Universitat Autònoma de Barcelona

2020/2021

Physiology and Regulation of Plant Development

Code: 100797
ECTS Credits: 6

Degree	Type	Year	Semester
2500250 Biology	OB	3	1

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

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

Prerequisites

The subject of Nutrition and Metabolism of the second course must be approved

Objectives and Contextualisation

To describe the functional mechanisms of plants and how they are regulated through internal and external factors.

To integrate the functional processes of the plants from the different organizational levels in the whole plant organism.

To understand the processes that determine the functioning of living beings in each of their levels of organization

To aAnalyze and interpret the development, growth and biological cycles of living beings

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Analyse and interpret the development, growth and biological cycles of living beings.
- Apply statistical and computer resources to the interpretation of data.
- Be able to analyse and synthesise
- Be able to organise and plan.
- Develop a historical vision of biology.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.

- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Understand the processes that determine the functioning of living beings in each of their levels of organisation.

Learning Outcomes

1. Analyse a situation and identify its points for improvement.
2. Analyse parameters of plant growth and development.
3. Apply statistical and computer resources to the interpretation of data.
4. Be able to analyse and synthesise.
5. Be able to organise and plan.
6. Critically analyse the principles, values and procedures that govern the exercise of the profession.
7. Describe the functional mechanisms of plants and how these are regulated by internal and external factors.
8. Identify the crucial discoveries in the history of plant physiology and assess their significance in the subsequent development of the discipline.
9. Integrate the functional processes of plants, from the different levels of organisation to the whole plant organism.
10. Propose new methods or well-founded alternative solutions.
11. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
12. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
13. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
14. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
15. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
16. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
17. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.

Content

General contents (Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents)

THEORY:

Plant growth: location and characteristics

Hormonal regulation: phytohormone concept. Characteristics, assessment of metabolism and functions of each group of hormones.

Other hormones and growth regulators.

Differentiation and Morphogenesis: cellular totipotence and polarity in development

Regulation by internal factors: Hormonal regulation and morphogenetic guidelines.

Regulation by external factors: photomorphogenesis, Photojournalism, Influence of cold on development.

Flowering

Dormition of buds and seeds

Seed germination.

Formation and ripening of fruits.

Movements of plants.

Aging, senescence and abscission

LABORATORY PRACTICES:

Determination of water potential in plant tissue

Oxidase bioassay in oat coleoptile (Avena sativa L.)

Cytokinin bioassay in leaf segments of barley (Hordeum vulgare)

Determination of overfertilization with nitrates

Visualization of toxicity by chemical agents through vital staining

Methodology

To consider: The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities

Theory classes
In the theoretical classes, the teacher explains the fundamental mechanisms of the functioning of the plants referring to the processes of growth and metabolism, establishing the relationships between them and clarifying the basic concepts necessary for their comprehension. The methodology is mainly of verbal communication, accompanied by visual schemes. Teacher's direct questions to students during the class are indicative of the student's degree of follow-up. Bibliographical references and other information funds are given to promote self-study.
Seminars
The main purpose of the seminars in this subject is to promote the knowledge of the general and transversal competences of the students. The teaching methodology is based on the exposition and discussion of study cases and / or problems posed by the teacher to the students to be solved in groups, presented to their colleagues and discussed with them with the help and orientation of the teacher.
Practical classes
Some of the topics covered in the theory class are visualized by means of a laboratory test. The student becomes familiar with protocols and basic techniques of a Laboratory of Plant Physiology and learns to represent and interpret the results obtained in their own experiments. The student will be able to access the protocols and praxis of practices through the Virtual Campus.
Tutoring
In the group and individual tutorials the teacher tries to help the student solve their doubts about the concepts of the subject and guide him in the study of the same

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory practices	12	0.48	2, 3
Seminars	6	0.24	4
theoretical classes	32	1.28	7, 8, 9
Type: Supervised			
Tutoring	2	0.08	8, 9
Type: Autonomous			
Personal study	69	2.76	2, 8, 9, 4
Report of laboratory practices	7	0.28	2, 3, 4
Work and report from seminar	18	0.72	8

Assessment

To consider: *Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities

By means of written exams that include the evaluation of the contents of the theoretical classes Two eliminatory tests will be carried out corresponding to each of the parts in which the content has been divided.

In order to be able to pass the subject, a minimum grade must be obtained in each of these parts of 5. The weight of each partial exam in the theory mark is 40% the first partial exam and 60% the second partial. The weight of the theory mark in the final grade is 70%.

To pass the notes less than 5, a final recovery of each of these examinations must be performed at a final recovery exam. In order to improve the note, it is necessary to take a final exam of the whole content and note the final exam (that is, with renunciation of the note previously obtained)

The laboratory practices will be evaluated through the results obtained during the laboratory sessions and their representation and discussion in the practice guideline prepared individually for each student, adding it to the numerical note resulting from a small conceptual test at the end of the practices. The practical note represents 20% of the final mark of the subject. Attendance is mandatory. In the event of non-justified assistance, it can be recovered through assistance to another group or, if that is not possible, by means of a substitute job.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exam	705	3	0.12	7, 8, 9, 15, 11, 4
Laboratory practices	20%	0.5	0.02	17, 6, 2, 1, 3, 14, 13, 12, 5
Seminars	10%	0.5	0.02	16, 3, 10, 4

Bibliography

BARCELÓ, J.; NICOLÁS, G.; SABATER, B.; SÁNCHEZ, R.: *Fisiologia Vegetal*. Pirámide. Madrid (2007).

MOHR, H.; SCHOPFER, P.: *Plant Physiology*. Springer Verlag, Berlin (1995).

SALISBURY, F.B.; ROS, C. W.: *Plant Physiology*, 4th edition. Wadsworth Publ. Company, Belmont, California (1992).

SCHOPFER, P.; BRENNICKE, A*.: Pflanzenphysiologie*, Elsevier, Spektrum (2006).

TAIZ,L.; ZEIGER, E.: *Plant Physiology*, 4ª Ed. Sinauer Associates, Sunderland (2006)

http://4e.plantphys.net/