Universitat Autònoma de Barcelona

2020/2021

Cell Biology

Code: 103980
ECTS Credits: 6

Degree	Type	Year	Semester
2500250 Biology	FB	1	1

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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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

Since Cell Biology is a first-semester subject of the Bachelor's Degree in Biology, there are no prerequisites for taking it. However, it is recommended that students have previous knowledge of basic biology, so that they can follow the classes. This would mostly include general aspects of cell structures and their organic composition (proteins, nucleic acids, carbohydrates, and lipids), as well as the main cellular metabolic pathways.

In addition, since most scientific information sources are in English, it is advisable to have a good grounding in this language.

Objectives and Contextualisation

Cell Biology is a basic subject of the Bachelor's Degree in Biology at the Autonomous University of Barcelona. The course aims to establish sound knowledge of the structural organization, functioning and regulation of eukaryotic cells.

The basic knowledge provided by the subject of Cell Biology is essential in order to be able to follow many other courses in the study plan. This is the main reason why this subject is scheduled for the first semester of the first year of the study plan.

The following are the specific training goals of this subject.

- To recognize the main differences between prokaryotes and eukaryotes.

- To describe the structure, composition and main features of cell membranes.

- To explain the organization and composition of other elements of the cell surface.

- To describe the transport processes through cell membranes.

- To describe the structure, composition and function of the different compartments of eukaryotic cells, as well as the relationships between them.

- To explain the role of mitochondria and chloroplasts in cell bioenergetics.

- To describe the protein classification systems and their intracellular distribution pathways.

- To describe chromatin composition and its organization throughout the cell cycle.

- To list the cytoskeleton elements and describe their composition and structure.

- To explain the contribution of the cytoskeleton to the cell shape and movement.

- To identify and describe molecules, structures and processes involved in a cell's communication with the external environment and other cells.

- To identify molecules involved in cell cycle regulation and explain their role.

- To list and describe the different mitotic and meiotic phases and to compare both types of cell divisions.

- To relate the functioning of eukaryotic cells with the occurrence of some diseases.

- To integrate and apply knowledge of theory when interpreting and resolving basic cell biology experiments.

- To use the appropriate scientific terminology in the field of cell biology.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- 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.
- 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 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.
- Understand the processes that determine the functioning of living beings in each of their levels of organisation.
- Work in teams.

Learning Outcomes

1. Analyse a situation and identify its points for improvement.
2. Be able to analyse and synthesise.
3. Be able to organise and plan.
4. Critically analyse the principles, values and procedures that govern the exercise of the profession.
5. Describe the processes of cell differentiation, specialisation and death, and the cellular bases of the pathologies associated with functional errors.
6. Describe the structure of the different parts of a cell and their functioning.
7. Integrate the functions of the different organelles and cell structures with the overall functioning of the cell.
8. Propose new methods or well-founded alternative solutions.
9. Relate the nature and organisation of genetic material in the cell to the control of gene expression at different points in the cell cycle.

10. 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.
11. 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.
12. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
13. 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.
14. Summarise the most important historical milestones in cell biology and genetics and appreciate their contributions to present-day biology.
15. Use the bibliographic sources specific to cell biology and genetics to work independently on acquiring further knowledge.
16. Work in teams.

Content

The contents of this subject will include the following points (***unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents***):

BLOCK I-INTRODUCTION

Unit 1. Organization of prokaryotic and eukaryotic cell.

BLOCK II- CELL SURFACE

Unit 2. Structure and composition of the plasma membrane.

Unit 3. Transport of molecules through the membrane.

Unit 4. Extracellular matrix and cell wall.

Unit 5. Unions and cell adhesion.

BLOKC III- INTRACEL·LULARS COMPARTMENTS

Unit 6. Introduction to the intracellular compartments and protein sorting.

Unit 7. Nucleus.

Unit 8. Cytosol.

Unit 9. Endoplasmic reticulum.

Unit 10. Golgi apparatus.

Unit 11. Endosomes, lysosomes, and vacuoles.

Unit 12. Mitochondria.

Unit 13. Chloroplasts.

Unit 14. Peroxisomes.

BLOCK IV- CYTOSKELETON

Unit 15. Microfilaments.

Unit 16. Microtubules.

Unit 17. Intermediate filaments.

