Universitat Autònoma de Barcelona

2023/2024

Genetics

Code: 100777
ECTS Credits: 6

Degree	Type	Year	Semester
2500250 Biology	FB	1	1

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 prerequisites to follow the course. Nonetheless, it would be desirable that students were familiar with basic knowledge of genetics, cell division, probability and statistics

Objectives and Contextualisation

The main objectives are:

- The understanding of the bases and mechanisms of biological inheritance as well as those of genetic improvement
- The ability to perform genetic analysis of the different characteristics of living organisms
- The ability to design and obtain information on genetic experiments as well as to interpret the results obtained
- The development of a historical vision that allows to summarize the main landmarks of genetics and to assess their contributions to current biology

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Analyse and interpret the origin, evolution, diversity and behaviour of living beings.
- Apply statistical and computer resources to the interpretation of data.
- Be able to analyse and synthesise
- Be able to organise and plan.
- Develop a historical vision of biology.

- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Obtain information, design experiments and interpret biological results.
- Perform genetic analyses.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Understand heredity mechanisms and the fundamentals of genetic improvement.
- Understand the processes that determine the functioning of living beings in each of their levels of organisation.

Learning Outcomes

1. Analyse a situation and identify its points for improvement.
2. Analyse the sex- or gender-based inequalities and the gender biases present in one's own area of knowledge.
3. Apply statistical and computer resources to the interpretation of data.
4. Be able to analyse and synthesise.
5. Be able to organise and plan.
6. Critically analyse the principles, values and procedures that govern the exercise of the profession.
7. Describe and interpret the mechanisms of heredity at all levels of organisation of living beings.
8. Design experiments in genetics, and interpret the data obtained.
9. Explain current models on the origin of life.
10. Explain the fundamental principles of genetic improvement.
11. Perform genetic analyses of the different features of living beings.
12. Propose new methods or well-founded alternative solutions.
13. Propose projects and actions that incorporate the gender perspective.
14. Propose viable projects and actions to boost social, economic and environmental benefits.
15. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
16. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
17. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
18. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
19. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
20. Summarise the basic genetic mechanisms of evolutionary change.
21. Summarise the most important historical milestones in cell biology and genetics and appreciate their contributions to present-day biology.
22. Use the bibliographic sources specific to cell biology and genetics to work independently on acquiring further knowledge.

Content

Theory

1. Introduction to Genetics. The biological inheritance. Genetics as a modern science. Basic ideas about biological inheritance.
2. Nature and organization of the hereditary material. The chromosomes. Cell division. Sexual reproduction and meiosis.
3. Genetic transmission. The works of Mendel. Segregation and dominance. Independent transmission.
4. Extensions of Mendelism. Sex and inheritance patterns. Multiple allele series. Lethality. Gene interaction. Environmental effects.
5. Mapping of eukaryotic chromosomes. Chromosomes and linkage. Recombination. Eukaryotic linkage maps.
6. Mutations. Chromosome variation. Types of chromosome mutations. Chromosomal rearrangements. Changes in chromosome number.
7. Quantitative genetics. Genetic basis of quantitative traits. Statistical analysis of the quantitative traits. Phenotypic variation and heritability. Artificial selection.
8. Population genetics. Genotypic and allelic frequencies. The law of Hardy-Weinberg. The sources of variation.

Classroom problems

1. The hereditary material
2. Mendelisme
3. Chromosome linkage and recombination
4. Quantitative genetics
5. Population genetics

Laboratory practices

1. Introduction to the biology and morphology of *Drosophila melanogaster*
2. Analysis of a mutant and assignment to its linkage group
3. Elaboration of a simple linkage map

Methodology

Lectures: Lectures are based on master classes with ICT support. Emphasis is made to acquisition of important concepts and skills for the students. The audiovisual material used in class can be found in the *Moodle*. The students require developing independent learning strategies outside of class.

