

Animal. Plant and Cell Biology

Code: 103251
ECTS Credits: 6

Degree	Type	Year	Semester
2501925 Food Science and Technology	FB	1	1

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Teachers

Josepa Plaixats Boixadera
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Prerequisites

There are no official prerequisites, but it is appropriate for the student to review the contents related to Cell Biology, Plant Biology and Animal Biology in the Biology subject of the secondary school.

Objectives and Contextualisation

This is a compulsory first course subject that introduces students to the basis of Cell Biology, Plant Biology and Animal Biology.

The practical lessons of all three parts of the subject will be given in the subject Experimentation in the Laboratory.

The objective of the subject Animal, Plant and Cell Biology is to provide the essential basic training that students need to be able to address the study of the production, properties and mechanisms of deterioration of raw materials of animal and plant origin. These contents will help students to assimilate the contents of the Raw Materials Production and Parasitology subjects that will be taught later in the degree.

Specifically, we propose:

- Study the eukaryotic cell and the compartments that make it up, putting emphasis on the production and transport of biomolecules within the cells and the basic principles of the nutrition of organisms from the cellular level.
- Offer a global vision of the structure, organization and functions of the main groups of plants and their diversity, with emphasis on the groups with food interest.

- Give students a global vision of the structure and organization of the main groups of animals and their diversity from an evolutionary point of view, emphasizing animal groups with food interest.

Competences

- Analyse, summarise, resolve problems and make professional decisions.
- Apply knowledge of the basic sciences to food science and technology.
- Apply the scientific method to resolving problems.
- Communicate effectively with both professional and non-professional audiences, orally and in writing, in the first language and/or in English.
- Display knowledge of the physical, chemical, biochemical and biological properties of raw materials and foods.

Learning Outcomes

1. Analyse, summarise, resolve problems and make professional decisions.
2. Apply the scientific method to resolving problems.
3. Classify and interpret animal diversity.
4. Classify and interpret plant diversity.
5. Communicate effectively with both professional and non-professional audiences, orally and in writing, in the first language and/or in English.
6. Describe the morphology and bionomy of the principal animal taxons of nutritional value.
7. Establish the basic principles of organisms' nutrition on the cellular scale.
8. Establish the interactions between cells for the formation of tissues.
9. Identify the differential characteristics of plant groups of nutritional value.
10. Identify the major groups of animals that are of value to human nutrition.
11. Interpret the biological cycles of the animal groups of nutritional value.
12. Present the morphology and physiology of plant species of nutritional value.
13. Synthesise the biogenesis of basic organic molecules in the eukaryote cell and their dynamics, and also the dynamics of the cell compartments that contain them.

Content

PART I (CELLULAR BIOLOGY)

Lesson I.1. Transmission and expression of genetic information. DNA replication. The end replication problem and the solution of the eukaryotes: why aren't we forever young? From DNA to protein. Folding of proteins and accumulation of misfolded proteins. Prions

Lesson I.2. Structure of cell membranes. Lipid bilayer: Lipid molecules in water. Membrane proteins. Fluidity of membranes and adaptations to maintain fluidity at low temperatures.

Lesson I.3. Transport through the cell membranes. Simple diffusion. Passive transport by permease transport proteins. Primary active transport: ion pumps. Secondary active transport: incorporation of nutrients within the organisms through the epithelial cells. Passive transport by channels.

Lesson I.4. Introduction to intracellular compartments. Compartments delimited by membranes. Mechanisms for the transport of proteins through the membranes. Bases of vesicular transport.

Lesson I.5. Biosynthetic-secretory route. Synthesis of proteins and lipids in the endoplasmic reticulum. Transport of biomolecules through the Golgi complex. Transport of proteins and lipids to the cell surface. Transport of proteins to lysosomes. Disorders caused by storage of biomolecules in the lysosomes.

Lesson I.6. Endocytosis routes. Phagocytosis. Pinocytosis. Receptor-mediated endocytosis: capture of cholesterol and immunoglobulins. Endosomes and lysosomes.

Lesson I.7. Aerobic respiration in mitochondria. Characteristics of mitochondria. Oxidative hydrolysis of molecules to produce ATP: oxidation of metabolites, respiratory chain, oxidative phosphorylation / heat production. Formation of free radicals and aging. Antioxidant molecules and caloric restriction. Aerobic and anaerobic metabolism in exercise.

PART II (VEGETABLE BIOLOGY)

Lesson II.1. Levels of organization in the plant world. Systematics, taxonomy and botanical nomenclature. Morphological levels of organization: Protophytes, thalophytes and cormophytes. Main families with interest in food.

Lesson II.2. Reproduction in the plant world. Basics Sexual reproduction. Type of gammy. Asexual reproduction. Spores. Biological cycles.

