Cell Biology

Code: 102954
ECTS Credits: 6

2024/2025

Degree	Type	Year
2502442 Medicine	FB	1

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Teachers

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Teaching groups languages

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

Prerequisites

There are no prerequisites for taking the core subject of Cell Biology as it is a subject in the first semester of the first year. However, in order to ensure proper follow-up and the achievement of the learning objectives set out, it is recommended that students have a basic general knowledge of the structure, chemical composition and functions of the cells.

In addition, students should have good knowledge of English because many of the sources of information on this subject are in this language.

Objectives and Contextualisation

The subject of Cell Biology is attended to the first year of the Degree of Medicine, corresponding to a preclinical period, where students must obtain solid knowledge about the structural organization, functioning and regulation of the cells, Eukaryotic cells.

These basic skills are complemented with other basic and compulsory subjects in the Plan of Studies such as Biochemistry, Human genetics, Histology and Physiology, which will provide the student with a good understanding of the structural and functional organization of the human organism in the normal state (non-pathological).

On the other hand, the theoretical knowledge acquired in the subject of Cell Biology is complemented by practical training in the laboratory that allows students to introduce the techniques of study of the somatic and germinal cells, in a state of rest or division as well as of the observation of the cellular ultrastructure.

The formative objective of Cell Biology is that the students at the end of the subject are able to:

- Recognize the main differences between prokaryotic and eukaryotic cells

- Describe the structure, chemical composition and main functions of cell membranes

- Explain the processes of transport through the cell membranes

- Describe the organization and chemical composition of other elements of the cell surface

- Describe the structure, chemical composition and functions of the different cell compartments

- Explain the structure, chemical composition and functions of mitochondria and peroxisomes

- Describe the role of the cytosol

- Describe the structure, chemical composition and functions of the nuclear envelope and chromatin.

- Recognize the basic mechanisms of nuclear activity: replication and transcription

- List the different components of the cytoskeleton and describe its composition and structure

- Explain the contribution of the cytoskeleton in the formation of tissues

- Identify the molecules that participate in the control of the regulation of the cell cycle

- Describe the mechanisms involved in cell death for necrosis and apoptosis

- List and describe the different phases of the mitotic and myosic cell division and compare the two types of cell divisions

- Describe the process of male and female gametogenesis and compare the two types of processes

- Explain the Fertilization process

- Use properly the scientific terminology used in the field of Cell Biology

Competences

- Communicate clearly, orally and in writing, with other professionals and the media.
- Convey knowledge and techniques to professionals working in other fields.
- Critically assess and use clinical and biomedical information sources to obtain, organise, interpret and present information on science and health.
- Demonstrate basic research skills.
- Demonstrate knowledge of the principles and physical, biochemical and biological processes that help to understand the functioning of the organism and its disorders.
- Demonstrate understanding of the basic sciences and the principles underpinning them.

- Demonstrate understanding of the importance and the limitations of scientific thought to the study, prevention and management of diseases.
- Demonstrate understanding of the mechanisms of alterations to the structure and function of the systems of the organism in illness.
- Demonstrate understanding of the organisation and functions of the genome, the mechanisms of transmission and expression of genetic information and the molecular and cellular bases of genetic analysis.
- Demonstrate understanding of the structure and function of the body systems of the normal human organism at different stages in life and in both sexes.
- Formulate hypotheses and compile and critically assess information for problem-solving, using the scientific method.
- Maintain and sharpen one's professional competence, in particular by independently learning new material and techniques and by focusing on quality.
- Recognise the effects of growth, development and ageing on individuals and their social environment.

Learning Outcomes

1. Communicate clearly, orally and in writing, with other professionals and the media.
2. Convey knowledge and techniques to professionals working in other fields.
3. Demonstrate basic research skills.
4. Describe the functional and organisational structure of hereditary nuclear and mitochondrial material.
5. Describe the processes involved in somatic and germinal cell proliferation: mitosis and meiosis.
6. Describe the processes of cell differentiation, ageing and death.
7. Explain how alterations to cell components lead to structural and functional alterations to systems of the human organism.
8. Explain the molecular and cellular significance of tissue and system structure.
9. Formulate hypotheses and compile and critically assess information for problem-solving, using the scientific method.
10. Identify the basic functional and organisational structure of hereditary nuclear and mitochondrial material.
11. Identify the basic processes of life on various levels of organisation: cell, organ and individual.
12. Identify the cell processes that can be the cause or the consequence of pathological manifestations in the organism.
13. Identify the main cellular processes involved in growth, development and ageing in individuals and their social environment.
14. Identify the mechanisms and the molecular and cellular processes that can be the cause or the consequence of pathological manifestations in the organism.
15. Integrate the functions of the the different cell organelles and structures with the overall functioning of the cell.
16. Maintain and sharpen one's professional competence, in particular by independently learning new material and techniques and by focusing on quality.
17. Relate the structure of the different parts of cell to its functioning.
18. Use specific bibliographic sources in cell biology to work independently on acquiring further knowledge.

