Universitat Autònoma de Barcelona

2022/2023

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
Jordi Bartolomé Filella
Maria Constenla Matalobos

Prerequisites

Since the subject is taught in the first semester of the first year of the Degree, there are no prerequisites to take it. However, it is advisable for the student to review the contents related to Cell Biology, Plant Biology, and Animal Biology in the Biology subject of the baccalaureate.

On the other hand, in a discipline like this, where the most up-to-date backgrounds are in English, it is recommended that students have a good knowledge of this language.

Objectives and Contextualisation

This is a compulsory first-year 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 (CELL 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. The 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 the storage of biomolecules in the lysosomes.

Lesson I.6. Endocytosis routes. Phagocytosis. Pinocytosis. Receptor-mediated endocytosis: the 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)

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

Lesson II.2. Reproduction in the plant world. Sexual and asexual reproduction. Biological cycles

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

Lesson II.4. Cryptogams: algae, mosses and ferns

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. CO_2 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: typesand 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. Mollusks. Basic characteristics of the group. Mollusks 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, Reptiles, 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 mollusk production.

Lesson III. 10. Platihelmints. 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 on the information available to him. The role of the teacher is to give him the information or indicate where he can get it and help him so that the learning process can be carried out effectively. To achieve this goal, the course is based on the following activities:

Theory lessons

The content of the theory program will be taught by the teacher in the form of master classes in the part of Plant Biology and in the form of inverted lessons or master lectures in the parts of Cell Biology and Animal Biology. In the case of inverted lessons, students will have recordings of the contents of each class to watch at home. There will be activities in class to work on the contents of the videos. These activities will consist of individual questionnaires from the Moodle classroom to be able to follow the viewing of the videos by the students and Kahoot questionnaires to stimulate the raising of doubts by the students that will be solved by the teacher in class, as well as practical cases, problem-solving. and questions for working in the classroom. Both in the case of master lectures and in the case of inverted lessons, the theoretical classes will be complemented with the display of animations and videos related to the topics covered. The visual aids used in class and in the recordings by the teacher will be available on the Virtual Campus. It is recommended that students make the visual aids available to use as support when taking notes. Although it is not essential to expand the contents of the classes taught by the teacher, unless the teacher expressly requests it, 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 explained subjects.

Directed Work Classes

They will consist of seminar classes and problem classes.

1. Seminars:

Students will work in groups of 4. The seminars work on the scientific-technical knowledge presented in the master lectures (or not) to complete their understanding and deepen in it. Various activities will be developed

such as analysis and discussion of videos, elaboration of a glossary of scientific terms corresponding to the topics studied, resolution of issues related to the topics covered using scientific articles, news, etc.

En l'avaluació del glossari i de les qüestions es tindrà en compte tant el contingut científic com la presentació del document, que haurà d'ésser redactat en una sola llengua (català o castellà). The last quarter of an hour of each session will be devoted to an individual assessment test. About 10 V / F questions will have to be answered on the topic worked on in the seminar or on the videos.

The mission of the seminars is to promote the ability to analyze, synthesize and solve problems, as well as critical reasoning.

2. Problem-solving classes:

The resolution of problems and questions allows a very interesting deduction and integration exercise for the training of students. Theoretical knowledge is complemented by solving problems related to the topics covered in theory classes. The collection of problems will also be found on the Virtual Campus in * pdf format. Prior to the classroom problem session, students will be required to submit their exercise via Moodle classroom. In addition, in the problem sessions, each student will have to bring and deliver the solved problems corresponding to the topics that will be worked on in that session. The teacher will ask a random student to solve each problemand explain itto therest of the class with the help of the teacher.

The mission of the problem classes is to guide the student in terms of his level of learning, to bring him closer to the scientific method, and to help him to integrate concepts and knowledge.

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures and inverted lessons	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 three blocks (Cell Biology, Plant Biology, and Animal Biology) contribute the same to the final grade of the subject (33.3 % each block). The evaluation will be organized by evaluating the following sections:

Assessment of the theoretical contents:

The assessment of the theoretical contents has an overall weight of 80% of the final grade. In this part, the knowledge acquired by the student in the subject will be evaluated individually, as well as his capacity for analysis, synthesis, and critical reasoning. In the Blocks of Cell Biology and Animal Biology, this 80% of the mark will be distributed as follows: up to 20% of the mark in each block will be derived from the questionnaires that the student takes in the classroom and at least the remaining 60% will derive of the mark that the student

obtains in the partial exam. The weight of the evaluable activities that are done in class with respect to the exam will depend on the number of face-to-face lessons that can be done. In the Plant Biology Block, 80% of the block grade will be obtained from the corresponding midterm exam (or the resit exam). Thus, there will be 3 partial exams (one for each part of the subject) that will be eliminatory from the subject when the mark obtained by the student is equal to or superior to 5 out of 10. In the second chance exams, the students will have to achieve also a minimum mark of 4,5 to do an average with the notes from the other blocks. Those students who, having reached the minimum score to pass the subject, want to raise their mark will also be able to take the resit exam. In this case, the grade that will prevail will be that of the last exam.

Assessments of seminars and problems: Both the work (questions/problems) that will have to be presented on the seminar days and problem classes, as well as the evaluation tests (group and individual) that will be developed throughout the seminar will be evaluated. This assessment has an overall weight of 20% of the final grade.

Second chance examination: Students who have obtained a mark in the partials equal to or higher than 4.5 do not reach 5 after making the weighted average between the mark of the theoretical contents and the mark of seminars will have to present to the second chance examination of the corresponding block or blocks.

Not assessable: A student will be considered non-assessable if he participates in assessment activities that represent less than 15% of the total mark.

Students who have inappropriate behaviours in relation to the authorship of the activities performed (plagiarism, copying, etc.) will receive a zero in that activity in question. This will affect both the student who copied and the one who was allowed to copy. In case of recidivism, the students involved will suspend the subject.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Assessment of seminars	20%	2	0.08	1, 2, 5
Partial exams	80% of the Plant Biol mark and a minimum of 50% of the mark of CB and AB (up to 30% remaining assessment activities in the class	5	0.2	3, 4, 6, 8, 12, 7, 10, 9, 11, 13

Bibliography

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- 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

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- Karp G. Biología Celular y Molecular (5ª Edición). McGrawn Hill. 2009

Biologia Vegetal

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

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Biologia Animal

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Principios integrales de Zoologia. 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/

Software

No special software will be used