COURSE DESCRIPTION

COURSE DETAILS

Title (of the course): **GENÉTICA**
Code: 100409
Degree/Master: **GRADO DE BIOLOGÍA** Year: 2
Name of the module to which it belongs: GENÉTICA
Field: GENÉTICA
Character: OBLIGATORIA Duration: ANUAL
ECTS Credits: 12.0 Classroom hours: 120
Face-to-face classroom percentage: 40.0% Study hours: 180
Online platform: Moodle

LECTURER INFORMATION

Name: RUIZ ROLDÁN, MARÍA DEL CARMEN (Coordinator)
Department: GENÉTICA
Area: GENÉTICA
Office location: Edificio C5 1ª planta
E-Mail: ge2rurom@uco.es Phone: 957218981

Name: SÁNCHEZ LÓPEZ BERGES, MANUEL
Department: GENÉTICA
Area: GENÉTICA
Office location: Edificio C5 1ª planta
E-Mail: ge2snlpm@uco.es Phone: 957218981

PREREQUISITES AND RECOMMENDATIONS

Prerequisites established in the study plan

Students must hold a B1 certificate in English.

Recommendations

It is recommended to have basic knowledge of chemistry and mathematics.

INTENDED LEARNING OUTCOMES

CU2

CB8v1

CB14v1

CB17v1

CB19v3

CE5v3

CE6v2

CE21v7

CE49v1

COURSE DESCRIPTION

OBJECTIVES

Learn the basic principles on which genetics is supported.
Understand the laws of inheritance and genetic analysis.
Learn the molecular mechanisms of expression of genetic information.
Understand the mutation and selection processes as the basis of evolutionary processes.

CONTENT

1. Theory contents

Lesson 1: Basic concepts of Genetics. Genetics in the set of Biological Sciences and in today's society.
Lesson 2: Chromosomal basis of inheritance. Genes and chromosomes. Mitosis and Meiosis. Genetic significance of mitosis and meiosis.
Lesson 3: Mendelian genetic analysis. The Mendelian genetic analysis method. Principle of segregation of alleles. Principle of independent transmission. Family trees. Calculation of probabilities. Statistical verification of the segregations: Chi-square test.
Lesson 4: Heredity and sex. Sex-linked inheritance. Characteristics influenced or limited by sex. Sex determination.
Lesson 5: Extensions and modifications of Mendelism. Variations in dominance relationships. Multiple allelism. Lethal genes. Gene interaction: Epistasis. Allelism test: Complementation. Penetrance and expressivity. Interaction between genes and environment.
Lesson 6: Linkage and recombination in eukaryotes. Linkage concept. Recombination frequency and its meaning. Map distances. Genetic maps: Maps of two and three points. Interference and coincidence coefficient.
Lesson 7: Chromosomal alterations. Deletion. Duplication. Inversion. Translocation. Aneuploidy and Polyploidy.
Lesson 8: Inheritance of characters with continuous variation. Quantitative characters and continuous variation. Mendelian basis of continuous variation. Genetic and environmental component of phenotypic variance. Number of genes that control a quantitative character. Heritability. Artificial selection.
Lesson 9: Population genetics. Mendelian populations and gene pool. Allelic, genotypic and phenotypic frequencies. Hardy-Weinberg equilibrium. Inbreeding. Mechanisms of evolutionary change: Mutation, migration, natural selection, genetic drift. Speciation and evolution.
Lesson 10: Genetics of Bacteria and viruses. Genetic analysis and genetic maps in viruses and bacteria.
Lesson 11: Molecular Bases of Inheritance. Nature and structure of the genetic material. The DNA double helix and its features. Properties of nucleic acids.
Lesson 12: DNA replication. Replication enzymology. Replication in prokaryotes. Replication in eukaryotes.
Lesson 13: Organization of the genetic material. Types of genomes. Chromatin structure.
Lesson 14: Transcription and gene expression. Eukaryotic mRNA maturation.
Lesson 15: Translation and genetic code.
Lesson 16: Regulation of gene expression. Gene regulation in prokaryotes. Gene regulation in eukaryotes: Epigenetics, transcriptional and post-transcriptional control.
Lesson 17: Mutation, Repair and Transposition. DNA damage and alterations. Repair mechanisms. Types of mutations. Transposable genetic elements.
Lesson 18: Genetic and Genomic Engineering. Basic recombinant DNA techniques and their applications. Genome sequencing strategies. Functional genomics.
Lesson 19: Developmental Genetics. Development, determination and differentiation. Space-time programming of developmental gene expression. Genes that control development: study models.
Lesson 20: Cancer Genetics. Cell cycle control and programmed cell death. Tumor suppressor genes and proto-oncogenes. Other genes involved in cancer development.

