Information about the subject

Degree: Bachelor of Science Degree in Veterinary Medicine

Faculty: Faculty of Veterinary Medicine and Experimental Sciences

Code: 1260110 **Name:** Genetics

Credits: 6,00 **ECTS Year:** 1 **Semester:** 2

Module: Module of Common Basic Training

Subject Matter: Genetics **Type:** Compulsory

Department: Basic and Cross-disciplinary Sciences

Type of learning: Classroom-based learning

Languages in which it is taught: Spanish

Lecturer/-s:

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Module organization

Module of Common Basic Training

Subject Matter	ECTS	Subject	ECTS	Year/semester
Statistics	6,00	Biometrics and Statistics	6,00	1/1
Biology	6,00	Animal and Plant Biology	6,00	1/1
Biochemistry	6,00	Biochemistry	6,00	1/2
Animal Anatomy	18,00	Animal Anatomy I and Embryology	6,00	1/1
		Animal Anatomy II	6,00	1/2
		Animal Cytology and Histology	6,00	1/2
Animal Physiology	12,00	Animal Physiology I	6,00	2/1
		Animal Physiology II and Immunology	6,00	2/2
Genetics	6,00	Genetics	6,00	1/2
Animal Domestication	6,00	Animal Domestication (Ethnology, Ethology and Animal Welfare)	6,00	1/2
Biological Agents of Interest in Veterinary Medicine	12,00	Veterinary Microbiology	6,00	2/2
		Veterinary Parasitology	6,00	2/1
Veterinary Medicine and Society	6,00	Veterinary Regulations and Legislation, Social Morality and Professional Deontology	6,00	5/1

Physics and Chemistry	6,00	Physico-chemical fundamentals of veterinary medicine	6,00	1/1

Recommended knowledge

The student should know or review the basic contents of Biology and Biochemistry.

Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

R1	The student knows the nature and organization of hereditary material, as well as the regulation of its expression.
R2	The student describes and interprets the principles of transmission and recombination of genetic information across generations in animal species.
R3	The student identifies and knows the basic principles of genetic biotechnology and the processes of genetic modification in different organisms.
R4	The student searches bibliographic information related to genetics from different sources and knows how to analyse it with a critical and constructive spirit.
R5	The student uses different molecular biology and genetics techniques in the laboratory.
R6	The student is able to differentiate between different types of mutations and knows the types of diseases caused by changes in hereditary material in animals.
R7	The student uses the necessary computer tools to carry out the genetic analysis.

Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

BASIC		Weighting			
		1	2	3	4
CB1	Students must show that they have and understand knowledge in a field of study that is based on general secondary education on a level that, although supported by advanced text books, includes also some aspects that involve knowledge belonging to the vanguard of their field of study.			x	

GENERAL		Weighting			
		1	2	3	4
CG3	Understanding and applying control of animal breeding, management, health, reproduction, protection, and feed as well as improving production.	x			

SPECIFIC		Weighting			
		1	2	3	4
E11	Knowing and applying principles and foundation of molecular and genetic bases of biological processes.				x
E12	Knowing and applying principles and foundations of the basic principles of genetic biotechnology and of population genetics.				x

TRANSVERSAL		Weighting			
		1	2	3	4
T1	Capacity of analysis, synthesis, implementation of knowledge for problem-solving and decision-making.			x	

T4	Mastering fluency in oral and written mother tongue communication, listening and responding effectively using a language appropriate to audience and context.			x
T6	Using information technology to communicate, share, search for, collect, analyze and manage information, especially related to the veterinarian practice.	x		
T8	Efficient and effective work, both independently and as a member of a multidisciplinary team or unit, showing respect, appreciation and sensitivity to the work of others.			x
T10	Ability to learn, to research, and to be aware of the need to keep knowledge updated, and attending training programs.			x

Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R3, R4, R6, R7	50,00%	Written assessment of acquired knowledge and skills. The test may consist of a series of open-ended questions or multiple-choice questions about the theoretical contents of the module and/or practical exercises (problem-solving).
R3, R4, R6, R7	15,00%	Evaluation of the use of the practical lessons in the classroom, of problems or computer science, seminars and tutorials, by means of participation, computer-supported problem solving and the elaboration of the corresponding reports.
R5	20,00%	Evaluation of the practical laboratory work, which must demonstrate the competences acquired by the student and his or her ability to use them to solve the different situations and problems that arise in a laboratory; this assessment may consist of one of the following methods, or a combination of several of them: an individual written test, the individual or group performance of a laboratory experience, the delivery of an individual or group report on the work carried out in the laboratory.
R1, R2, R3, R6	10,00%	Evaluation of group work through a system of continuous assessment throughout the course based on the delivery of assignments the objectives and content of which will be proposed by the teacher.
R1, R2, R3, R6	5,00%	Evaluation of activities in which the student must do some research individually and structure information related to each of the topics through a system of continuous assessment throughout the course based on the delivery of papers, the objectives and contents of which will be proposed by the teacher.