BLOCK V- CELLULAR REGULATION

Unit 18. Cell signaling.

Unit 19. Cell cycle.

Unit 20. Mitosis.

Unit 21. Meiosis.

Methodology

The subject of Cell Biology includes Theory classes, Problem-based classes and Laboratory Practicals. Below, the organization and teaching methodology for these three types of training activities are described.

Theory classes

The content of the Theory program will be taught mainly in the form of formal lectures with audio-visual support. This will include PowerPoint presentations containing an index for each unit with the most important points that will be described, illustrative schematics of the contents, and also images of cells or their components, to familiarize students with real cell structure and organization.

The teacher will make supplementary audio-visual material available to the students through the Moodle classroom of the subject, to help them follow the lectures. They are recommended to bring this material to class as a support when taking notes. Some animations and videos related to cellular processes described in specific units will also be displayed.

Students will be advised to consult the recommended books listed in the Bibliography section of this Study Guide on a regular basis, in order to consolidate and, if necessary, clarify the contents described. In addition, it will also be recommended that they consult the links made available through the Moodle classroom: to additional videos and animations that, due to time constraints or content prioritization, cannot be shown in class.

As well as in the follow-up to lectures, students are also expected to play an active role in preparing certain course contents, which involves using alternative methodologies and requires them to develop transferable and generic competences related to independent learning. Specifically, students will be required to prepare some units of the program based on guidelines provided by the teacher. These guidelines will consist of a detailed index of the contents and the most important concepts that the students must acquire.

Problem-based classes

During these sessions, students will give presentations to the rest of the class, offering solutions to experimental problems related to the contents of the Theory classes. In general in these sessions, no additional programmed content will be presented, as their main aim is to consolidate and facilitate comprehension of the contents presented in the Theory classes, and to familiarize students with interpreting scientific data and problem-solving through real experimental situations.

In these sessions, students will be distributed in seveal working groups. They will present their solutions to the exercises they had previously been working on outside the classroom, as scheduled for that class. At the beginning of the semester, the teacher will provide the students with a dossier containing all the exercises to work on over the course, along with the calendar of submissions and presentations. Before each Problem-based class, students will have to submit their written answers of the scheduled exercises (a single submission each group). In these sessions, the teacher will ask several students to explain the solution to a problem to the rest of the class. The students who give these presentations will be chosen by the teacher, who will ensure that all groups get involved in these presentations throughout the course.

Once the exercises programmed for each practice class have been completed, the remaining available time will be devoted to debate and students' queries about important concepts in the units that they must prepare independently.

Laboratory Practicals

These sessions are intended to provide an applied view of the knowledge acquired in the Theory classes to the students and, at the same time, favoring their learning of how to use basic laboratory instruments. Specifically, these classes will be organized in sessions of two hours each one. The students, in groups of maximum two people, will carry out simple experiments related to the contents of the subject'sprogram.

At the beginning of the course, the teacher will provide the Laboratory-Practicals script to the students through the Virtual Campus. Students will have to bring it printed in the several sessions in order to follow the activities and protocols established for each class. This script will contain *the General Regulations of the Laboratory Practicals* that students will have read and follow throughout all sessions.

In addition, before assisting to these practical sessions, students must have passed the corresponding Biosafety Tests and submit the corresponding certifying documentation.

The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory Practicals	12	0.48	4, 1, 6, 7, 8, 13, 10, 11, 9, 14, 2, 3, 16
Problem-based classes	2	0.08	4, 1, 5, 6, 7, 8, 13, 10, 11, 9, 2, 3
Theory classes	36	1.44	5, 6, 7, 13, 9, 14, 2
Type: Autonomous			
Individual study	55	2.2	5, 6, 7, 13, 12, 9, 14, 2, 3, 15
Problem resolution in groups	14	0.56	5, 6, 7, 13, 12, 10, 11, 9, 14, 2, 3, 16, 15
Self-learning contents	22	0.88	5, 6, 7, 13, 12, 9, 2, 3, 15

Assessment

Students' progress in acquiring competences on the course will be monitored through continuous assessment. For this purpose, different assessment systems will be used to verify that the student has achieved the various learning outcomes established for the subject.