Problems: The sessions are performed in small groups which allow to deepen the information given on the master class and to work on specific areas of the course. These sessions promote students to apply the theoretical knowledge to solve practical problems, as well as to demonstrate their skills by solving problems on the blackboard.

Practices: These sessions are done in small groups. Here the student has the opportunity to work at the laboratory doing experiments related to practical cases of the subject. The data obtained in the experiments are analyzed and a global view of the techniques used is given. The students can access protocols and practice guides through the Moodle. To be able to attend it is necessary that the student justify having passed the biosafety and security tests (*Moodle*) and accepts the operating rules of the laboratories of the *Facultat de Biosciènices*.

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			
Laboratory practices	9	0.36	3, 7, 8, 11, 4
Lectures	30	1.2	7, 10, 9, 11, 20, 21, 4, 22
Problems sessions	11	0.44	3, 8, 11, 4
Type: Supervised			
Tutorials	5	0.2	22
Type: Autonomous			
Individual study	68	2.72	7, 10, 9, 20, 21, 22
Moodle participation	10	0.4	9, 21, 22
Problems solving	10	0.4	8, 11, 4

Assessment

The evaluation of the competences is done as follows:

1 Exams. The students perform three midterm exams to evaluate the contents of theory and problems. The grade corresponding to these three tests represent 25%, 25% and 25%, respectively, of the final subject grade. The students will be able to overcome any failed midterm exam through a second-chance exam at the end of the course. To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course. Thus, the student will be graded as "No Avaluable" if the weighthin of all conducted evaluation activities is less than 67% of the final score.

2 Practices. Each of the practice sessions will be evaluatedby means of a test. The grade of practices represents 15% of the final grade of the course. Attendance at practices is mandatory.

3 ***Moodle*** activities. This activity represents 10% of the final grade of the course.

Final considerations:

1. The course will be approved when the final weighted mark is greater than or equal to 5.0.
2. Students with a weighted final grade of less than 5.0 may take a final exam. The grade for this exam will replace the average grade for the three classroom exams. The students must have been previously evaluated in a set of activities the weight of which is equivalent to a minimum of 2/3 of the total grade of the subject. Therefore, the student will obtain the qualification of "Not Evaluable" when the evaluation activities carried out have a weighting of less than 67% in the final qualification.
3. Single evaluation. Students who have requested the single assessment of the subject will take the same final exam as students with a weighted grade ofless than5.0. The mark of this exam will correspond to 75% of the final mark of the subject. 15% of the final grade will correspond to the practical grade whose attendance is mandatory. The remaining 10% of the final mark will correspond to the participation in the activities, of Moodle. Single-assessment students who have a weighted final grade of less than 5.0 may take an extraordinary exam, whose grade will only replace the grade previously obtained from the final exam.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exams	75	6	0.24	6, 2, 1, 7, 8, 10, 9, 11, 12, 13, 14, 19, 18, 17, 15, 16, 20, 21, 4, 22
Moodle activities	10	0.5	0.02	6, 2, 12, 13, 18, 5, 22
Practices	15	0.5	0.02	6, 3, 7, 8, 11, 18, 4

Bibliography

Theory

- Klug, W.S., M.R. Cummings, Ch.A. Spencer & M.A. Palladino (2013) Conceptos de Genética. 10th edition. Pearson Educación, S.A., Madrid.
- Griffiths, A.J.F., S.R. Wessler, R.C. Lewontin & S.B. Carroll (2008) Genética. 9th edition. McGraw-Hill/Interamericana, Madrid.
- Pierce, B.A. (2009) Fundamentos de Genética. Conceptos y relaciones. Editorial Médica Panamericana, Madrid.
- Pierce, B.A. (2016) Genética. Un enfoque conceptual. 5th edition. Editorial Médica Panamericana, Madrid.

Problems

- Benito, C. (1997). 360 problemas de Genética. Resueltos paso a paso. Editorial Síntesis, Madrid
- Elrod, S. & W.D. Stansfield (2002) Schaum´s Outline of Genetics. 4th edition. Mc Graw-Hill, USA

Software

None