Observations

According to the general evaluation and qualification regulations, the preferred evaluation system will be by means of continuous evaluation. The assessment of the group and individual activities will be carried out through continuous evaluation. The students should complete a group work and the individual questionnaires available on the platform on the stablished deadlines. This subject cannot be assessed by means of a single assessment.

The minimum to approve the subject is a mark of **5 points**. The average mark must be equal to or greater than **50 %** in the **“Assessment of written”**, **“Evaluation of the practical work in the laboratory”** and **"Assessment of practical activities in the classroom, solving problems or computer work**" assessment tools in order to be taken into account with the rest of the items.

Attendance to the practicals is compulsory.

The use of tools based on artificial intelligence (AI) is subject to the teacher's criteria, who may establish specific limits or conditions depending on the training or assessment activity.

MENTION OF DISTINCTION:
In accordance with the regulations governing the assessment and grading of subjects in force at UCV, the distinction of "Matrícula de Honor" (Honours with Distinction) may be awarded to students who have achieved a grade of 9.0 or higher. The number of "Matrículas de Honor" (Honours with Distinction) may not exceed five percent of the students enrolled in the group for the corresponding academic year, unless the number of enrolled students is fewer than 20, in which case a single "Matrícula de Honor" (Honours with 9 Distinction) may be awarded. Exceptionally, these distinctions may be assigned globally across different groups of the same subject. Nevertheless, the total number of distinctions awarded will be the same as if they were assigned by group, but they may be distributed among all students based on a common criterion, regardless of the group to which they belong. The criteria for awarding "Matrícula de Honor" (Honours with Distinction) will be determined according to the guidelines stipulated by the professor responsible for the course, as detailed in the "Observations" section of the evaluation system in the course guide.

Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

M1 On-site training activity aimed primarily at acquiring knowledge acquisition skills. It is characterised by the fact that students are spoken to. Also called master class or exposition, it refers to the oral presentation made by the teacher, (with the support of blackboard, a computer and a projector for the display of texts, graphs, etc.), in front of a group of students. They are expository, explanatory or demonstrative sessions of contents. The size of the group is determined by the limit or physical capacity of the classroom; therefore, it is a single group.

M2 On-site training activity aimed primarily at obtaining knowledge application and research skills. Knowledge is built through interaction and activities. The activity consists of supervised monographic sessions with shared participation (teachers, students, experts). The size of the group is variable, from one large group to various small groups, with a minimum of 6 students to ensure interaction. The evaluation will be based on follow-up records kept by the teacher. Participation and the development of the capacity to problematize should be taken into account.

M3 On-site group-work training activity oriented toward problem solving under the supervision of a teacher. It would correspond to "Animal-free supervised practical work", type e1, from the European evaluation of EAEVE. The size of the group is variable, in a range of 10 to 20 students, to differentiate it from a master class.

M4 On-site training activity in groups that takes place in the classroom. It includes working with documents and formulating ideas without handling animals, organs, objects, products, or corpses (e.g., work with articles or documents, clinical case studies, diagnostic analyses, etc.). It would correspond to "Animal-free supervised practical work", type e1, from the European evaluation of EAEVE. The size of the group is variable, in a range of 10 to 20 students.

M5 On-site training activity in groups that takes place in the Computer Lab where the computer is used as support for learning. It includes work with computer models, specific software, Web queries, etc. It would correspond to "Animal-free supervised practical work", type e1, from the European evaluation of EAEVE. The size of the group is variable, in a range of 10 to 20 students.

M6 On-site training activity in groups carried out in the laboratory. It includes the sessions where the students develop laboratory experiments, make dissections or use the microscopes for the study of histological or histopathological samples actively and autonomously, under the supervision of the professor. It also includes work with healthy animals, objects, products, corpses (e.g., animal handling, bacteriological practices, physiology or biochemistry, meat inspection, etc.). It would correspond to the "Supervised practical non-clinical animal work" type e2 of the European evaluation of EAEVE. The size of the group is variable, in a range of 10 to 20 students.

