

COURSE DESCRIPTION

COURSE DETAILS

Title (of the course): **GENÉTICA**

Code: 101453

Degree/Master: **GRADO DE VETERINARIA**

Year: 1

Field: CIENCIAS BÁSICAS

Character: BASICA

Duration: SECOND TERM

ECTS Credits: 6.0

Classroom hours: 60

Face-to-face classroom percentage: 40.0%

Study hours: 90

Online platform:

LECTURER INFORMATION

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Department: GENÉTICA

Area: GENÉTICA

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PREREQUISITES AND RECOMMENDATIONS

Prerequisites established in the study plan

None

Recommendations

None specified

INTENDED LEARNING OUTCOMES

CE3 Molecular bases of biological processes.

CE4 Genetic bases in biological processes

CE5 Theoretical principles in Genetic Biotechnology and Population Genetics

OBJECTIVES

To know the molecular and biological bases of Genetics, for which the following specific competences will be achieved:

CE4: Knowledge of the genetic bases of biological processes and their application

CE3: Knowledge of the molecular bases of biological processes and their application.

CE5: Knowledge of the basic principles of Genetic Biotechnology and Population Genetics and their application.

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CONTENT

1. Theory contents

Theoretical contents

1. Mendelian theories. Mendelian experiments with one pair of characters (monohybridism). Goodness-of-fit test. Autosomal and sex-linked traits. Pedigrees.
2. Two pairs of characters or dihybridism. Polyhybridism. Goodness-of-fit test. Chromosomal theory of inheritance. Genetic relevance of Mitosis and Meiosis.
3. Extension of Mendelian analysis. Interactions between alleles of the same gene. Multiallelism. Lethality. Pleiotropy. One trait determined by two genes. Genetic interactions between alleles of different genes. Gene interactions without modification of the proportions.
4. Gene interactions with modification of the proportions. Epistasis. Interactions between more than two pairs of genes. Genetic determination of mammalian coat color. Penetrance and expressivity. Allelism test. Sex-limited and sex-limited traits.
5. Linkage and recombination. Docking and repulsion. Cross-over (recombination). Cytological evidence of crossover. Recombination. Detection of recombination. Inter-chromosomal recombination. Intrachromosomal recombination. X-chromosome gene ligation. Fit test for the detection of linkage.
6. The three-point cross-over. Double intercrossing. Deduction of the ordination without calculations. Coincidence and interference coefficients. Genetic maps in domestic animals. Recombination maps.
7. Cytogenetics. The eukaryotic chromosome. Functional elements of the eukaryotic chromosome: centromeres and telomeres. Chromatin: chemical composition. Euchromatin and heterochromatin. Chromatin structure: the nucleosome. The human karyotype. Numerical chromosomal alterations of euploid and aneuploid type.
8. Structural chromosomal alterations. Karyotypes of domestic animals. Examples of abnormalities in the karyotype (chromosomal mutations). Evolution of karyotypes.
9. Gene expression. Transcription and translation. The expression of genetic information. The genetic key. Transcription: initiation, elongation and termination of transcription. Genetic control of transcription initiation. RNA(hn) processing. Post-transcriptional gene control. Translation.
10. Mutation and genetic variation. The molecular basis of gene mutations. Spontaneous mutations. Induced mutations. Molecular basis of repair. Variation and markers. DNA genetic markers and applications.
11. Recombinant DNA. Construction and amplification of recombinant DNA molecules. Cloning of a specific gene. DNA fractionation by electrophoresis. DNA sequencing. Polymerase chain reaction (PCR): another way to synthesize specific DNA fragments in large quantities. Restriction mapping. Eukaryotic gene expression in bacteria. DNA genetic markers and applications.
12. Genomics. Structural genomics. Genome sequence. The human genome. Functional genomics: transcriptome and proteome. Comparative genomics. Genomes of domestic species.
13. Genetic variability in populations. Observations of variation. The effect of sexual reproduction on variation. Phenotypic, genotypic and gene (allelic) frequencies. Hardy-Weinberg equilibrium in genes with codominance. Hardy-Weinberg equilibrium in genes with dominance. Hardy Weinberg equilibrium with more than two alleles. Hardy-Weinberg equilibrium in sex-linked genes.
14. Concept of random cross-over. Inbreeding and associative mating. Kinship. Genealogies or path diagrams to calculate the inbreeding coefficient (F). Sources of variation and changes in gene frequencies. Variation from mutation. Variation from migration. Variation from drift.
15. Biological efficiency and the struggle for existence. Components of biological efficacy. Measurement of biological efficacy. Change in allele frequency by selection. Total selection against recessive homozygote and complete dominance (recessive lethal gene). Selection against homozygous recessive and incomplete dominance. Selection-mutation equilibrium.

2. Practical contents

Practical contents Classroom practices: Resolution of problems and specific practical cases of each of the 15 units of the theoretical syllabus, which will have as objectives the consolidation and application of the knowledge



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acquired in the theoretical subjects. The classroom practice program is the same as the theory program, throughout the 15 weeks of the four-month period.

