Universitat Autònoma de Barcelona

2023/2024

Genetics

Code: 102674
ECTS Credits: 3

Degree	Type	Year	Semester
2502445 Veterinary Medicine	OB	2	2

Contact

Name: Josep Maria Folch Albareda

Email: josepmaria.folch@uab.cat

Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Teachers

Josep Maria Folch Albareda

Marcelo Amills Eras

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 three thematic sections:

Section A. Mendelian Genetics Problems

Section B. Molecular Genetics Problems.

Section C. Linkage Analyis Problems

Methodology

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.

Activities

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

Assessment

Continuous assessment

The evaluation will be individual and will be carried out continuously in the context of the different training activities that have been scheduled. There will be a single theoretical-practical exam that will include two independent assessment activities. The first activity will correspond to the evaluation of theory sections 1,2 and 3 and of the problems A section by means of a test exam and will represent 40% of the final grade of the subject. The second evaluation activity will consist of the evaluation of theory sections 4, 5, and 6 and of problem sections B and C by means of a test exam and will represent 45% of the final grade of the subject. Students who have failed one (or both) assessment activities will be able to retake it (them) on a resit exam. Students who have passed the exam and want to improve the grade obtained may also take the resit exam, but this will lead to the dismissal of the grade previously obtained.

Besides, a work will be carried out, in groups of 4 students, consisting of answering a series of questions related to the analysis of DNA sequences and the structural characterization of the genome. Carrying out 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 this bioinformatic work will be definitive (no second chance will be granted in case of failure). In the event that a student fails the subject, the grade of the work will be saved for the next year. However, it will be possible to redo the work to increase such grade, but this will lead to the dismissal of the previously obtained grade).

As mentioned, the grade obtained in the first evaluation activity of the theoretical-practical exam will constitute 40% of the overall mark and the one obtained in the second 45%. The grade of the work will constitute 15% of the global grade. The grades obtained in the two evaluation activities of the theoretical-practical exam will be averaged when at least a grade equal to or higher than 4 is attained in each one of them. In the case of not reaching this threshold (either in one of activities or both), the overall grade of the subject will be "failed". The maximum overall grade will be 10 points. When the overall grade is less than 10 points, it can be subsidized (up to a maximum of 1.5 points and in accordance with the criteria established by the professor responsible of the subject) depending on the student's attitude towards the subject, class participation and level of achievement. The minimum grade to pass the course 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 professor on the Virtual Campus.

Not assessable: A student not participating in assessment activities that represent $\leq$ 15% of the final grade will be considered as non-assessable.

Single Assessment

The single assessment follows the same program as the continuous assessment, it consists of a single theoretical-practical exam that will include two independent evaluation activities that will be carried out on the same day, time and place as the continuous evaluation of the subject. The first evaluation activity of the theoretical-practical exam will constitute 40% of the overall mark and the second the 45%.

The delivery of the work will follow the same procedure as in the continuous evaluation and must be delivered on the day of the theoretical-practical exam. This exam represents 15% of the overall mark.

The resit exam will be the same day than in the continuous assessment.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Theoretical-practical exam: Theory (sections 1-3) and Problems (section A)	40%	2	0.08	1, 4, 7, 6
Theoretical-practical exam: Theory (sections 4-6) and Problems (sections B and C)	45%	2	0.08	2, 5
Work	15%	0	0	2, 3

Bibliography

Textbooks

Books about general genetics

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/

Krebs J.E., Goldstein E.S., Kilpatrick S.T. (2017). Lewin's GENES XII. Jones & Bartlett Learning; Edición: 12. Anglès.

Krebs J.E., Goldstein E.S., Kilpatrick S.T. (2012). Lewin. Genes. Ed. Panamericana. Castellà.

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

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. (2016). Genetics: A Conceptual Approach. WH Freeman; Edición: 6th ed. Anglès.

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

Genetics of each 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)