COURSE DESCRIPTION

2. Practical contents

In the laboratory
Practice 1. Polymorphism analysis and Hardy-Weinberg equilibrium (2 sessions).
Practice 2. Repair and mutagenesis.
Practice 3. Application of Genetic Engineering techniques routinely used in the laboratory.

In the classroom
Discussion and problem solving.

SUSTAINABLE DEVELOPMENT GOALS RELATED TO THE CONTENT

Good health and well-being
Quality education
Gender equality
Responsible consumption and production
Life on land

METHODOLOGY

General clarifications on the methodology (optional)

The theoretical program will consist of lecture sessions in which the teacher will introduce the students to the contents of the subject using PowerPoint presentations.
The classes of problems will be held in medium-sized groups and will consist of the explanation of the resolution of a series of problems specific to each topic. Students must actively participate in these classes with the help of the teacher.
The laboratory practices will be developed in small groups of students using the instrumentation appropriate for its realization, so it is essential the attendance of the students to these sessions.

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

The methodological adaptations for part-time students will be decided in meetings between the teaching staff and the interested students in order to personalize the possible cases that arise. In these cases, assistance will be provided to the group that best suits your needs.
In the case of students with special educational needs, the teacher will meet with the affected students to establish the most appropriate adaptations to each particular case, following the indications of the report issued by the Inclusive Education Unit.

Face-to-face activities

Activity	Large group	Medium group	Small group	Total
Assessment activities	6	-	-	6
Lab practice	-	42	-	42
Lectures	60	-	12	72
Total hours:	***66***	***42***	***12***	***120***

COURSE DESCRIPTION

Off-site activities

Activity	Total
Activities	45
Exercises	2
Information search	15
Reference search	25
Self-study	93
Total hours	***180***

WORK MATERIALS FOR STUDENTS

Dossier
Exercises and activities
Lessons summary
Oral presentations

EVALUATION

Intended learning	Exams	Placement reports	Problem solving
CB14v1	X	X	X
CB17v1	X	X	X
CB19v3	X	X	X
CB8v1	X	X	X
CE21v7	X	X	X
CE49v1	X	X	X
CE5v3	X	X	X
CE6v2	X	X	X
CU2	X	X	X
Total (100%)	***60%***	***10%***	***30%***
Minimum grade	***5***	***4***	***4***

(*)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.

COURSE DESCRIPTION

Attendance will be assessed?:

No

General clarifications on instruments for evaluation:

A **final exam** will be held in June/July that will consist of questions and problems that must be done by the students who have not obtained an average score of at least 5 out of 10 in the partial exams. There will be two **partial exams**, one in each four-month period. It will not be necessary to do the final exam if at least 4 points (out of 10) are obtained in each of them and the average between the two partial exams equals or exceeds 5 points (out of 10). If you want to do the final exam to increase the average grade in any of the partial exams, the final mark will be the obtained in the final exam. The marks of the partial exams will be maintained for the June and July calls. In no case the grades obtained in the final exams of the June or July calls will be maintained. The average grade obtained in the partial or in the final exams will constitute 60% of the final grade for the course.

The completion of **laboratory practices** is mandatory and will be scored up to a **maximum of 1 point**, based on the memories/reports delivered by the students. It will not be possible to deliver reports of practices to which has not been attended. The qualifications obtained in the laboratory practices may be maintained between courses.

The problems will be scored up to a maximum of 3 points as follows:

a) **The response to online questionnaires**, announced in advance, will be scored up to a **maximum of 1 point**. The qualifications obtained in the online questionnaires may be maintained between courses. However, it is recommended to perform these activities.

b) **The problems solved by the student and explained in the class of problems** will be scored up to a **maximum of 2 points**. Attendance to problem classes is mandatory for first-year students. The qualifications obtained in the problem classes may be maintained between courses. However, it is recommended to perform this activity.