Assessment of contents taught in Theory classes

The contents taught in Theory classes will have a weight of 70% of the final grade for the subject. During the course there will be two interim tests related to these contents that the students will have to take individually. These tests will consist of a series of objective questions to show whether the students have assimilated the concepts required to pass the subject, and whether they know how to integrate and interrelate them. These tests will also include questions on the units that students will have prepared on their own, in order to evaluate the corresponding learning outcomes.

The first interim test will have a weight of 35% of the final mark and will focus on the contents taught up to that moment including two units that students have had to prepare independently.

The second interim test will include the rest of the contents (although some questions can also indirectly refer to aspects of the units evaluated in the first test). This test will also include two units that students have to prepare independently. The weight of this second test in the final mark will be 35%.

The final exam will integrate the contents of the whole course and will be in two parts. Each of these parts will include the contents related to the two previous interim tests and thus they will again represent 35%+35% of the final mark.

Assessment of contents taught in Problem-based classes

The contents related to the practice classes will have a weight of 10% of the final mark. In this part, students' teamwork when solving experimental problems related to the Theoretical content of the subject will be evaluated.

Each team will have to provide solutions to the problems programmed for each session according to the calendar set by the teacher (a single submission from each group). The corresponding answer sheets should be downloaded from the Campus Virtual. Of all problems collected during the semester, the teacher will choose some of them to be evaluated and marked for all groups. The average mark obtained from these corrections will account for the 10% of the final grade for the subject. All members of each team will receive the same mark. This assessment will take into account whether students have understood how to approach the problem, whether they have interpreted the data properly, and whether they have reached the correct answer.

Additionally, in each session, several students will be asked to orally present the solutions to the exercises programmed for that session. These students will be chosen by the teacher to ensure that all groups will be involved in the presented exercises to the rest of the class. With the purpose of ensuring that all students had been involved in the teamwork necessary to solve these exercises, in these exhibitions the teacher will ensure that the students who present the resolutions had worked and had understood the problem (independently whether the answer is correct or not). In the case of detecting that a student had not participated in the teamwork, a penalty will be applied to all members of the group regardless of who had done the exhibition. If any group has problems with any of its members when doing this teamwork, they will have to contact the teacher in advance of these classes. The teacher will schedule the convenient tutorials in order to help the groups solving this situation. Those students who interfere or do not participate in the teamwork will not benefit from the qualifications obtained in this part of the subject or a penalty will be applied to their mark.

In these presentations the participation of the other teams will be encouraged, either by discussing the results presented or by assessing the possibility of other valid answers. This will also help to ensure that all students have understood the exercise.

Assessment of contents taught in Laboratory Practicals

At the end of each Practical lesson, the students will have to individually answer a questionnaire that will contain questions related to the corresponding class. The resulting average of all marks obtained from these tests will have a weight of 20% on the final mark of the subject.

Attendance to all six practical sessions is mandatory and students must be prompt (once the teacher begins the class, no more students will be allowed in the classroom). If a student arrives late or does not attend to a given session, he/she will have the option of recovering the corresponding lesson another day under his/her responsibility. That is, he/she may try to attend to another session programmed for another group/Degree as long as that group is not full. In case all remaining groups are full, or that practical lesson is no longer taught, this unjustified absence will entail a penalty on the mark of this part of the subject:

- Non-attendance to one or two sessions (without justification) will imply a reduction of the average mark of this part of the subject by 25% or 50%, respectively.

- Non-attendance to more than two session (without justification), will imply obtaining a 0 in this part of the subject. This will represent failing the subject.

Otherwise, if a student does not attend a programed session for extenuating circumstances(i.e. health problem, death of a first- or second-degree relative, an accident, or unavoidable competitions in the case of elite student athletes), she/he will have to contact the coordinator of the subject and provide the official documentation (respectively: official medical certificatethat explicitly confirms the inability to carry out the exam, police statement, justification from the competent sports organization.). This way, the coordinator will ensure that the student recovers the session in another group.

Moreover, if a student assist to the Laboratory Practicals without having passed the corresponding Biosecurity Tests, he will obtain a 0 in this part and therefore suspend the subject.

MARKING SYSTEM

Regarding the Theory contents, in order to have the right to the 70% of the final grade corresponding to this part, students will be able to perform two interim tests and a final recovery exam. For the marks obtained in the two interim tests to be taken into account, it is necessary to obtain a mark higher than 4 (out of 10) in each one of them. Students who do not achieve this mark will be able to retake the corresponding parts in the final exam. To be eligible for the retake process in the final exam, the student should have been previously evaluated in the two previous interim tests. If a student who has passed the subject by performing the two interim tests decides to take the final exam to improve the mark obtained, he/she will lose all previously obtained interim marks.

