

Genetics

Code: 100944
ECTS Credits: 3

Degree	Type	Year	Semester
2500253 Biotechnology	OB	1	2

Contact

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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.

Prerequisites

There are no official prerequisites. Even so, a basic knowledge of probability, combinatorics, and statistics is recommended. On the other hand, to ensure the student will properly follow the classes and achieve the learning outcomes proposed, it is essential to know the cellular processes studied in cytology, with particular emphasis on the cell cycle, mitosis, and meiosis.

Objectives and Contextualisation

The Genetics course aims to provide the students with the basic fundamentals of genetics, leaving the study of its molecular aspects to more advanced courses. The main objectives of the course are:

- Provide the students with the basic knowledge about the mechanisms and probabilistic aspects of biological inheritance
- Develop the ability to perform genetic analyses of different characters
- Develop the ability to interpret data and obtain conclusions, as well as the ability to apply theoretical knowledge to practical situations

Competences

- Describe the molecular, cellular and physiological bases of the organisation, functioning and integration of living organisms in the framework of their application to biotechnological processes.
- Learn new knowledge and techniques autonomously.
- Reason in a critical manner
- Think in an integrated manner and approach problems from different perspectives.
- Work individually and in teams

Learning Outcomes

1. Describe and interpret the principles for the transmission of genetic information across generations.
2. Explain the nature of genetic variation, and its origin and maintenance in populations.
3. Learn new knowledge and techniques autonomously.
4. Produce and work with genetic maps.
5. Reason in a critical manner
6. Think in an integrated manner and approach problems from different perspectives.
7. Work individually and in teams

Content

The contents of the course lectures can be divided into six different blocks:

Theoretical contents

1. Introduction to Genetics: basic concepts; Main areas and study methodologies; Genetics and biodiversity; Model organisms
2. Heritage patterns: Mendel's experiments, principles of segregation and independent transmission; dominance and recessiveness, incomplete dominance, codominance, multiple alleles, lethality, pleiotropy, environmental effects, penetrance and expressiveness, gene interaction, implications of sex in inheritance patterns; Mechanisms of sexual determination.
3. Genetic linkage and recombination: Chromosomes and linkage; Interchromosomal and intrachromosomal recombination; Mitotic crossing over; Gene mapping, linkage estimation between two or more genes, genetic maps and physical maps.
4. Mutations: gene mutations; structural chromosomal mutations; numerical chromosomal mutations.
5. Quantitative genetics: Genetic basis of continuous variation, phenotypic variation and additive phenotype distribution; heritability; natural and artificial selection.
6. Population genetics: dynamics of population genetic variation; allelic and genotypic frequencies; Hardy-Weinberg's law; forces of evolution

The contents will also be dealt with in an active manner through the resolution of problems:

Problems

2. Probabilistic nature of Mendel's laws.
2. Segregation analysis for monohybrid or polyhybrid crossings and distribution of the offsprings' phenotypes.
2. Pedigree analysis.
3. Calculation of recombination frequencies and chromosomal interference.
3. Determination of the order and the distances between linked genes.

5. Analysis of inheritance patterns and response to artificial selection of quantitative traits.
6. Calculation of genetic frequencies.

Methodology

The teaching methodology is based on two approaches: a theoretical and a practical one.

Theoretical approach

Classes will give the students the basic knowledge needed to understand the course's contents. Support material will be available on the virtual campus. It is recommended that students take the presentations published in the CV to classes, in order to follow them easily and take notes, if necessary. The concepts explained in class will have to be autonomously deepened to promote the development of non-guided learning strategies. In order to facilitate this task, bibliography, audiovisual and interactive material will be provided. Finally, individual tutorials are planned for students who wish to do so. These tutorials should be used to potentiate the students' progress and to help them understand the most difficult or complex concepts.

Practical approach

Problem seminars will be used to learn how to apply the previously-acquired knowledge. Students will find the problems that will be treated on each seminar on the Virtual Campus. Seminars will be given in reduced groups and will be based on the discussion and the resolution of practical problems, applying theoretical concepts together with mathematical tools and statistics. Students who want it can request individual tutorials to facilitate the understanding of the most complex problems.

