

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

Code	33931
Name	General biology
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1205 - Degree in Human Nutrition and Dietetics	Faculty of Pharmacy	1	First term

Subject-matter

Degree	Subject-matter	Character
1205 - Degree in Human Nutrition and Dietetics	2 - Biology	Basic Training

Coordination

Name	Department
GONZALEZ MAS, MARIA DEL CARMEN	25 - Plant Biology
RENAU MORATA, BEGOÑA	25 - Plant Biology

SUMMARY

General Biology is a basic training semiannual course of the first year of pharmacy degree. It has a total of 6 ECTS. Due to their theoretical-experimental character, theoretical training (3.8 ECTS) is complemented by experiments conducted in the laboratory (1.5 ECTS). Such experiments include practical aspects of concepts and techniques studied, familiarizing students with scientific method and team work.

The primary objective of General Biology course is that students acquire basic knowledge of cells as basic units of structure and function of all living organisms.

The course starts by introducing the student to the diversity of life, grouped into domains bacteria, archaea and Eucarya. After specifying the main features of prokaryotic cells (bacteria and archaea) and eukaryotes (plants, fungi and animals), the course focuses on the latter, beginning to establish whose are the structural differences between plant and animal cells. From this point begins the journey through the different structures and processes in the cell.



The plasma membrane establish life boundaries: their selective permeability and transport are essential for maintaining integrity of the cell as a coordinated chemical system. Communication mechanisms are based on extracellular signal molecules produced by cells to communicate with their neighbors or distant cells. Also, an elaborate protein system allows cells to respond external signals. Extracellular components, plant cell wall and extracellular matrix of animal cells, establish fundamental differences between both type of cells: Plant cell wall allows life in non-isotonic conditions, while extracellular matrix of plant cells influences intercellular junctions, cell communication and intercellular recognition.

Cells have internal compartments delimited by membranes, including endoplasmic reticulum, Golgi, mitochondria, chloroplasts and the nucleus. These compartments provide a suitable environment to carry out specific functions. The nucleus contains the genetic material with the information necessary for the cell to carry out all functions for survival and reproduction. Mitochondria and chloroplasts are semiautonomous organelles that transform energy by using a chemical (mitochondria) or light (chloroplasts) source.

Ribosomes, non-membrane delimited organelles, carry out the genetic instructions contained in the nucleus. By the other side, cytoskeleton constitutes a network of fibers necessary for internal cell structure organization and cell mobility.

The perpetuation of the species is based on cell division. Mitotic division produces genetically identical daughter cells. Sexual reproduction requires the reduction of cell chromosome number, that is performed through a special type of cell division: meiotic division.

For all living species, each cell is the vehicle of transmission of genetic information. The study of the phenomenon of heredity and hereditary variation is called genetics. The acquisition of basic knowledge of this part of biology is essential to understand the molecular basis of disease and the application of recombinant DNA technology, which has allowed the development of several applications of genetics in medicine, agriculture, industry biotechnology, etc.

According to the above, course program is structured to achieve knowledge of cell structure and function, including the processes that allow the transmission of genetic information.



At the same time, the subject program must incorporate the 2030 Agenda in all its strategies and actions in a global and transversal way. In 2015, the United Nations General Assembly approved the Resolution “Transforming our world: the 2030 Agenda for Sustainable Development”, with two fundamental pillars: the 2030 Agenda and 17 Sustainable Development Goals (SDGs). The 2030 Agenda is a roadmap that seeks to achieve Sustainable Development by that date and, to achieve it, outlines these 17 objectives. The Agenda aims to respond to the most serious challenges faced by global society. The great diversity of topics covered by the SDGs is structured in the Model of the 5 Ps: Planet, People, Prosperity, Peace and Partnerships, which include the following SDGs: No Poverty, Zero Hunger, Good Health and Well-being, Quality Education, Gender Equality, Clean Water and Sanitation, Affordable and Clean Energy, Decent Work and Economic Growth, Industry, Innovation and Infrastructure, Reduction of Inequality, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Life Below Water, Life on Land, Peace, Justice and Strong Institutions, and Partnerships to achieve the Goals. The development of the SDGs will help universities create synergies and collaborations with other institutions, associations and industries, both in research and education, in addition to offering a framework to show the impact of the University on Society. In turn, universities will provide solutions, knowledge and innovative ideas to achieve them.

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

1205 - Degree in Human Nutrition and Dietetics

- Acquire basic training for the research activity, be able to formulate hypotheses, collect and interpret information for problem solving using the scientific method, and understand the importance and the limitations of scientific thought in the field of health and nutrition.
- Know the structure and evolution of cells.
- Understand cell function in general terms.
- Understand where the different cellular processes take place.
- Know the cell cycle and its regulation.
- Understand the basic principles of genomic organisation, heredity and biological diversity.
- Know the chemical, biochemical and biological principles applicable to human nutrition and dietetics.



