UAB
Universitat Autònoma de Barcelona

Molecular Genetics of Eukaryotes

Code: 104121
ECTS Credits: 6

2025/2026

Degree	Type	Year
Genetics	OB	2

Contact

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

-To review the basics concepts in Genetics and Biochemistry learned during the first year of the Genetics degree. To know and understand the Mendelian principles and transmission of genetic information, the chromosomal theory of inheritance, cell cycle and nuclear division.

- Comprehension English skills

Objectives and Contextualisation

The fundamentals of Eukaryotic Molecular Genetics are explained in this course. This course takes place in the second-year of the Genetics degree providing the fundamental molecular knowledge of inheritance. The course is focus to give the current information on Molecular Genetics regarding gene structure and function, DNA replication, transcription and translation, as well as regulatory mechanisms of the transmission of the genetic information. In addition, the students will be familiar with some of the main molecular techniques and their applications in life sciences and health. Then, this course looks at the molecular basis of inheritance which principles were learned during the first year in the Genetics course. Complementary to this course are the Eukaryotic Molecular Genetics laboratory practices that is simultaneously teach in the Combined Laboratory III course, and the Molecular Biology of Prokaryotes and the Instrumental Techniques courses.

The educational objectives are as follows:
1) Acquisition of the basic concepts in molecular genetics as well as the composition of the nucleic acids and their roles in the molecular processes.
2) To obtain the essential knowledge about the processes driving the flow of genetic information, from DNA replication, transcription and translation in the organisms.

3) To be familiar with the regulatory processes of gene expression.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Apply knowledge of theory to practice.
- Apply scientific method to problem solving.
- Be able to analyse and synthesise.
- Describe and identify the structural and functional characteristics of nucleic acids and proteins including their different organisational levels.
- Describe epigenetic mechanisms.
- Describe the genetic bases of the development and control of genic expression.
- Develop self-directed learning.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Reason critically.
- 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 and describe the structure, morphology and dynamics of the eukaryotic chromosome during the cell cycle and meiosis.
- Use and manage bibliographic information or computer or Internet resources in the field of study, in one's own languages and in English.

Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Apply knowledge of theory to practice.
3. Apply scientific method to problem solving.
4. Be able to analyse and synthesise.
5. Describe the mechanisms and genetic consequences of epigenetic modifications.
6. Describe the mechanisms for regulating genic expression in viruses, bacteria and eukaryotes.
7. Describe the organisation of genetic material throughout the cell cycle.
8. Describe the processes of replication, transcription, translation and regulation of genes in prokaryotes and eukaryotes.
9. Develop self-directed learning.
10. Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
11. Reason critically.
12. Relate the structure of nucleic acids with their biological functions.
13. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
14. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
15. Use and manage bibliographic information or computer or Internet resources in the field of study, in one's own languages and in English.

Content

1- Introduction to Molecular Genetics

2- The nature of genetic material

3-Eukaryotic genome organization

4-Eukaryotic chromosome structure

5-Replication and recombination of genetic material

6-Transposable elements

7-Eukaryotic transcription

8-RNA categories and processing mechanisms

9-Genetic code and the translation process

10-Eukaryotic gene regulation

11- Modification and processing mechanisms of proteins and cellular cycle regulation

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problems/Seminars	7	0.28	3, 2, 5, 9, 11, 15
Theory lectures	33	1.32	6, 5, 8, 7, 9, 11, 12
Type: Supervised			
Tutorials	6	0.24	2
Type: Autonomous			
Bibliographical searches	9	0.36	9
Problem solving	18	0.72	3, 2, 11
Reading of prescribed texts	12	0.48	15
Study	58	2.32	9, 11, 4

Lectures:

Lectures are based on master classes with ICT support. Emphasis is made to acquisition of important concepts and skills for the students. Also the use of diverse information sources facilitates the understanding of complex issues. Lectures do not offer much interaction but using diverse ICTs (ex. video projection) encourage discussion and dynamism along the lessons.

Problems-Seminars:

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. In addition, students have to debate practical cases, and to make the oral presentation of topics proposed in class.

Tutorials:
Here the student has the possibility to raise specific doubts related to the course.

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.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Partial exam 1	40% of the final grade	1.5	0.06	13, 3, 6, 5, 8, 7, 10, 12, 4
Partial exam 2	40% of the final grade	1.5	0.06	13, 3, 6, 5, 8, 7, 10, 12, 4
Resolution of exercices and oral presentations	20% of the final grade	4	0.16	1, 14, 3, 2, 9, 10, 11, 4, 15

Evaluation

The evaluation of contents of the theory and problems/seminars sessions is done as follows:

1. The students perform two midterm exams to evaluate the theory and problem contents. It is necessary to obtain a grade ≥ 5 in each of the midterm exams, to pass the subject. The grade corresponding to this evaluation is the average of the individual grade obtained in the two test. The average grade obtained by this concept represents 80% of the final subject grade. The student will be able to overcome any failed midterm exam or to improve the grade through a second-chance exam at the end of the course. If the student do this exam to improve the grade, only the grade of the last exam will be valid. 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 or module. 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. Evaluation of the assigned homework and presentation of activities related to the subject. The grade obtained in this part represents 20% of the final grade of the course, attendance to all the seminar sessions being mandatory.

The use of Artificial Intelligence (AI) technologies is not allowed in this course. Any work that includes AI-generated content will be considered an act of academic dishonesty and may result in a partial or total penalty in the activity's grade, or more severe sanctions in serious cases.

Single Assessment

The single assessment consists of a single synthesis test in which the contents of the entire theory and exercices program of the subject will be assessed. The test will consist of questions of the same type as the continuous assessment. It is necessary to obtain a grade ≥ 5 in the synthesis test to pass the subject. The grade obtained in this synthesis test will account for 80% of the final grade of the subject.

Attendance at all the seminar sessions is mandatory. The evaluation of this part will follow the same process as the continuous evaluation. The grade obtained in this part represents 20% of the final grade of the subject.

The single evaluation test will take place at the same time that the last midterm test of the continuous evaluation (date and time set in the academic calendar). The same recovery system and the same criterion for "No avaluable" will also be applied.

Bibliography

1) Pierce, B.A. 2016. Genética. Un enfoque conceptual. (5th edition). Ed. Médica Panamericana. Online UAB library access: https://bibcercador.uab.cat/permalink/34CSUC_UAB/avjcib/alma991007007729706709

2) Pierce, B.A. 2020. Genetics: A conceptual approach (7ª edition). Ed. Macmillan Learning. Online UAB library access : https://bibcercador.uab.cat/permalink/34CSUC_UAB/avjcib/alma991010703420506709

3) Watson, J.D.; Baker, T.A.; Bell, S. P.; Gann, A.; Levine, M.; Losick, R. 2016. Biología Molecular del Gen. (7th edition). Editorial Médica Panamericana. Online UAB library access (https://bibcercador.uab.cat/permalink/34CSUC_UAB/avjcib/alma991006798139706709).

4) Krebs, J.E.; Goldstein, E. S.; Kilpatrick, S.T. 2017. Lewin's Genes XII (12th edition). Jones and Bartllet Publishers.

5) Brown, T.A. 2007. Genomes 5. Ed. Médica Panamericana. Online UAB library access (https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991010871761406709).

Web links:
-Campus virtual interactiu https://cv2008.uab.cat/

Software

Specific softwares are not needed

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(SEM) Seminars	621	Catalan/Spanish	first semester	afternoon
(SEM) Seminars	622	Catalan/Spanish	first semester	afternoon
(TE) Theory	62	Spanish	first semester	afternoon