Universitat Autònoma de Barcelona

2018/2019

Cell Biology

Code: 103980
ECTS Credits: 6

Degree	Type	Year	Semester
2500250 Biology	FB	1	1

Contact

Name: Lleonard Barrios Sanromà
Email: Lleonard.Barrios@uab.cat

Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Prerequisites

There are no official prerequisites, but it is advisable for the student to review:

1) The cellular structure

2) The basic functions of the cellular organelles

Objectives and Contextualisation

The subject Cellular Biology is taught in the 1st semester of the 1st year of the Biology Degree and in the same period as in other degrees of the Biosciences Faculty. Therefore, it can be considered as a basic subject of study in the field of biosciences.

Objectives of the course:

1) To describe the cellular structure and ultrastructure.

2) To know the functions of the organelles and other cellular structures, their relationships and to understand that their coordinated functioning is essential for cells tasks.

3) To know the processes of differentiation, specialization and cell death, and also their importance for the correct functioning of an organism.

Skills

- Be able to analyse and synthesise
- Be able to organise and plan.
- Develop a historical vision of biology.
- Develop independent learning strategies.
- Respect diversity in ideas, people and situations
- Understand the processes that determine the functioning of living beings in each of their levels of organisation.
- Work in teams.

Learning outcomes

1. Be able to analyse and synthesise.
2. Be able to organise and plan.
3. Describe the processes of cell differentiation, specialisation and death, and the cellular bases of the pathologies associated with functional errors.
4. Describe the structure of the different parts of a cell and their functioning.
5. Develop independent learning strategies.
6. Integrate the functions of the different organelles and cell structures with the overall functioning of the cell.
7. Relate the nature and organisation of genetic material in the cell to the control of gene expression at different points in the cell cycle.
8. Respect diversity in ideas, people and situations.
9. Summarise the most important historical milestones in cell biology and genetics and appreciate their contributions to present-day biology.
10. Use the bibliographic sources specific to cell biology and genetics to work independently on acquiring further knowledge.
11. Work in teams.

Content

LECTURES PROGRAM

1. Basic Microscopy Techniques in Cell Biology.

2. Organization of biological membranes. Structure and composition of the plasma membrane. Transmembrane transport: simple and facilitated diffusion, active transport. Endocytosis and phagocytosis. Cell junctions.

3. The extracellular matrix: components, structures and functions.

4. The internal membranous system. The endoplasmic reticulum: Structure and synthesis of lipids and proteins. The Golgi Complex: Structure. Post-translational modifications, classification and distribution of proteins. Routes of secretion.
Lysosomes and Endosomes.

5. Organelles related with the energy metabolism. Mitochondria: Structure, biogenesis and function. Chloroplasts: Structure, biogenesis and function. Peroxisomes: Structure, biogenesis and function.

6. The cytoskeleton. Microfilaments: structure, polymerization and functions. Cellular displacement. Microtubules: structure, polymerization and functions. Paper in vesicular transport. Intermediate filaments: types of proteins and structures.

7. The nucleus. Structure of the nuclear envelope. Structure of the nuclear pores. Transport nucleus-cytoplasm. Chromatin and chromosomes.

8. Introduction to cell signalling.

9. Cell cycle. The cell cycle: phases and control points. Cell division: Mitosis. Meiosis.

10. Gametogenesis and fertilization.

PRACTICE SESSIONS PROGRAM

1.- Introduction to the use of the optical microscope. Study of the plant cell.

2.- Introduction to the use of the optical microscope. Study of the animal cell.

3.- Electron microscopy

4.- Osmosis

5.- Mitosis

6. Meiosis

Methodology

The subject of cellular biology consists of theoretical classes using audio-visual media, practical classes in the laboratory and classes of problems.

Theoretical classes will be realized using audio-visual material prepared by the teacher. The students will have this material at their disposal, in the Moodle of the UAB, before the class.

Practical classes are designed to learn the use of laboratory instruments and to complement the theoretical training. Students will have 6 practice sessions of two hours each. Students will work in groups of 2 people, and at the end of each practice they must complete a questionnaire.

Problem classes are designed for students to work in small groups (4 students), and acquire group work abilities and critical thinking skills. Each group should make during the course two deliveries of problems that will be solved autonomously. The problems will be accessible to the students at least two weeks before the problems class and should be delivered to the teacher before the class. All groups will do a presentation of their results during the problems class.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Laboratory practice sessions	12	0.48	6, 8, 1, 11
Lectures	36	1.44	3, 4, 6, 9, 1
Problems class	2	0.08	6, 8, 1, 2
Type: Supervised			
Problems sessions preparation	4	0.16	1, 10
Tutorials	6	0.24	3, 4, 6, 8, 10
Type: Autonomous			
Problems solving	14	0.56	5, 6, 1, 11, 10
Study	70	2.8	3, 4, 5, 6, 7, 9, 1, 10

Evaluation

To pass the subject it will be necessary to obtain a minimum overall score of 5 points from a maximum of 10 possible points.

The planned evaluation activities are:

1) **First theory examination**. It will represent **35% of the final score** and will evaluate the first half of the subject taught in the theoretical classes.

2) **Second theory examination**. It will represent **35% of the final score** and will evaluate the second half of the subject taught in the theoretical classes.

3) **Problems classes**. It will represent **15% of the final score**. During the course, students must deliver two dossiers with four solved problems each. These problems will be available to the students, in the Moodle, at least one week before the delivery deadline. The resolution of the problems will be done autonomously in groups of four people. After that, in the class day, the students will explain their results.

4) **Laboratory practices.** It will represent **15% of the final score**. Attendance at laboratory practices is mandatory. The grade will be the average obtained from the evaluation of the questionnaires to be completed at the end of each practice.

The students that did not pass, will have a retake opportinuty. 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.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
First examination	35%	2	0.08	3, 4, 6, 9
Problems solving	15%	0.5	0.02	8, 1, 2, 11
Second examination	35%	2	0.08	3, 4, 6, 7, 9, 10
Solving practice questionnaires	15%	1.5	0.06	5, 8, 1

Bibliography

References

- Alberts B, Johnson A, Lewis J, Raff M, Roberts K, Walter P. 2016. Biología Molecular de la Célula. 6ª Edición. Editorial Omega.
- Alberts B, Johnson A, Lewis J, Morgan D, Raff M, Roberts K, Walter P. 2015. Molecular Biology of the cell. 6th Edition. Editorial Garland Science.
- Lodish H, Berk A, Kaiser CA, Krieger M, Bretscher A, Ploegh H, Amon A, Scott MP,. 2016. Biología Celular y Molecular. 7ª Edition. Editorial Panamericana.
- Lodish H, Berk A, Kaiser CA, Krieger M, Bretscher A, Ploegh H, Amon A, Martin K,. 2016. Molecular Cell Biology. 8th Edition. Editorial Freeman.
- Karp G. 2014. Biología Celular y Molecular. 7ª Edición. Editorial Mc Graw Hill.
- Karp G. 2018. Karp's Cell Biology. Global Edition. Editorial Wiley.
- Cooper GM, Hausman RE. 2017. La Célula. Edición 2017. Marbán Libros S.L. Madrid.
- Cooper GM, Hausman RE. 2018. The Cell. A molecular approach. 7th Edition. Sinauer - Oxford Eds.