Lesson II.3. Mushrooms and Lichens. General characteristics. Classification and diversity. Uses and applications.

Lesson II.4. Algae, Briophytes and Vascular Cryptogames. Classification and diversity. Cell structure, morphology, reproduction and ecology. Uses and applications.

Lesson II.5. Upper plants (Spermatophytes). General characteristics. Diversity: Gymnosperms and Angiosperms. The root, the stem, the leaves, the flower, the fruits and the seeds.

Lesson II.6. Monocotyledons. General characteristics. Ecology and geographic distribution. Classification Species of greater interest in the feeding.

Lesson II.7. Dicotyledons. General characteristics. Ecology and geographic distribution. Classification. Species with greater food interest.

Lesson II.8. The water in the plant. Water relations Absorption and transport by xylem. Transpiration

Lesson II.9. Mineral nutrition. Mineral composition of plants. Plant nutrition. Essential elements. Deficiencies and phytotoxicity.

Lesson II.10. Photosynthesis and respiration. CO₂ fixation. Plants C₃, C₄ and CAM and their interest in plant production.

Lesson II.11. Secondary metabolism. Phenols, terpenoids and alkaloids. Functions. Products of dietary interest.

Lesson II.12. Growth and development. Plant development. Reproductive development. Flowering. Fruit formation and maturation. Regulatory substances of vegetal growth: types and functions in the plant.

PART III (ANIMAL BIOLOGY)

Lesson III.1. Diversity of animals. Animal concept. Levels of animal organization. Animal phylogeny

Lesson III.2. Reproduction and animal development. Type of asexual and sexual reproduction. Parthenogenesis. Adaptive meaning of different reproductive models. Animal development. Ontogeny. Direct and indirect development. Larvae and metamorphosis.

Animal food: aquatic animals

Lesson III.3. Molluscs. Basic characteristics of the group. Molluscs in human feeding. Gastropods, bivalves and cephalopods.

Lesson III.4. Arthropods. General characteristic. Structure and importance of the cuticle. Tagmosis. Crustaceans. Crustaceans in human feeding. Basic characteristics.

Lesson III.5. Echinoderms. General organization of the group and adaptive diversification. Echinoderms in human feeding.

Lesson III.6. Chordata. Characteristics of chordata. Vertebrates: Agnata and Gnatostomata. Diversity and environmental adaptations. Fish and food.

Animal food: terrestrial animals

Lesson III.7. Annelids. Basic characteristics of the annelids. Main groups and adaptations to the different habitats. Use of annelids.

Lesson III.8. Vertebrates: Amphibians, Reptils, Birds and Mammals. Compared general characteristics. Diversity in human feeding. Disease vectors

Animals related to food health

Lesson III. 9. Porifera. Basic characteristics. Importance in mollusc production.

Lesson III. 10. Plathelminths. Basic characteristics. Adaptations of different groups to parasitism. Parasite biological cycles.

Lesson III. 11. Nematoda. Basic characteristics. Biological cycles of parasitic nematodes.

Lesson III. 12. Arthropods. Arachnids and Hexapods (Insects). Basic characteristics. Main groups. Insects in human feeding. Arthropods and food health.

Methodology

The methodology used in this subject is based on making the student work the information that is available to him. The function of the teacher is to give him/her the information or tell him/her where he/she can get it and help him/her so that the learning process can be carried out effectively. To achieve this goal, the subject is based on the following activities:

Master Classes

The content of the theory program will be taught by the teacher in the form of master classes. The theoretical classes will be complemented with the visualization of animations and videos related to the topics seen in class. The visual aids used in the classroom by the teacher will be available on the Virtual Campus or the copy of the Faculty. It is recommended that students print this material and bring it to class to use it as a support when taking notes. Although it is not essential to extend the contents of the classes taught by the teacher, unless expressly requested by the latter, it is essential that students regularly consult the books recommended in the Bibliography section in order to consolidate and clarify the contents explained in class.

With these classes the student acquires the basic scientific-technical knowledge that must complement the personal study of the topics explained.

Seminars

They will consist of directed work classes and classes of problems.

1. Supervised work sessions:

The students will work in groups of 4. In the seminars, the students will work the scientific-technical knowledge exposed to the master classes. Various activities will be carried out: analysis and discussion of videos, elaboration of a glossary of scientific terms, resolution of questions related to the topics covered, and analysis of zoological and botanical information.

In the evaluation of the glossary and questions, both the scientific content and the presentation of the document will be taken into account, which will have to be written in a single language (Catalan or Spanish).

The last fifteen minutes of each session will be devoted to an individual assessment test. Some 10 V / F questions will be answered about the topic worked on in the seminar or on videos.

The mission of the seminars is to promote the capacity for analysis, synthesis and resolution of problems, as well as critical reasoning.