Content

Basic techniques in Cell Biology. Plasma membrane. Internal membrane system. Energy conversion organs. Cytoskeleton Extracellular matrix. Nucleus and its relation with the cytoplasm. Cell cycle: Interphase and Mitosis. Cell Death: Necrosis and Apoptosis. Meiosis. Male and female gametogenesis. Fertilization.

Distributive blocks

A. Levels of cell organization. Cell theory and general organization of the cell. General characteristics of prokaryotic and eukaryotic cells.

B. Plasma membrane. Macromolecular organization of the plasma membrane and glycocalyx. Characteristics of the membrane: fluidity and asymmetry. Functions of the membrane: transport of ions, small molecules, macromolecules and particles. Processes of endocytosis, pinocytosis, potocytosis, phagocytosis and exocytosis.

C. Internal membrane system. Introduction to cell division and the traffic of proteins and other molecules. Elements of the internal membranous system. Structure and functions of the rugged and smooth endoplasmic reticulum, of the Golgi apparatus, of the endosomes and lysosomes.

D. Mitochondria and peroxisomes: structure and composition. Functions of mitochondria and peroxisome. Biogenesis. Mitochondrial genome. Import of proteins and lipids from the cytosol. Apoptosis. Alteration of mitochondrial function in cancer.

E. Cytosol and cytoskeleton. Functions of the cytosol. Cell signaling. Cytoskeleton components: structure and functions. Cytoskeleton-associated proteins: examples and association with disease. Types of intermediate filaments and their presence according to cell types.

F. Cell adhesion and matrix. Adhesion and cell binding molecules. Structure and functions of the different types of junctions: occlusive, anchoring, cell-cell adhesives, cell-matrix extracellular adhesives, and communicants. Examples of matrix-cell relationship: lymphocyte extravasation; metastasis.

G. Nucleus and nuclear activity. Structure of its components: nuclear envelope, nuclear pores, nuclear lamina, nuclear matrix, nucleolus, nucleoplasm. Chromatin structure and organization: relationship with the nuclear sheet and with the genetic control of transcription. Non-coding RNAs: types, biogenesis, structure, and function. Non-coding RNAs and cancer.

H. Cell cycle: phases and control mechanisms. Mitotic cell division: phases. Alterations of the cycle and its control: immortality and cancer.

I. Meiosis. Meiotic divisions: phases. Biological significance of meiosis: genetic diversity and meiotic recombination. Male gametogenesis. Female gametogenesis. Fertilization mechanism. Stem cells.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
THEORY (TE) / CLASSICAL PRACTICES (PAUL) / LABORATORY PRACTICES (PLAB) / SPECIALIZED SEMINARS (SESP)	53	2.12	1, 3, 6, 5, 4, 2, 8, 7, 9, 14, 13, 11, 12, 10, 15, 16, 17, 18
Type: Supervised			
PROBLEM-BASED LEARNING (ABP)	23	0.92	1, 3, 6, 5, 4, 2, 8, 7, 9, 14, 13, 11, 12, 10, 15, 16, 17, 18
Type: Autonomous			
DEVELOPMENT OF WORK / PERSONAL STUDY	69	2.76	1, 3, 6, 5, 4, 2, 8, 7, 9, 14, 13, 11, 12, 10, 15, 16, 17, 18

Directed Teaching
Theory lecture (TE). Classroom practices (PAUL). Laboratory practices (PLAB). Specialized seminars (SEM)

Supervised Teaching

Problem based learning

Autonomous Teaching
Personal study. Elaboration of works

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
Classroom practices: evaluations written through objective tests of multiple choice items	10%	1	0.04	1, 3, 5, 2, 9, 13, 12, 15, 16, 17
Laboratory practices y seminario: written assessments through activities or test essays of restricted questions and objective tests of multiple choice items	20%	1	0.04	6, 5, 9, 14, 13, 12, 15, 16, 17, 18
Theory: evaluations written through objective tests: multiple choice items	70%	3	0.12	6, 5, 4, 8, 7, 14, 13, 11, 12, 10, 15, 17

Evaluation Model

The evaluation of the subject will be based on the theoretical and practical syllabus that consists in the Program of the same. The achievement of the objectives and the acquisition of the competences described in the previous sections will be assessed, both those associated with the theoretical concepts expressed in the blocks and those associated with seminars and practices (laboratory and classroom).