The qualifications obtained in practices, problems and on-line questionnaires will be added to the grade obtained in the final exam, whenever it exceeds 5 points out of 10. To pass the course it is necessary to reach at least 5 points.

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

The adaptations for the evaluation of part-time students will be decided in meetings between the teaching staff and the interested students in order to personalize the possible cases that arise.

In the case of students with special educational needs, the teacher will meet with the affected students to establish the most appropriate adaptations for each particular case, following the indications of the report issued by the Inclusive Education Unit.

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

For the **first extraordinary call and extraordinary call for completion studies** (the latter for students of second enrollment or higher), the grades obtained in the laboratory practices, on-line questionnaires and problem classes, counting for 10%, 10% and 20%, respectively, will be maintained. The exam in both calls will count for 60%.

COURSE DESCRIPTION

Qualifying criteria for obtaining honors:

In accordance with the criteria of article 80 of the Academic Regulations, the mention of \"Honors\" may be awarded to students who have obtained a grade higher than 9.0.

BIBLIOGRAPHY

1. Basic Bibliography

- Pierce BA (2023) **Fundamentals of Genetics. Concepts and Relationships**, 5th Edition. Panamericana.
- Pierce BA (2016) **Genetics Essentials: Concepts and Connections**, 3rd Edition, W.H. Freeman & Co.
- Pierce BA (2014) **Genetics: a conceptual approach**, 5th Edition, W.H. Freeman & Co.
- Klug WS, Cummings MR, Spencer CA (2012) **Concepts of genetics**, 10th Edition, Pearson.
- Klug WS (2021) **Essentials of genetics**, 10th Edition, Pearson.
- Griffiths AJF (2005) **Introduction to genetic analysis**, 8th Edition, W.H. Freeman & Co.

2. Further reading

- Freeman S, Herron JC (2015) Evolutionary analysis, 5th Edition, Pearson.
- Krebs JE, Lewin B, Kilpatrick ST, Goldstein ES (2018) Genes XII, 12th Edition, Jones and Bartlett.
- Alberts B, Wilson J, Hunt T (2015) Molecular biology of the cell, 6th Edition, Garland Publishing.
- Lodish H (2008) Molecular cell biology, 6th Edition, W.H. Freeman.
- Watson JD (2015) Molecular biology of the gene, 7th Edition, The FASEB journal, Wiley Online Library.

COORDINATION CRITERIA

Common evaluation criteria

Clarifications

Common evaluation criteria will be used in all teaching groups including large theory groups, medium problem groups and small laboratory practice groups.
We will adopt all the measures and criteria agreed in coordination meetings of the teaching staff of the course in which the subject is taught.

SCHEDULE

Period	Assessment activities	Lab practice	Lectures
1# Week	0,0	0,0	3,0
2# Week	0,0	0,0	3,0
3# Week	0,0	3,0	2,0
4# Week	0,0	0,0	2,0
5# Week	0,0	3,0	2,0
6# Week	0,0	3,0	2,0
7# Week	0,0	3,0	2,0

COURSE DESCRIPTION

Period	Assessment activities	Lab practice	Lectures
8# Week	0,0	0,0	2,0
9# Week	0,0	0,0	2,0
10# Week	0,0	3,0	2,0
11# Week	0,0	3,0	2,0
12# Week	0,0	0,0	2,0
13# Week	0,0	3,0	2,0
14# Week	0,0	0,0	5,0
15# Week	3,0	0,0	5,0
16# Week	0,0	0,0	3,0
17# Week	0,0	0,0	3,0
18# Week	0,0	3,0	2,0
19# Week	0,0	0,0	2,0
20# Week	0,0	3,0	2,0
21# Week	0,0	3,0	2,0
22# Week	0,0	3,0	2,0
23# Week	0,0	0,0	2,0
24# Week	0,0	0,0	2,0
25# Week	0,0	3,0	5,0
26# Week	0,0	3,0	5,0
27# Week	0,0	0,0	2,0
28# Week	3,0	3,0	2,0
Total hours:	***6,0***	***42,0***	***72,0***

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.