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			
Classes	16	0.64	3, 1, 4, 2, 6, 5, 7
Problems' seminars	8	0.32	3, 1, 4, 2, 6, 5, 7
Type: Supervised			
Tutorials	5	0.2	1, 4, 2, 6, 5, 7
Type: Autonomous			
Problem solving	18	0.72	3, 1, 4, 2, 6, 5, 7
Study	24	0.96	3, 1, 4, 2, 6, 5

Assessment

Se realizará una evaluación formativa continua para conocer el grado de comprensión de los conocimientos adquiridos y para corregir posibles errores en las técnicas de aprendizaje autónomo.

La evaluación sujeta a calificación se dividirá en exámenes (60% de la nota) y en la entrega de problemas (40%). Es necesario obtener una nota mínima de 5,0 en todas las actividades para aprobar la asignatura.

Exámenes: Consistirán en dos pruebas parciales correspondientes cada una a la mitad del temario. Cada prueba consistirá en preguntas de contenido y de resolución de problemas. Los alumnos que no superen (nota inferior a 5,0) una o dos de las pruebas parciales tendrán que realizar una recuperación final del/los parcial/es no superado/s. La prueba final también estará abierta a cualquier estudiante que, a pesar de haber superado la evaluación continua, desee mejorar la nota obtenida; sin embargo, en este caso queda anulada la nota obtenida previamente.

Recuperación: Para participar en la recuperación, el alumnado debe haber sido previamente evaluado en un conjunto de actividades cuyo peso equivalga a un mínimo de dos terceras partes de la calificación total de la asignatura o módulo. Por tanto, el alumnado obtendrá la calificación de "No Evaluable" cuando las actividades de evaluación realizadas tengan una ponderación inferior al 67% en la calificación final. La recuperación consistirá en un examen que abarcará la materia de las actividades de evaluación no superadas.

Evaluación única. El alumnado que haya solicitado la evaluación única de la asignatura se presentará en los mismos exámenes de recuperación del otro alumnado. La nota media de estos dos exámenes de recuperación corresponderá al 60% de la nota final de la asignatura. El 40% restante de la nota final corresponderá a la entrega de problemas. Es necesario obtener una nota mínima de 5,0 tanto de los exámenes como de la entrega de problemas para poder aprobar la asignatura.

Formative evaluations will be performed to assess the level of understanding and to correct possible errors in the autonomous learning techniques.

The evaluation subject to qualification, will be divided into exams (60% of the grade) and the assignment of problems (40%). A minimum grade of 5.0 must be obtained in all activities to pass the subject.

Exams: They will consist of two exams, each corresponding to half of the course's contents. Each exam will consist of theoretical and problem-solving questions. Students that do not pass (grade below 5.0) one or two of the exams will be subjected to a second-chance examination. This will also be open to any student who, despite having passed all assessments, wants to improve his/her grade; in this case, however, the previously obtained grade won't be valid anymore.

Recovery: To participate in recovery, students must have previously been assessed in a set of activities whose weight is equivalent to a minimum of two-thirds of the total grade for the subject or module. Therefore, the student will obtain the qualification of "Not Assessable" when the assessment activities carried out have a weighting of less than 67% in the final qualification. The recovery will consist of an exam that will include the subject matter of the assessment activities not passed.

Unique assessment. The students who have requested the single assessment of the subject will take the same make-up exams as the other students. The average grade of these two remedial exams will correspond to 60% of the final grade of the subject. The remaining 40% of the final mark will correspond to the delivery of the problems. A minimum grade of 5.0 is required on both the exams and the problem assignment.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
First block exam	30%	1.5	0.06	3, 1, 4, 2, 6, 5, 7
Group assignments	40%	1	0.04	1, 4, 2, 6, 5, 7
Second block exam	30%	1.5	0.06	3, 1, 4, 2, 6, 5, 7

Bibliography

Benito, C. 1997. 360 problemas de Genética. Resueltos paso a paso. Editorial Síntesis, Madrid.

Griffiths, A.J.F., S.R. Wessler, R.C. Lewontin & S.B. Carroll. 2008. Genética. 9a. edición. McGraw Hill - Interamericana.

Jiménez Sánchez, A. 2008. Problemas de Genética para un curso general. Colección manuales UEX-52. Servicio de Publicaciones, Universidad de Extremadura.

Ménsua, J.L. 2003. Genética. Problemas y ejercicios resueltos. Pearson Prentice Hall.

Pierce. B.A. 2011. Fundamentos de Genética. Conceptos y relaciones. 1a. edición. Editorial Médica Panamericana.

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Software

Does not apply.