2. Problem resolution sessions:

The resolution of problems and questions allows for a very interesting deduction and integration exercise for the scientific training of students. The theoretical knowledge is complemented by the resolution of problems related to the topics covered in theory lessons. The collection of problems will also be found in the Virtual Campus in *pdf format. In the sessions of problems, each student will have to take and deliver the resolved problems corresponding to the topics that will be worked during that session. The teacher will ask a student to solve each problem and explain it to the rest of the classmates with the help of the teacher.

The mission of the problem sessions is to orient the student about his level of learning, to approach the scientific method and to help the student integrate concepts and knowledge.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	37	1.48	3, 4, 6, 8, 12, 7, 10, 9, 11, 13
Preparation of assignments	35	1.4	1, 2, 3, 4, 5, 6, 8, 12, 7, 10, 9, 11, 13
Seminars (Cell Biology in context)	2	0.08	2, 5, 8, 7, 13
Seminars (supervised work)	6	0.24	1, 3, 4, 5, 6, 12, 10, 9, 11
Study and self-learning	63	2.52	1, 2, 3, 4, 5, 6, 8, 12, 7, 10, 9, 11, 13

Assessment

The assessment of this subject will be carried out continuously in the different activities that have been programmed. To pass the subject, a minimum overall score of 5 out of 10 must be achieved. The assessment will be organized by assessing the following sections:

Assessment of theoretical contents

The evaluation of the theoretical contents has an overall weight of 80% of the final mark. In this part, the student's knowledge on the subject will be evaluated individually, as well as his/her capacity for analysis, synthesis and critical reasoning. There will be 3 partial exams that will be eliminatory when the mark obtained by the student is equal to or higher than 5 out of 10. In the second-chance examinations, students must also obtain a minimum score of 5 to average with the scores of the other parts. The students can also present themselves to the second-chance examination when they want to raise mark. In this case, the mark that will prevail will be that obtained in the last exam.

Assessment of seminars and problem sessions:

The work (questions / problems) carried out individually or in group will be delivered in seminar days and problem sessions and will be evaluated. This evaluation has a global weight of 20% of the final mark.

Second chance exams

Students who do not score a minimum of 5 in the partial exams / retrieval or after completing the weighted average between the theoretical content mark and the seminar mark will have a second-chance.

Not assessable students

A student will be considered as not assessable if he/she participates in assessment activities that represent less than 15% of the total activities of evaluation.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Assessment of seminars	20%	2	0.08	1, 2, 5
Partial examinations of the theoretical contents of each part	80%	5	0.2	3, 4, 6, 8, 12, 7, 10, 9, 11, 13

Bibliography

Biologia Cel·lular

- Alberts B, Bray D, Hopkin K, Johnson A, Lewis J, Raff M, Roberts K, Walter P. Introducción a la Biología Celular. (3ª Edición). Editorial Médica Panamericana. Madrid. 2011
- Cooper GM, Hausman RE. La Célula (5ª Edición). Marbán S.L. Madrid. 2010
- Karp G. Biología Celular y Molecular (5ª Edición). McGraw Hill. 2009

Biologia Vegetal

- Barceló, J., Nicolás, G., Sabater B., Sanchez, R. Fisiología Vegetal. Pirámide. Madrid.

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- Història Natural dels Països Catalans Vol. 4, 5 i 6. Ed. Enciclopèdia Catalana. Barcelona. 1985.
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- HICKMAN, C.P., ROBERTS, L.S., KEENS, L., LARSON, A., L'ANSON, M., EISENHOUR, D.J. (2008).

Principios integrales de Zoología. Ed. Interamericana. Catorzena edició.

- HISTÒRIA NATURAL dels Països Catalans. Vol. 8, 9, 10, 11, 12, 13. Ed. Enciclopèdia Catalana.

El contingut d'alguns llibres es pot consultar per internet al NCBI, a la següent adreça:

<http://www.ncbi.nlm.nih.gov/sites/entrez?db=Books&itool=toolbar>:

Enllaços web:

- Aula Virtual de l'Autònoma Interactiva: <https://cv2008.uab.cat>
- Animal Diversity Web: <http://animaldiversity.ummz.umich.edu/>

- Adena/World Wildlife Found: <http://www.wwf.es/>
- Biodidac: <http://biodidac.bio.uottawa.ca>
- Comissió Internacional de Nomenclatura Zoològica: <http://www.iczn.org/>
- Museu Nacional de Ciències Naturals de Madrid (CSIC): <http://www.mncn.csic.es/>
- Natural History Museum, Londres: <http://www.nhm.ac.uk/>
- Tree of Life Project: <http://phylogeny.arizona.edu/tree/phylogeny.htm>
- FAO (Food and Agriculture Organization): <http://www.fao.org/>