Universitat Autònoma de Barcelona

2017/2018

Genetics

Code: 100944
ECTS Credits: 3

Degree	Type	Year	Semester
2500253 Biotechnology	OB	1	2

Contact

Name: Constanza Lorena Cortes Crignola
Email: Constanza.Cortes@uab.cat

Use of languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Other comments on languages

Even though the linguae francae of this course are Spanish and Catalan, part of the study material is in English

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

Skills

- 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; IInterchromosomaland intrachromosomal recombination; Mitotic crossing over; Gene mapping, linkage estimation between two or more genes, genetic maps and physical maps.

4. Quantitative genetics: Genetic basis of continuous variation, phenotypic variation and additive phenotype distribution; heritability; natural and artificial selection

5. Population genetics: dynamics of population genetic variation; allelic and genotypic frequencies; Hardy-Weinberg's law; forces of evolution

6. Mutations: gene mutations; structural chromosomal mutations; numerical chromosomal mutations.

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.

4. Analysis of inheritance patterns and response to artificial selection of quantitative traits.

5. 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.

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			
Resolución de problemas	18	0.72	3, 1, 4, 2, 6, 5, 7
Study	24	0.96	3, 1, 4, 2, 6, 5

Evaluation

Formative evaluations will be performed to assess the level of understanding and to correct possible errors in the autonomous learning techniques. The evaluation will be done through a questionnaire that will be available on the Virtual Campus at the end of each block of contents. This evaluation will not be subject to qualification, but will be mandatory.

Grading will be divided into exams (80% of the grade) and in two group assignments (20%). A minimum grade of 5 in all activities must be obtained to pass the course. For examinations and assignments, students who copy will get a 0.

Exams (80% of final grade)

They will consist of two exams, each corresponding to half of the course's contents (blocks 1-3 and 4-6). Each exam will consist of theoretical and problem-solving questions, which may be asked as multiple-choice questions or concept/exercise development questions. Students that do not pass (grade below 5) 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. Finally, the students can also decide to only do one final exam, without performing the partial ones.

Group assignments (20% of final grade)

There will be two group assignments that the students must solve autonomously in groups of 2 or 3 students. The groups will be different for each of the assignments and will be assigned by the professor. The assignment must be delivered on the virtual campus in a PDF format before a stipulated day, which will be decided by the students. Along with the assignment, a signed document must be submitted by all members of the group, attesting that they all agreed on the distribution of the assignment work among the group members. Delayed delivery will lead to a decrease in the grade dependingon the delay time (1 per day, starting the minute after the delivery limit).

The grade of "Not graded" will be obtained if the number of evaluation activities carried out has been less than 50% of those programmed for the course. For more information on assessment methods, consult the faculty evaluation regulations.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
First block exam	40%	2	0.08	3, 1, 4, 2, 6, 5, 7
Group assignments	20%	0	0	1, 4, 2, 6, 5, 7
Second block exam	40%	2	0.08	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. edició. 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. edició. Editorial Médica Panamericana.

Pierce. B.A. 2016. Genética. Un enfoque conceptual. 5a. edición. Editorial Médica Panamericana.