in this case the retake exam will entail the waiver of the grade previously obtained.

Likewise, a work assignment will be carried out, in groups of 4 students, which will represent 15% of the final grade, consisting of answering a series of questions related to the analysis of DNA sequences and the structural characterization of the genome. The performance of this work will involve the use of a wide variety of bioinformatics tools, as well as consulting various databases related to Structural Genomics. The grade of the work will not be recoverable. In the event of failing the subject, the grade of the work will be saved for the following year. However, there will be the possibility of redoing it to increase the grade (this will entail the renunciation of the grade previously obtained). The work will be delivered in paper format on the same day as the Theoretical Exam.

The grades obtained in the Practical Problem-Solving Session and in the Theoretical Exam may be averaged when a grade equal to or greater than 4 is achieved in each of them. In the event of not reaching this threshold (either in one of the activities or in both), the overall grade of thesubject will be a failing grade. It is not necessary to obtain a minimum grade of the work to make an average. The maximum overall mark will be 10 points. When the overall grade is less than 10 points, it may be awarded (up to a maximum of 1.5 points and under the conditions indicated by the teacher in charge) depending on the student's attitude towards the subject, participation in class and the level of academic achievement. The minimum grade to pass the subject will be 5 points out of a maximum of 10 points.

Students will have the opportunity to review the grades of the exams and the work on the day/time/place indicated by the responsible teaching staff on the Virtual Campus.

Non-assessable: A student will be considered not to be assessable if he/she has participated in evaluation activities that represent $\leq$ 15% of the final grade.

Unique ***evaluation***

The unique evaluation follows the same programme as the continuous evaluation and consists of a single Theory and Problems Exam that will take place on the same day, time and place scheduled by the Theory Exam (see continuous evaluation). This theoretical-practical exam will represent 85% of the final grade. The work will be done as explained above and will represent 15% of the final grade, delivered on the same day that the Theory and Problems Exam is taken. The single evaluation can be recovered on the day scheduled for the Recovery Exam (see continuous evaluation).

Bibliography

General textbooks:

Pierce B.A. 2023. Fundamentos de Genética. Ed. Médica Panamericana.

Goldberg M., Fischer J., Hood L., Hartwell L., Aquadro C., Silver L. & Reynolds A.E. 2023. Genetics: From Genes to Genomes. Ed McGraw Hill.

Brooker R. 2023. Genetics: Analysis and Principles. Ed. McGraw Hill.

Benito C & Espino FJ. (2013) Genética: Conceptos esenciales. Ed. Médica Panamericana.

Krebs J.E., Goldstein E.S. & Kilpatrick S.T. (2012). Lewin. Genes: Fundamentos. Ed. Médica Panamericana.

Brown T.A. (2017). Genomes 4. Garland Science; Edición: 4. Anglès. Versió online de accés lliure: 2nd edition https://www.ncbi.nlm.nih.gov/books/NBK21128/

Nicholas F.W. (2009). Introduction to Veterinary Genetics. Blackwell Publishing..

Nickle & Barrette-Ng. Open Genetics. Book Online:

https://bio.libretexts.org/Bookshelves/Genetics/Book%3A_Online_Open_Genetics_(Nickle_and_Barrette-Ng)

Pierce B. A. (2015). Genética. Un enfoque conceptual 5ª ed. Panamericana. Castellà.

Textbooks by species:

PIPER L. & RUVINSKY A. (1997). The Genetics of Sheep. CABI Publishing.

ROTHSCHILD M. F. & RUVINSKY A. (2011). The Genetics of the Pig. CABI Publishing.

FRIES R. & RUVINSKY A. (1999). The Genetics of Cattle. CABI Publishing.

BOWLING A. T. & RUVINSKY A. (2000). The Genetics of the Horse. CABI Publishing.

RUVINSKY A. & SAMPSON A. J. (2012). The Genetics of the Dog. CABI Publishing.

Webs:

Online Mendelian Inheritance in Animals - http://omia.angis.org.au/

Inherited Diseases Database in Dogs - http://www.vet.cam.ac.uk/idid/

Canine Inherited Disorders Database - http://www.upei.ca/~cidd/intro.htm

National Center of Biotechnology - http://www.ncbi.nlm.nih.gov

Ensembl - http://www.ensembl.org/index.html

Bovine Genome Database - http://genomes.arc.georgetown.edu/drupal/bovine/

Software

National Center for Biotechnology Information (NCBI): http://www.ncbi.nlm.nih.gov/

Webcutter: http://heimanlab.com/cut2.html

Translate: https://web.expasy.org/translate/

Nucleotide Blast (https://blast.ncbi.nlm.nih.gov/Blast.cgi)

Language list

Name	Group	Language	Semester	Turn
(TE) Theory	1	Catalan	second semester	morning-mixed
(TE) Theory	2	Catalan	second semester	morning-mixed