Continuous evaluation:

The subject will be evaluated continuously during the course through two partial tests (P1 and P2) eliminatory of subject plus three activities or tests that will evaluate the content of the sessions of laboratory practices (S1, S2, S3), and a test that will evaluate the contents of the microscopy seminar (SEM). Each of the two partial tests will be done through an objective exam with multiple choice items, aimed at demonstrating the acquisition of competences and the integration of theoretical and practical learning. It will consist of multiple choice questions with 4 answers, of which 1, 2 or 3 can be true. Wrong answers will be proportionately subtracted.

The contents that will be evaluated in P1 are: i) Theory of the first topics (from A to D and cytosol) (32%) and ii) the first two classroom practices (5%)

The contents that will be evaluated in P2 are: i) Theory of the last topics (from E, except Cytosol, to I) (38%) and ii) classroom practices 3 and 4 (5%).

The tests or activities that will be carried out in the S1, S2 and S3 of laboratory practices and in the SEM will evaluate the participation and knowledge acquired in each of these sessions. The activities or tests will be related to the activity carried out.

The partial tests P1 and P2 will be done on the days indicated by the Faculty, in the classrooms indicated. The activities or tests of S1, S2, S3 and SEM will be done in the same practice laboratory (for S1, S2 and S3) or in the seminar room (for SEM), at the end of each of the sessions and are not recoverable. Each of the tests and activities described in the previous paragraph will have the following weighting in the final grade of the subject:

P1 (37%) + P2 (43%) + S1(5%) + S2 (5%) + S3 (5%) + SEM (5%)

To pass the subject, the following requirements must be met: i) that the two grades obtained in P1 and P2 are equal to or greater than 5 and ii) that the weighted average of P1+P2+S1+S2+S3+SEM is equal to or greater than5 out of 10.

Attention: attendance at laboratory practice sessions is mandatory for students enrolled for the first time in this subject and who follow the continuous assessment model. Repeating students of course 22-23 who have a grade higher than 5 in tests S2 and S3 are not obliged to do them and the mark obtained the previous course is saved.

Final test of recovery:

In the case of not passing the subject through continuous assessment, there will be a final evaluation of recovery of the partial tests with a grade lower than 5, mandatory to make average. Students with partial tests with a grade greater than 5 can also take the recovery exam in order to try to raise the grade of the partial or partials they consider. To do this, they must request it sufficiently in advance from the coordinator of the subject. The grade previously obtained in the continuous evaluation will be replaced by the grade obtained in the recovery exam

In order to participate in the recovery test, two requirements must be met: i) have submitted to the two partial tests P1 and P2 and ii) that the weighted average mark of the continuous evaluation (P1(37%)+P2(48%)+S1(5%)+S2 (5%)+S3 (5%)+SEM(5%)) is equal to or greater than 2.5.

The recovery exam will consist of two parts:

The first part (37% of the final grade) is an objective test that corresponds to the contents of P1, and therefore evaluates the following contents: i) Theory of the first topics (from A to D and cytosol) (32%) and ii) the first two classroom practices (5%).

The second part (48% of the final grade) is an objective test that corresponds to the contents of P2, and therefore evaluates the following contents: i) Theory (38%) of the last topics (from E, except Cytosol, to I) and ii) classroom practices 3 and 4 (5%).

Students who have passed one of the two partials with a grade equal to or greater than 5 will be able to examine only the corresponding part of the suspended partial, without also having to submit to the partial that they have already approved.

The final grade of recovery of the subject will be the sum of the weighted grade of the recovery exam plus the weighted notes of the two practice tests. In case a student has passed a partial, the grade obtained during the continuous assessment, corresponding weighted, will be taken into account for the calculation of the final grade of the recovery exam.

The day and time of the revisions of the partial exams and the recovery exam will be announced immediately upon the publication of the notes.

Exam review procedure:

Students may submit claims to the statement of the questions during the two days following the completion of the face-to-face exams.

The day and time of the revisions of the partial exams and the recovery exam will be announced immediately upon the publication of the notes.

ATTENTION: Student's assessment may experience some modifications depending on events outside the universitythat may affect face-to-face learning.

Examination-based evaluation:

Students can enter the single assessment system, according to the regulations of the Faculty. Single assessment will be based on the content of the subject's programme, the acquisition of the same competences, and will have the same level of demand as continuous assessment.

Single assessment consists of examinations carried out on the same date as the second partial of the continuous assessment.