M8 A set of on-site training activities carried out by the teacher to provide personalised attention to the student or in small groups with the aim of reviewing and discussing the materials and topics presented in classes, seminars, readings, carrying out projects, etc. The aim is to ensure a truly comprehensive education of the student rather than a mere transfer of information. It is, therefore, a personalized assistance relationship in which the tutor assists, facilitates and guides one or more students in the learning process.

M9 Set of processes that attempt to evaluate the learning outcomes of students expressed in terms of acquired knowledge, capacities, skills or abilities developed and manifested attitudes. It covers a wide range of activities that can be developed for students to demonstrate their training (e.g. written, oral and practical tests, projects or assignments). It also includes the Official Calls.

M10 Autonomous training activity, including activities and coursework, bibliographic searches. The results obtained from unsupervised group and teamwork will be evaluated, with particular attention paid at the time of evaluation to the acquisition of specific knowledge development skills through group work.

M11 Autonomous training activities related to personal study, or the preparation of individual course assignments. The individual preparation of readings, essays, problem solving, papers, reports, etc. will be evaluated through presentations or submissions during theoretical classes, practical classes, seminars and/or tutorials. The evaluation of the submitted papers will consider the structure of the paper, the quality of the documentation, originality, spelling and presentation.

IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
Theoretical lessons (TL) M1	R1, R2, R3, R6	34,00	1,36
Seminars (S) M2	R3, R6	10,00	0,40
Problem-solving Practice (PSP) M3	R2, R6	4,00	0,16
Computer Practice (CoP) M5	R4, R7	2,00	0,08
Laboratory Practice (LP) M6	R5	6,00	0,24
Tutorial M8	R1, R2, R3, R4, R5, R6, R7	2,00	0,08
Evaluation (Ev) M9	R1, R2, R3, R4, R5, R6, R7	2,00	0,08
TOTAL		**60,00**	**2,40**

LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
Group work M10	R1, R2, R3, R4, R5, R6, R7	30,00	1,20
Individual work M11	R1, R2, R3, R4, R5, R6, R7	60,00	2,40
TOTAL		**90,00**	**3,60**

Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block	Contents
I: INTRODUCTION	**DU 01.** Evolution, genomes and genetics **DU 02.** The central dogma of molecular biology
II: GENOMES	**DU 03.** Genome organization, structure, and variation **DU 04.** Continuity and variation in the genome **DU 05.** Descent with modification: DNA replication and mutation
III: HEREDITY	**DU 06.** Basic principles of single gene inheritance **DU 07.** X-linked genes and sex chromosomes **DU 08.** The inheritance of multiple genes
IV: THE LOCATION OF GENES ON CHROMOSOMES	**DU 09.** Linkage and genetic maps **DU 10.** Genome Wide Association Studies (GWAS)
V: GENE EXPRESSION	**DU 11.** Transcription **DU 12.** Translation **DU 13.** Networks of gene regulation
VI: GENETICS AND EVOLUTION	**DU 14.** Intercourse and evolution **DU 15.** The genetics of populations **DU 16.** Metagenomics

Organization of the practical activities:

	Content	Place	Hours
PR1.	LABORATORY: Genetic engineering techniques	Laboratory	4,00
PR2.	BIOINFORMATICS: Genome analyses	Computer	6,00
PR3.	PROBLEMS SOLVING: Molecular genetics, Mendelian genetics, Linkage	Lecture room	6,00

Temporary organization of learning:

Block of content	Number of sessions	Hours
I: INTRODUCTION	4,00	8,00
II: GENOMES	6,00	12,00
III: HEREDITY	6,00	12,00
IV: THE LOCATION OF GENES ON CHROMOSOMES	6,00	12,00
V: GENE EXPRESSION	4,00	8,00
VI: GENETICS AND EVOLUTION	4,00	8,00

References

MENEELY, P., HOANG, R.D., OKEKE, I.N., HESTON, K., (2017). Genetics: genes, genomes and evolution, Oxford (UK): Oxford Unversity Press.

KLUG, W. S. CUMMINGS, M.R., SPENCER, C.A. PALLADINO, M.A. (2013). Conceptos de genética, Madrid (Spain): Grupo Anaya Educacion. 10ª ed.

GRIFFITHS, A.F.J., MURILLO, A.J. (2000). Genética moderna. Madrid (Spain): McGraw-Hill/Interamericana.

NICHOLAS, F.W. (2010). Introduction to Veterinary Genetics. Iowa (USA): Blackwell Publishing.3rd Edition.

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