After completing this course, students will be able to:

- Know the plant and animal cell structure.
- Understand how different cellular processes and basic cell signaling systems are performed and where they place on in the cell.
- Understand and manage the basic scientific terminology related to the subject of study.
- Know how to search for relevant literature to update and deepen knowledge on a specific topic.
- Work safely and efficiently in a laboratory.
- Understand and interpret scientific papers related to General Biology.
- Know the SDGs and be able to relate them to the subject.

Furthermore, it must acquire the following social skills:

- Team work ability.
- Ability to argue from rational criteria, distinguishing clearly between debatable facts and accepted scientific evidence.
- Ability to speaking before a public audience, such as the class itself, by exposing a brief work, the intervention in a debate on a controversial topic or issue or during the discussion of results in the practical sessions.
- Ability to interact with both the teacher and their mates.
- Ability to build a comprehensive and organized written text.
- Ability to try to achieve the implementation of some SDGs in their university life, among their classmates, and in their community.

DESCRIPTION OF CONTENTS

1. Introduction

Evolutionary history of biodiversity: the tree of life. General organization of prokaryote and eukaryote cell. The animal cell and plant cell.

2. The plasma membrane

Membrane structure and function. Permeability and transport. Osmotic phenomena. Endocytosis and exocytosis.

3. Cellular communication

Cell signaling types. Intracytoplasmic receptors. Cell surface receptors: ion channel-associated, G proteins-associated and enzyme-associated. Receptors with enzymatic activity.



4. The extracellular components

Plant cell wall. Extracellular matrix of animal cells. Intercellular junctions.

5. Cytoskeleton

Cytoskeleton Structure and function, microtubules, microfilaments and intermediate filaments. Cell motility.

6. Endomembrane system

Endoplasmic reticulum. The Golgi complex. Lysosomes. Vacuoles. Vesicular transport. Other organelles: peroxisomes and glyoxysomes.

7. Chloroplasts. Photosynthesis

Chloroplast structural features. The photosynthetic apparatus. Absorption of light. Light phase reactions. Photosynthetic CO₂ fixation.

8. Mitochondria.

Mitochondria. Cell respiration. Mitochondria Structural features. General aspects of cell respiration.

9. The cell nucleus

Nuclear components: nuclear envelope, chromatin, nucleolus. Chromatin structure: DNA packaging in chromosomes.

10. The cell cycle

Cell cycle phases. Cell cycle control mechanisms. Cell division. Mitosis. Meiosis.

11. Flow of genetic information: from gene to protein

Gene organization. The flow of information within the cell. The genetic code. Basic principles of transcription and translation.

12. Introduction to genetics

Genetic variation and epigenetics. Location of genes on chromosomes. Sex-linked inheritance. Genetic disorders. Non-nuclear inheritance.

**13. Laboratory sessions**

1. The optical microscope: principles and management. Observation of histological preparations. Fresh stain: observation of oral mucosa epithelium
2. Membrane permeability. Factors that affect it. Plasmolysis of onion epidermal cells.
3. Respiration in germinating seeds. Observation of mitosis in onion root cells
4. Preparation of histological sections. Observation of microorganisms in a drop of pond water.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	38,00	100
Laboratory practices	15,00	100
Seminars	2,00	100
Tutorials	2,00	100
Development of group work	10,00	0
Development of individual work	3,00	0
Study and independent work	24,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	15,00	0
Preparation of practical classes and problem	10,00	0
Resolution of case studies	6,00	0
Resolution of online questionnaires	2,00	0
TOTAL	147,00	

TEACHING METHODOLOGY**Theory classes.**

For theory classes lectures will be given, since this method allows the lecturer to give key concepts to understanding the subject and recommend further detailed study. In some class student participation will be used, both between students, and between students and lecturer.

Laboratory sessions.

In these classes students will be able to learn the practical applications of the knowledge gained in the theory classes.

Tutorials.

Tutorials will be carried out in small groups, where the teacher will direct students about everything related to the learning process, both in global and concrete terms, including the supervision of tasks.

Seminars.



The seminars will be held by an oral presentation and discussion of topics previously proposed by the teachers. In these seminars, students will exercise the ability to outline, summarize, write and orally express the topic chosen. Both the written preparation and the oral and written presentation must be carried out as a group (3-4 students) and all of them must participate in the presentation. After each seminar there will be a debate where the majority of the participation should be between students .

Continuous evaluation activities. These activities will be linked to students knowing the SDGs and knowing how to incorporate them into these activities. Students must acquire the appropriate tools to be able to contribute to the achievement of the SDGs in their future professional and personal lives.

