Universitat Autònoma de Barcelona

2019/2020

Molecular Genetics of Eukaryotes

Code: 104121
ECTS Credits: 6

Degree	Type	Year	Semester
2500890 Genetics	OB	2	1

Contact

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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: Yes

Teachers

Maria Antonia Velázquez Henar
Alejandra Bodelon de Frutos

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

- 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.
- Reason critically.
- 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 ones own languages and in English.

Learning Outcomes

1. Apply knowledge of theory to practice.
2. Apply scientific method to problem solving.
3. Be able to analyse and synthesise.
4. Describe the mechanisms and genetic consequences of epigenetic modifications.
5. Describe the mechanisms for regulating genic expression in viruses, bacteria and eukaryotes.
6. Describe the organisation of genetic material throughout the cell cycle.
7. Describe the processes of replication, transcription, translation and regulation of genes in prokaryotes and eukaryotes.
8. Develop self-directed learning.
9. Reason critically.
10. Relate the structure of nucleic acids with their biological functions.
11. Use and manage bibliographic information or computer or Internet resources in the field of study, in ones 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

Methodology

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. This is an essential teaching complement that allows to provide individual attention to the students.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problems/Seminars	7	0.28	2, 1, 4, 8, 9, 11
Theory lectures	33	1.32	5, 4, 7, 6, 8, 9, 10
Type: Supervised			
Tutorials	6	0.24	1
Type: Autonomous			
Bibliographical searches	9	0.36	8
Problem solving	18	0.72	2, 1, 9
Reading of prescribed texts	12	0.48	11
Study	58	2.32	8, 9, 3

Assessment

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.

Assessment Activities

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

Bibliography

1) Pierce, B.A. 2010. Genética. Un enfoque conceptual. (3ª edición). Ed. Médica Panamericana.

2) Watson, J.D.; Baker, T.A.; Bell, S. P.; Gann, A.; Levine, M.; Losick, R. 2006. Biología Molecular del Gen. (5º Edición). Editorial Médica Panamericana.

3) Lewin's Genes XI. 2014. Jones and Bartllet Publishers.

4) Brown, T.A. 2007. Genomes. (3ª Edición). Ed. Médica Panamericana.

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