Universitat Autònoma de Barcelona

2021/2022

Plant Nutrition and Metabolism

Code: 100796
ECTS Credits: 6

Degree	Type	Year	Semester
2500250 Biology	OB	2	2

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

Name: Carlota Poschenrieder Wiens
Email: Charlotte.Poschenrieder@uab.cat

Use of Languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Other comments on languages

Use of English in homeworks and seminars is positively evaluated

Teachers

Isabel Corrales Pinart

Prerequisites

none

Objectives and Contextualisation

The subject introduces students to the functional processes of mineral nutrition and metabolism of plants. An integrating vision of these basic mechanisms of Plant Physiology is essential to understand the complexity of the growth and development of plants and their relationship with the environment, subjects that will be treated in subjects taught in later courses.

The main training objectives of this subject are:

Describe the functional mechanisms of plants and their regulation through external and internal factors

Integrate the functional processes of the plants from the different organizational levels within the plant organism

Identify the crucial discoveries in the history of Plant Physiology and evaluate their meaning for subsequent scientific development of the discipline

Competences

- Apply statistical and computer resources to the interpretation of data.
- Be able to analyse and synthesise
- Be able to organise and plan.
- Carry out functional tests and determine, assess and interpret vital parameters.
- Develop a historical vision of biology.
- 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.
- Understand the processes that determine the functioning of living beings in each of their levels of organisation.

Learning Outcomes

1. Apply statistical and computer resources to the interpretation of data.
2. Be able to analyse and synthesise.
3. Be able to organise and plan.
4. Consolidate understanding of physiological processes in plants with the aim of putting this to practical use.
5. Describe the functional mechanisms of plants and how these are regulated by internal and external factors.
6. Identify the crucial discoveries in the history of plant physiology and assess their significance in the subsequent development of the discipline.
7. Integrate the functional processes of plants, from the different levels of organisation to the whole plant organism.
8. 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.
9. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
10. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.

Content

Lectures

1st part

- Concept of Plant Physiology, history, sources of information

- Distinguishing characteristics of plant cells. Vacuole and cell wall

- Water relations. Concept of water potential and its components

- Absorption and transport of water

- Transpiration and stomata regulation

- Phloem transport

- Mineral nutrition. Concept of essentiality. Functions of mineral nutrients

- Passive absorption and active absorption of mineral nutrients

- Nitrogen, symbiotic fixation of atmospheric nitrogen

2nd part

- Photosynthesis. Concept and History

- Light and photosynthetic pigments

- Photosynthetic electron transport and photophosphorylation

- Reductive assimilation of CO2, Calvin cycle

- Photorespiration

- C4 and CAM Plants

- Reductive assimilation of nitrogen and sulfur

- Regulation of photosynthesis

- Distinctive characteristics of plant respiration; Alternative oxidase

- Secondary metabolism

Laboratory Practices

- Water and osmotic relations of the plant cell. Plasmolysis

- Mineral nutrition: Determination of the inorganic fraction

- Carbon photosynthesis: measurement methods. Hill Reaction

- Nitrogen photosynthesis: nitrate reductase

- Secondary metabolism: identification of compounds

*Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents

Methodology

Lectures

During the lectures the professor explains the fundamental mechanisms of the functioning of the plants regarding the processes of nutrition and metabolism, establishing the relationships between them and clarifying basic concepts necessary for their understanding.

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 sources of information are given to foster 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.

Teaching methodology is based on the exposition and discussion of case studies and / or problems posed by the teacher to the students to solve them in a group, present them to their classmates and discuss them with them with the help and guidance of the teacher .

Laboratory practices

Some of the topics covered in the theory class are visualized through laboratory testing.

The student will get familiar with protocols and basic techniques of a Plant Physiology Lab. and learns to represent and interpret the results obtained in its own experiments

The student will gain access the protocols and practical guides through the Virtual Campus.

Tutoring

In tutorials in groups and individuals, the teacher tries to help the student solve their doubts about the concepts of the subject and guide them in their studies.

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

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			
Lab practice	12	0.48	1, 4, 5, 7, 2, 3
Lectures	32	1.28	5, 6, 7, 2
Seminars	6	0.24	5, 6, 7, 9, 8, 2
Type: Supervised			
Group tutorials	3	0.12	1, 5, 7, 2
Personel tutorials	1.5	0.06	1, 5, 7, 2
Type: Autonomous			
Personal study	62	2.48	1, 5, 6, 7, 10, 8, 2
Preparation of homework and/or seminars	20	0.8	5, 6, 7, 10, 9, 2, 3
Preparation of lab practice report	10	0.4	1, 4, 5, 7, 8, 2

Assessment

Written exams that include the evaluation of the contents of the lectures.

There will be two eliminatory tests corresponding to each of the parts in which the program has been divided.

To be able to pass the subject, a minimum grade of 5 must be obtained in each of these parts. The weight of each partial exam in the theory mark is 50%. The weight of the theory mark in the final grade is 70%.

To improve the mark, or to pass the marks below 5, you can do a recovery at the end of the course of each of these exams in a final examination of recovery. The minimum mark to pass the subject to the final examination of recovery is 5.

In the case of submitting to improve the mark of a partial exam, the note of the recovery exam is counted.

To be eligible for this retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as "No Avaluable" if the weighthin of all conducted evaluation activities is less than 67% of the final score".

The laboratory practices will be evaluated by means of an exam the last day of the practices and considering the results obtained in each one of the laboratory sessions and their representation and discussion in the guideline of practices prepared individually by each student. 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 it is not possible, by means of substitute work. There is no second chance to recover the exam of lab practices.

Participation in the seminars and the quality of the works and / or problems resolved and presented account for 10% of the final mark

The subject will be approved when the student fulfills the conditions to be able to pass it and the resultant note of the different evaluations (exams, practicesand seminar) is ≥5.0.

Students who can not attend an individual assessment test for justified cause (such as illness, death of a first-degree relative or accident) and provide the official documentation corresponding to the Degree Coordinator, will be entitled to take the exam in question on another date.

Every year a voluntary activity is proposed with which you can achieve a maximum increase of 0.3 points on the final mark, as long as it is greater than 5.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of lab practice and seminar	30%	0.5	0.02	1, 4, 5, 7, 10, 9, 8, 2, 3
Examinations of lecture programs	70%	3	0.12	4, 5, 6, 7, 9, 2

Bibliography

BARCELÓ, J.; NICOLÁS, G.; SABATER, B.; SÁNCHEZ, R.: *Fisiologia Vegetal*. Pirámide. Madrid (2009).

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*, 7ª edición Elsevier, Spektrum (2010).

TAIZ,L.; ZEIGER, Moller IE, Murphy A.: *Plant Physiology and Development*, 6ª Ed. Sinauer Associates, Sunderland (2010)

http://6e.plantphys.net/

Heldt H.W., Piechulla B. Plant Biochemistry 4th edition 2010. libro accessible online para usuarios UAB

https://www.sciencedirect.com/science/book/9780123849861

Software

none