For the evaluation an exam will be carried out consisting of:

Theoretical knowledge

- multiple choice questions to evaluate the theoretical knowledge of the subject (blocks A-I) and the content of the PAUL, with a weighting of 80% of the overall grade.

Practical knowledge

- Multiple choice questions and / or restricted written questions of the concepts related to the laboratory and seminar practices, with a weighting of 20% of the overall grade.

To pass the subject, the following requirements must be met:

1. Have obtained a grade of 5.0 or higher in the exam that evaluates the theoretical knowledge of the subject.

2. That the weighted average of the marks obtained in the different exams carried out is equal to or greater than 5.0.

The student who does not attend the scheduled global and recovery exams will be considered as "not evaluable".

Retake exam. The same recovery system will be applied as for continuous assessment.

The review of the qualifications will follow the same procedure as for the continuous assessment.

Bibliography

BASIC BIBLIOGRAPHY

1 - "Biología Molecular de la Célula". Alberts y col. 6ª edición. Ed. Omega. Barcelona, 2016

2 - "Molecular Biology of the Cell". Alberts et al. 7th edition. W W Norton&Company. New York, 2022.

3 - "La Célula". Cooper y Hausman. 7ª edición. Ed. Marbán Libros S.L. Madrid, 2017

4 - "The Cell". Cooper & Hausman 7th edition, Sinauer Associetes (Oxford University Press), 2017

5 - "Introducción a la Biología Celular". Alberts y col. 3ª ed. Ed. Médica Panamericana. Madrid, 2010

6 - "Biología Celular Biomédica" Calvo A. Elsevier. Barcelona, 2015

7 - "Biología Celular y Molecular". Karp. 6ª edició. Ed. Mac Graw-Hill Interamericana S.A. Mèxic, 2011
8 - "Molecular Cell Biology". Lodish et al. 8th edition. WH Freeman and Company. New York, 2016

9 - "The World of the Cell". Becker et al. 7th edition. Pearson. San Francisco, 2008

INTERNET RESOURCES

- Books: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=Books

- Open access review articles and accessible review articles from the computers of the UAB Network. (If you are outside the campus, through the ARE service, Access to Electronic Resources service)

Software

There is no need for any specific software

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	101	Catalan	first semester	morning-mixed
(PAUL) Classroom practices	102	Catalan	first semester	morning-mixed
(PAUL) Classroom practices	103	Catalan	first semester	morning-mixed
(PAUL) Classroom practices	104	Catalan	first semester	morning-mixed
(PAUL) Classroom practices	105	Catalan	first semester	morning-mixed
(PAUL) Classroom practices	106	Catalan	first semester	morning-mixed
(PAUL) Classroom practices	107	Catalan	first semester	morning-mixed
(PAUL) Classroom practices	108	Catalan	first semester	morning-mixed
(PAUL) Classroom practices	109	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	101	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	102	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	103	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	104	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	105	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	106	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	107	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	108	Catalan	first semester	morning-mixed

(PLAB) Practical laboratories	109	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	110	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	111	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	112	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	113	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	114	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	115	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	116	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	117	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	118	Catalan	first semester	morning-mixed
(SEM) Seminars	101	Catalan	first semester	morning-mixed
(SEM) Seminars	102	Catalan	first semester	morning-mixed
(SEM) Seminars	103	Catalan	first semester	morning-mixed
(SEM) Seminars	104	Catalan	first semester	morning-mixed
(SEM) Seminars	105	Catalan	first semester	morning-mixed
(SEM) Seminars	106	Catalan	first semester	morning-mixed
(SEM) Seminars	107	Catalan	first semester	morning-mixed
(SEM) Seminars	108	Catalan	first semester	morning-mixed
(SEM) Seminars	109	Catalan	first semester	morning-mixed
(SEM) Seminars	110	Catalan	first semester	morning-mixed
(SEM) Seminars	111	Catalan	first semester	morning-mixed
(SEM) Seminars	112	Catalan	first semester	morning-mixed
(SEM) Seminars	113	Catalan	first semester	morning-mixed
(SEM) Seminars	114	Catalan	first semester	morning-mixed
(SEM) Seminars	115	Catalan	first semester	morning-mixed
(SEM) Seminars	116	Catalan	first semester	morning-mixed
(SEM) Seminars	117	Catalan	first semester	morning-mixed
(SEM) Seminars	118	Catalan	first semester	morning-mixed
(TE) Theory	101	Catalan	first semester	afternoon
(TE) Theory	102	Catalan	first semester	afternoon
(TE) Theory	103	Catalan	first semester	afternoon

(TE) Theory	104	Catalan	first semester	afternoon