During the activities, both theoretical and practical, examples of the applications of the contents of the subject in relation to the Sustainable Development Goals (SDGs), as well as in the proposed topics for coordinated seminars. This is intended to provide students knowledge, skills and motivation to understand and address these SDGs, while promoting reflection and criticism.

A total of 4 sessions, each session lasting 3 h 45 min.

LABORATORY SESSION

Laboratory sessions are obligatory. Manual will be available in the virtual classroom web as well as in the laboratory.

CONTINUOUS EVALUATION ACTIVITIES AND TASKS

In these activities, the contents of the subject clearly related to sustainability will be detected and promoted. Students must carry out a sustainability analysis of the subject; for this, the SDGs directly and indirectly related to the subject will be determined globally, as well as the contents of the subject directly related to sustainability, extracting the related SDGs topic by topic and analyzing whether the current approach is aligned or not with sustainability to be able to correct it in case it is not like that.

Activities may include classes with small groups of students, sessions without a tutor, individual work at home, and sessions of joint presentations and discussions. Students should highlight all the elements that will contribute to the achievement of ODS.

EVALUATION

Evaluation: Knowledge gained during theory and lab classes, will be evaluated. **In order to be eligible for examination, students must have attended ALL the laboratory sessions. If the student has enrolled for the first time on the course, this requirement extends also to attend ALL the tutorial sessions.**

The maximum score is 10 points, distributed according to the following criteria:



Theoretical and practical written exam: Counts up to 8,0 points

The exam will include questions about knowledge acquired in the theory (6,5 points) and laboratory sessions (1.5 points). The exam may include short and long questions, as well as multiple choice tests, where students must relate concepts learnt in different lessons.

Seminars: Count up to 1 point

Content and oral presentation will be evaluated.

Continuous evaluation: Count up to 1 point

Homework, activities and student participation will be evaluated. In this homework and activities, students will be involved in achieving the Sustainable Development Goals (SDGs). The proposed change in the methodology by adding continuous evaluation activities, and the relationship of certain SDGs with the General Biology subject will allow the implementation of these SDGs. Among the SDGs linked to the subject are Health and Well-being, Sustainable Cities and Communities, Action for the Climate, Submarine Life or Terrestrial Ecosystems Life.

Final score

In order to pass, a minimum of 4 points must be obtained in the theoretical-practical exam. To this mark will be added the marks of the continuous assessment and the seminars.

First Call

There will be an examination of the whole subject at the end of the first semester/term. If the student does not sit first call exam, his grade will be "not present".

Second Call:

If the student has not passed the subject on first call, he can go to a second call. In this second call, the student will be examined again on all the theoretical and practical subjects.

REFERENCES

Basic

- Alberts B y col (2021). Introducción a la Biología Celular. 5ª Ed. Médica panamericana, Madrid
- Becker WM y col. (2007). El Mundo de la Célula. 6ª Ed. Pearson Education, Madrid
- Campbell NA y Reece JB(2007). Biología. 7ª Ed. Médica Panamericana, Madrid
- Curtis H y col. (2008). Biología, 7ª Ed. Médica Panamericana, Madrid
- Dale JW y von Schantz M (2007). From Genes to Genomes. Concepts and Applications of DNA Technology. Wiley, Chichester
- Escaso F y col. (2010). Fundamentos Básicos de Fisiología Vegetal y Animal. UNED/Pearson, Madrid
- Freeman, S.(2009). Biología. 3ª ed. Pearson educación. Madrid
- Karp G. 2019. Biología Celular y Molecular. 8ª ed. McGraw-Hill Interamericana. Madrid.
- Lodish H y col. (2016). Biología Celular y Molecular. 7ª Ed. Médica Panamericana, Madrid.



- Paniagua R y col. (2007). *Biología celular*. 3ª Ed. Tomo I. MacGraw-Hill Interamericana. Madrid.
- Ponsoda X y col. (2000). *Pràctiques de Citologia i Histologia*. Publicacions de la Universitat de València, Colecció: Educació. Materials.
- Hillis D y col. (2020). *Life: the Science of Biology*. 12ª Ed. WH Freeman and Company Ltd, New York, USA.
- Plattner H y Henstchel J (2014). *Biología Celular*. 4ª Ed. Médica Panamericana, Madrid
- Freeman S (2019). *Fundamentos de Biología*. 6ª Ed. Pearson UNED. Madrid
- Freeman S y col. (2020). *Biological Science*. 7ª Ed. Pearson. New York, USA

Additional

- <http://www.medicapanamericana.com/campbell/>
- <http://www.nature/index.html>
- <http://www.nature.com/molcellbio/index.html>