

**COURSE DATA****Data Subject**

Code	33173
Name	Cellular biology
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1102 - Degree in Biotechnology	Faculty of Biological Sciences	2	First term

Subject-matter

Degree	Subject-matter	Character
1102 - Degree in Biotechnology	83 - Cell biology	Obligatory

Coordination

Name	Department
BLASCO IBAÑEZ, JOSE MIGUEL	21 - Cellular Biology and Parasitology

SUMMARY

The objective of this course is that the students acquire an integrated vision of the various processes involved in the cellular function from the perspective of the static cell as well of the cell division and of the interactions among cells in a multicellular organism. This knowledge is necessary for a deep understanding of the possible interactions with the cellular metabolism. The contents correspond to: The cell as a structural and functional unit of living matter. Organization of the prokaryotic and eukaryotic cells. Plasma membrane and endomembrane systems, vesicular trafficking and protein trafficking. Mitochondria and chloroplasts. The nucleus, the nuclear matrix and chromatin organization. The cytoskeleton and cell motility. Cell interactions and extracellular matrix. The plant cell. Structures and compartments of the plant cell. Cell cycle; phases. Cell signaling. Mechanisms of action and signal transduction. Introduction to the basic molecular mechanisms of cell fate control: growth and cell division, differentiation, senescence, and apoptosis. Mitosis. Meiosis. Gametogenesis in animals. Fertilization. Notions of embryogenesis. Introduction to animal and plant tissues.



PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

OUTCOMES

1102 - Degree in Biotechnology

- Be able to identify the molecules that make up a living being.
- Understand the process of synthesis of proteins, their processing and their location in different sub-cellular compartments.
- Understand cell signalling processes.
- Know how to carry out a study of the different phases of the cell cycle and quantify them correctly.

LEARNING OUTCOMES

Knowing the composition, formation and function of each cell compartment.

Knowing the mechanism and function of cell division and its implications.

Knowing the mechanism and function of meiosis and gametogenesis.

Knowing the mechanism and implications of fertilization and how a multicellular organism is formed up to the early stages of embryonic development.

Knowing the formation of the germ layers and how they transform into the tissues and organs.

Recognizing the different cell structures both under light and electron microscopy.

Recognizing the special characteristics of different tissue types, and the most characteristic examples of them.

By the end of the course the student is to be able to transmit the contents of the course and to discuss and argue about issues of scientific interest using the contents of this course.

DESCRIPTION OF CONTENTS



1. Theory

- 1 Levels of organization, cell theory and study techniques in cell biology.
- 2 lipid membranes: composition, structure and function. Transport through membrane.
- 3 Nucleus. The interphase chromatin. The metaphase chromosome. The nuclear lamina. The nuclear membrane. The nuclear pore: transport through the pore.
- 4 nucleolus. Other intranuclear organelles.
- 5 The rough endoplasmic reticulum. Translation and processing of membrane proteins and secreted proteins. The smooth endoplasmic reticulum.
- 6 Golgi. Maturation and transport of membrane proteins and extracitoplasmáticas. Protein transport to lysosomes.
- 7 exocytosis. Endocytosis. Receptor-mediated endocytosis. Vesicle transport and routing.
- 8 Components of the cytoskeleton. Microtubules, intermediate filaments and microfilaments: assembly, function and location. Cell migration.
- 9 extracellular matrix. Components and structure. Degradation of extracellular matrix components. Cell adhesion to extracellular matrix.
- 10 The cell junctions. Unions anchor cell-cell: adherent junctions and desmosomes. Occluding junctions. Junctions.
- 11 Cell signaling. Signaling systems. Receptor types. Surface receptors bound to G-proteins bound to surface receptors enzymes. Cellular adaptation.
- 12 The mitochondria and chloroplasts. Protein transport to mitochondria and chloroplasts. Peroxisomes. Origin and biogenesis
- 13 cell cycle. Cell growth and proliferation. Growth factors. Cancer. Senescence and cell death. Necrosis and apoptosis. Cell division
14. Mitosis.
- 15 Sexual reproduction. Meiosis. Meiotic stages. Gametogenesis in animals. Spermatogenesis and spermiogenesis. Oogenesis.
- 16 Fertilization. Segmentation. Gastrulation. Cell differentiation. Germ layers.
- 17 types of tissue: origin and organization. Epithelial tissues.

2. Practice

1. The optical microscope: types. Sample preparation: making a blood smear.
- 2 Electronic Microscopy. Organelles.
- 3 Problems of electron microscopy. The electron microscope.
- 4 Fluorescence microscopy. Cell markers. Counts in a hemocytometer.
- 5 Mitosis. Markers of cell division and cell activity.
- 6 Plant tissues. Spermatogenesis and oogenesis.
- 7 Epithelial tissues. Skin, lung, kidney, digestive tract. Exocrine and endocrine glands.
- 8 Fabrics nonepithelial. Connective. Bone. Cartilage. Muscle.
- 9 Blood and hematopoietic tissues.
- 10 Nervous tissue. Neurons and glia. Gray matter and white matter.

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Theory classes	38,00	100
Laboratory practices	20,00	100
Tutorials	2,00	100
Attendance at events and external activities	2,00	0
Preparation of evaluation activities	18,00	0
Preparing lectures	70,00	0
TOTAL	150,00	

TEACHING METHODOLOGY

Theory classes will consist of 3 sessions per week where the contents of the course will be exposed by the teacher and doubts that could arise will be solved in common. Voluntary reading a series of scientific literature that dealt with the contents of the subject will be proposed. The practices will be developed in 10 sessions of two hours with a demonstrative content and will be expanded next years in the course *Tecnologies Cel·lulars*

EVALUATION

During the term there will be 3 scoring tests on content proposed by the teacher that will collectively represent 1 point on the final grade. Theory Exam. The final theory exam will consist of a written test that will count 6.5 points for the final grade. Practice Exam. It will consist of a written test and will count 2.5 points for the final grade. It will be necessary to have attended practical classes or carried out the substitute activities. It will be compulsory to pass the theory and practical exams separately in the same call to pass the course. The qualification of the scoring tests will be kept for the second call. Failure to take either the theory or the practical exam in a call will be classified as NOT PRESENTED, despite having a score in the rest of the tests.

Activities	Percentage	Minimum
	note	in each part

Scoring Tests	10%	0%
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Theory 65% 50%
Exam

Practice 25% 50%
Exam

REFERENCES

Basic

- Básicas:
 - Alberts et al., Essential cell biology. 5th edition. Norton & Company (2018)
 - Alberts et al., Molecular biology of the cell. 6th edition. Garland Science (2014)
 - Cooper. The cell: a molecular approach. 8th edition. OUP USA (2019)
 - Paniagua et al. Biología celular y molecular. 4ª edición. McGraw-Hill Interamericana de España S.L. (2017)

Additional

- Barresi and Gilbert, Developmental biology. 12th edition. Sinauer Assoc (2019)
- Lodish et al. Molecular cell biology. 8th edition. MH Freeman (2016)
- Rhodin. Histology: a Text and Atlas. Oxford University Press (1974)
- Pawlina and Ross. Histology, a text and atlas: with correlated cell and molecular biology. 8th edition. Lippincott Raven (2018)
- Trends in Cell Biology. ed. Cell Press.