In the evaluation of the contents related to the Problem-based classes, in order to have the right to the 10% of the final grade corresponding to this part, students should have been part of a team that has punctually submitted all problems set. Students who do not participate in the tasks of their team or in the oral presentations will obtain a 0 in this part of the subject.

In the evaluation of the contents related to the Laboratory Practicals, in order to have the right to the 20% of the final grade corresponding to this part, students must have attended to all practical sessions and obtain a mark higher than 4 (out of 10) as an average marks of all questionnaires performed. In case of not achieving this qualification, the student will fail the subject.

Globally, the maximum mark that can be obtained after completing all these activities will be 10 points (out of 10).

To be able to pass the subject, the following conditions must be fulfilled.

- Obtaining a mark equal to or greater than 4 points (out of 10) in each interim test or in the corresponding parts of the final exam.

- Obtaining a mark equal to or greater than 4 points (out of 10) as a result of the questionnaires performed in the Laboratory sessions.

- Obtaining an overall mark of ≥5 (out of 10) for all evaluations received.

All the factors to be taken into account in the marking systems established for this subject are described in the following table:

	MARKS OBTAINED	WEIGHT	MINIMUM MARK TO QUALIFY	ADDITIONAL FACTORS
THEORY CLASSES (70%)	Mark for the 1r Interim Test	35%	≥4 points (out of 10)	- Students with a fail mark can the corresponding part in the fi (they should have been previou evaluated in the two previous ir tests)
	Mark for the 2n Interim Test	35%	≥4 points (out of 10)	

	Final Exam	Mark for the reassessment of the 1r Interim Test	35%	≥4 points (out of 10)	- Trying to improve the marks c implies losing the previously ob interim marks
		Mark for the reassessment of the 2n Interim Test	35%	≥4 points (out of 10)	
PROBLEM-BASED CLASSES (10%)	Average mark of the delivered problems		10%	N/A	- Each team must have deliver exercises according to the sche - It is mandatory to participate i teamwork
LABORATORY PRACTICALS (20%)	Average mark of the questionnaires		20%	≥4 points (out of 10)	- The assistance of ≥4 session compulsory to pass the subject - It is necessary to pass the Bic Tests
	NOTA FINAL		100%	≥5 points (out of 10)	

Students will be considered "not assessable" if the combined weight of all the evaluation activities they have done is less than 67% of the final mark.

Students who engage in misconduct (plagiarism, copying, personation, etc.) in an assessment activity will receive a mark of "0" forthe activity in question. In thecase of misconduct in more than one assessment activity, the students involved will be given a final mark of "0" for the subject.

In the case of students who do not pass the subject in a given academic year, the marks obtained in the Problem-based classes and in the Laboratory Practicals will be kept for the next year whenever the competences associated with these classes have been obtained (obtaining >5 points out of 10 in each). Otherwise, they will have to repeat the evaluation activities to obtain the corresponding grade. This exemption will be maintained for a period of three additional enrolments.

Students who are unable to attend an exam due to extenuating circumstances (i.e. health problem, death of a first- or second-degree relative, an accident, or unavoidable competitions in the case of elite student athletes) and who provide the official documentation to the degree coordinator (respectively: official medical certificate that explicitly confirms the inability to carry out the exam, police statement, justification from the competent sports organization), will be entitled to perform the test on another day. Both the Bachelor's Degree coordinator and the teacher will do as much as possible to resolve these situations.

Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Final reassessment exam	70%	3	0.12	5, 6, 7, 13, 12, 9, 14, 2, 3, 15

First interim test	35%	3	0.12	5, 6, 7, 13, 12, 9, 14, 2, 3, 15
Problem resolution, delivery and presentation	10%	0	0	4, 1, 5, 6, 7, 8, 13, 12, 10, 11, 9, 2, 3, 16, 15
Questionnaires of the Laboratory Practicals	20%	0	0	4, 1, 6, 7, 8, 13, 10, 11, 9, 2
Sec	35%	3	0.12	5, 6, 7, 13, 12, 9, 14, 2, 3, 15

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