Laboratory practices: 1. Mendelism.

2. Cytogenetics. Study and observation of chromosomes.

3. Analysis of genetic variation by PCR-RFLP.

4. Simulation in Population Genetics.

SUSTAINABLE DEVELOPMENT GOALS RELATED TO THE CONTENT

Unrelated

METHODOLOGY

Methodological adaptations for part-time students and students with disabilities and special educational needs

The final grade will take into account the particular considerations of the students who take the Part-Time Degree, and if applicable, the special educational needs.

Face-to-face activities

Activity	Large group	Medium group	Small group	Total
<i>Case study</i>	-	15	-	15
<i>Lab practice</i>	-	-	12	12
<i>Lectures</i>	33	-	-	33
Total hours:	33	15	12	60

Off-site activities

Activity	Total
<i>Analysis</i>	20
<i>Exercises</i>	10
<i>Self-study</i>	60
Total hours	90

WORK MATERIALS FOR STUDENTS

Exercises and activities

Oral presentations

Placement booklet

Clarifications

Exercises and activities

Oral presentations

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Placement booklet

EVALUATION

Intended learning	Exams	Laboratory Practice	Problem solving
CE3	X	X	X
CE4	X	X	X
CE5	X	X	X
Total (100%)	70%	15%	15%
Minimum grade	5	0	0

(*)Minimum mark (out of 10) needed for the assessment tool to be weighted in the course final mark. In any case, final mark must be 5,0 or higher to pass the course.

Attendance will be assessed?:

No

General clarifications on instruments for evaluation:

The grade (0 to 10 points) will result from the evaluation of the different parts of the course: The theoretical part (final exam): 7 points.

Problem solving: 1,5 points.

Reports/practice reports: 1,5 points.

1. Evaluation of the theoretical contents by means of written tests (final exam): 50% multiple-choice questions and short questions, and 50% problem solving.
2. Evaluation of problem solving, which will be carried out weekly, in parallel to the theoretical subjects. Evaluation of the laboratory practices, 15%. Attendance and active participation in the practices will be valued (7,5%), and the realization of a final report of each practical session (7,5%). Those students who have not passed the course in the ordinary evaluation, will be evaluated in the extraordinary call of the theoretical and/or practical contents, maintaining for this extraordinary call, and also for the following course (in case of repeating the course), the grade obtained in the practical and problem-solving activities passed during the course.

Clarifications on the methodology for part-time students and students with disabilities and special educational needs:

The final grade will take into account the particular considerations of students who take the degree on a part-time basis, as well as for students with special needs.

Clarifications on the evaluation of the extraordinary call and extra-ordinary call for completion studies:

Those students who have not passed the course in the ordinary evaluation, will be evaluated in the extraordinary call/s of the theoretical contents, exercises and/or practical, maintaining for this extraordinary call, and also for the following course (in case of repeating the course), the grade of pass or higher, obtained in the laboratory practices.

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For those students who appear in the extraordinary call for completion of studies, the track record in the subject will be taken into account.

Qualifying criteria for obtaining honors:

With a final grade equal to or higher than 9, and a maximum number of 5% of those enrolled in this course.

BIBLIOGRAPHY

1. Basic Bibliography

- Griffiths et al. (2008). Introduction to Genetic Analysis. 7th edition. McGraw-Hill Ed.
- Pierce. (2009). Genetics. A Conceptual Approach. 2nd Edition. Ed.: Panamericana.
- Benito and Espino (2013). Genetics: essential concepts. Ed. Panamericana.
- Ménsua (2003). Genetics: problems and exercises solved. Pearson Ed.
- Tamarin. (1996). Principles of Genetics. Reverté, S.A.- Nicholas. (1990). Veterinary Genetics. Ed. Acribia S.A.
- Nicholas (2010). Introduction to Veterinary Genetics. Ed: Wiley-Blackwell

2. Further reading

None

COORDINATION CRITERIA

Joint activities: lectures, seminars, visits ...

SCHEDULE

Period	Case study	Lab practice	Lectures
1# Week	1,0	0,0	3,0
2# Week	1,0	0,0	3,0
3# Week	1,0	1,0	3,0
4# Week	1,0	1,0	2,0
5# Week	1,0	1,0	2,0
6# Week	1,0	1,0	2,0
7# Week	1,0	1,0	2,0
8# Week	1,0	1,0	2,0
9# Week	1,0	1,0	2,0
10# Week	1,0	1,0	2,0
11# Week	1,0	1,0	2,0
12# Week	1,0	1,0	2,0

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Period	Case study	Lab practice	Lectures
<i>13# Week</i>	1,0	1,0	2,0
<i>14# Week</i>	1,0	1,0	2,0
<i>15# Week</i>	1,0	0,0	2,0
Total hours:	15,0	12,0	33,0

The methodological strategies and the evaluation system contemplated in this Course Description will be adapted according to the needs presented by students with disabilities and special educational needs in the cases that are required.