VNIVERSITAT DE VALÈNCIA

Course Guide
34106 General Biology

COURSE DATA

Data Subject	
Code	34106
Name	General Biology
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1201 - Degree in Pharmacy	Faculty of Pharmacy	1	First term
1211 - D.D. Pharmacy and Human Nutrition and Dietetics	Faculty of Pharmacy	1	First term

Subject-matter

Degree	Subject-matter	Character
1201 - Degree in Pharmacy	43 - Biology	Basic Training
1211 - D.D. Pharmacy and Human Nutrition and Dietetics	1 - Asignaturas obligatorias del PDG Farmacia-Nutrición Humana y Dietética	Obligatory

Coordination

Name	Department
BENLLOCH ORTIZ, REYES	25 - Plant Biology

SUMMARY

General Biology is a basic semiannual course taught in the first year of the Degree in Pharmacy. It has a total of 6 ECTS. Due to its 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 teamwork.

The primary objective of thisGeneral Biology course is the acquisition of basic knowledge on the ell as basic structural unit of life and function of all living organisms.

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

The plasma membrane establishes life boundaries: their selective permeability and transport system 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 neighboring 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 either a chemical (mitochondria) or light (chloroplasts) source.

Ribosomes, non-membrane delimited organelles, translate the genetic instructions contained in the nucleus. On the other hand, 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 heredity and its 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..

Based on the above, this course program is presented to improve the understanding of cell structure and function, including processes that allow the transmission of genetic information.

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

1201 - Degree in Pharmacy

- Understand and manage the basic scientific terminology related to the subject
- Know how to apply the scientific method and acquire skills for managing the main bibliographic sources.
- Know how a cell is structured, and its evolution.
- To have a general understanding of how cells work.
- Be able to understand where different cell processes take place.
- Know the cell cycle and its regulation.
- Understand the basic principles of the organisation of genomes, heredity, and biological diversity.
- Know how to operate apparatus and basic techniques related to the subject.

After completing this course, students should be able to:

• Know the plant and animal cell structure

• Understand different cellular processes and basic cell signaling systems and where they occur in the cell.

• Understand and use 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

Furthermore, they should acquire the following social skills:

• Teamwork ability

• Ability to discuss in a knowledgeable manner, distinguishing clearly between debatable concepts and accepted scientific evidence

• Ability to speak in front of a public audience, such as the class itself, by presenting a brief work, by participating in a debate on a controversial topic or during the discussion of results in the practical sessions

• Ability to interact with both the teacher and their peers

• Ability to build a comprehensive and organized written text

DESCRIPTION OF CONTENTS

1. Introduction.

Evolutionary history of biodiversity: the tree of life. General organization of prokaryote and eukaryote cells. 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. Cytoplasmic receptors. Cell surface receptors: ion channel-coupled receptors, G proteins-coupled receptors and enzyme-coupled receptors. 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. Respiration.

Mitochondria structural features. Glycolysis, citric acid cycle, electron transport and oxidative phosphorylation.

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. Basic principles of transcription and translation. The genetic code. Gene transcription: components and stages. Translation of RNA to polypeptide: ribosomes and protein synthesis

12. Introduction to genetics.

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

13. LABORATORY

The optical microscope: principles and use. Observation of histological preparations. Fresh stain: observation of oral mucosa epithelium.

Membrane permeability. Factors that affect it. Plasmolysis of onion epidermal cells.

Respiration in germinating seeds. Observation of mitosis in onion root cells.

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 individual work	2,00	0
Preparation of evaluation activities	28,00	0
Preparing lectures	40,00	0
Preparation of practical classes and problem	20,00	0
TOTAL	**147,00**	

TEACHING METHODOLOGY

The teaching methodology is structured in four complementary parts:

Theory classes. For theory classes one-hour lectures will be given, which allows the lecturer to give key concepts to understanding the subject, using the resources and training materials most suitable for further detailed study. In some lectures, student participation will be encouraged, 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.

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 with knowledge, skills and motivation to understand and address these SDGs, while promoting reflection and criticism

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

Seminars. Practical seminars and monographic work-shops programmed to work out specific aspects of Biology in order to reinforce the learning process.
The seminars will be held according to one of these two options:

1. A conference by a visiting expert
2. A presentation made by the lecturer of a recent development related to Biology

There will be a subsequent debate where the majority of the participation should be between students. Also, students must prepare and submit to the professor a summary of the topic presented.

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**

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

Continuous assessment: counts up to 1 point.

Continuous assessment tasks will be graded by means of multiple-choice questionnaires and/or open questions, assays, exercises or other similar activities. Those activities will be available as tasks at the VLE. Students will have a time limit to provide their answers. Evaluated activities will be scheduled when all lectures of a particular unit are completed. Alternatively, these questions or tasks could also be raised and evaluated during lecture sessions, tutorials and/or seminars sessions.

Theoretical and practical written exam: Counts up to 9 points

The exam will include questions about knowledge acquired in the theory (7 points) and laboratory sessions (2 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 0.5 points

Seminar mark will count as a bonus on the final grade, although the final score may not exceed the maximum of 10. The quality of the summary of the topic presented in the seminar sessions will be evaluated.

Final mark

The final grade will be obtained from the sum of the parts to be evaluated (continuous evaluation, theoretical-practical written examination and seminar). In order for continuous assessment and seminars to be added, at least 50% of the maximum score in the theoretical and practical exams must be obtained. To pass you must match or exceed the final grade of 5 points.

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, with a maximum score of 10 points. The seminar and the continuous assessment marks obtained during the semester/term will be saved for this second call.

REFERENCES

Basic

- Alberts B y col (2006). 2ª Ed. Introducción a la Biología Celular. Médica panamericana, Madrid

Becker WM y col. (2007). 6ª Ed. El Mundo de la Célula, Pearson Education, Madrid

Campbell NA y Reece JB (2007). 7ª Ed. Biología, Médica Panamericana, Madrid

Curtis y col. (2008). 7ª Ed. Biología, Médica Panamericana, Madrid

Dale JW y von Schantz M (2007). From Genes to Genomes. Concepts and Applications of DNA Technology. Wiley, Chichester

Escaso y col. (2010). Fundamentos Básicos de Fisiología Vegetal y Animal. UNED/Pearson, Madrid

Lodish H y col. (2004). Molecular Cell Biology. Freeman, new York

Pràctiques de Citologia i Histologia. Publicacions de la Universitat de València, Colecció: Educació. Materials

Purves y col. (2004. 8ª Ed. Life, the Science of Biology. Sinauer Associates/WH Freeman and Company, Sunderland, MA, USA

Additional

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