UAB
Universitat Autònoma de Barcelona

Applied Plant Physiology.

Code: 100911
ECTS Credits: 6

2024/2025

Degree	Type	Year
2500252 Biochemistry	OT	4

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

It is recommended to review the basic concepts of Plant Physiology

Objectives and Contextualisation

The general objective of this subject is to introduce the students into the functional mechanisms and techniques that will improve the yield of the crop plants and their agricultural and industrial applications.

The specific training objectives are:

- Identify the processes that determine the yield of plants of agricultural and industrial interest and their regulation by internal and external factors.
- Acquire an advanced vision of reproduction techniques for plants with a practical purpose.
- Introduce the students to the basic techniques of agricultural biotechnology.
- Introduce the students to the basics of phytochemistry and its application in medicine and industry.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Analyse and explain normal physiological processes and alterations in them on the molecular scale, using the scientific method.
- Collaborate with other work colleagues.
- Describe intercellular and intracellular communication systems that regulate the proliferation, differentiation, development and function of animal and plant tissues and organs.
- Describe metabolic routes, their interconnections and their physiological significance, and also understand the mechanisms that regulate their activity to satisfy physiological needs.
- Interpret experimental results and identify consistent and inconsistent elements.
- Introduce changes in the methods and processes of the field of knowledge to provide innovative responses to the needs and demands of society.
- Manage bibliographies and interpret the information in the main biological databases, and also know how to use basic ICT tools.
- Read specialised texts both in English and one's own language.
- Show initiative and an entrepreneurial spirit.
- Stay abreast of new knowledge of the structure, organisation, expression, regulation and evolution of genes in living beings.
- 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.

Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Collaborate with other work colleagues.
3. Describe the characteristics and organisation of the genome of the different organelles of the plant cell, and also the coordinated expression of this genome and the functions that derive from it.
4. Describe the genetic characteristics of the principal model organisms in plant genetics.
5. Describe the principal molecular tools available for studies in plant genetics.
6. Explain the molecular bases of interactions between plants and microbial pathogens and resistance responses.
7. Explain the molecular bases of processes related to postembryonic growth and to the mechanisms of adaptation to the environment, including responses to different types of stress.
8. Integrate the function of the principal metabolic pathways within the processes of plant growth.
9. Interpret experimental results and identify consistent and inconsistent elements.
10. Introduce changes in the methods and processes of the field of knowledge to provide innovative responses to the needs and demands of society.
11. Make use of bibliography and databases to prepare seminars.
12. Read specialised texts both in English and one's own language.
13. Show initiative and an entrepreneurial spirit.
14. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
15. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.

Content

Lectures

- Applied Plant Physiology: field of study; Scientific and social interest

- Plant productivity and yield: Assessment parameters; Conditioning factors
- Genetic potential and its regulation by internal and external factors
    - External factors:
        - Biotic
            - Plant-microorganism interaction: pathogenesis of bacterial, viral and fungal diseases
            - Molecular bases of plant defense
        - Environmental
            - Essential nutrients and soil fertility.
            - Water needs of plants and increased efficiency in water sources.
            - Temperature needs of the plants. Greenhouses and hydroponics.
    - Internal factors
        - Reproduction and regulation of development
        - Genetics of reproduction: Sexual reproduction and seed technology
        - Asexual reproduction
        - *In vitro* reproduction
        - Genetic breeding
        - Plant biotechnology: methods and applications
        - Secondary metabolism of plants
        - Regulation of growth by the use of phytoregulators
- Optimization of production technologies
- Sustainable plant production and integrative plant production

Seminars

Different projects that will be developed by groups

Laboratory practices

- In vitro culture techniques
- Assessment of ascorbic acid in fruits
- Effect of herbicides on photosynthetic pigments
- Germination assay
- Effect of the osmotic potential on the seed germination
- Susceptibility of fruits to the fungus *Botrytis cinerea*

Field trips

Visit an agrotechnological research center

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lab practice	16	0.64	2, 9
Lectures	28	1.12	14, 3, 5, 6, 7, 8, 10
Seminars	6	0.24	1, 15, 14, 2, 9, 10, 12, 11, 13
Type: Supervised			
Field trip	4	0.16	3, 5, 8
Tutorial	5	0.2	

Type: Autonomous			
Personal study	70	2.8	
Preparation of homework and/or seminars	11	0.44	1, 14, 2, 9, 10, 12, 11
Preparation of lab practice report	5	0.2	2, 8, 9

Lectures

During the lectures, the professor explains the functional mechanisms and techniques that allow to improve the yield of crop plants and their agricultural and industrial applications, establishing the functional and mechanistic relationships clarifying the basic concepts necessary for their understanding. The methodology is mainly lecture-based, accompanied by visual diagrams. During the lectures, exercises will also be proposed and questions will be thrown to the students which will be solved by the teachers in order to know the degree of follow-up and facilitate the understanding of the concepts. Bibliographical references and other sources of information are given to foster self-study.

Flipped classes

Three hours of lectures have been eliminated and replaced by a task where the students, divided into groups, will have to search for a scientific publication in the *Web of Science* database following quality guidelines. The publication will have to be related to the block of biotic factors that affect crop productivity. Then, the different subgroups will have to work on this publication in order to capture the main ideas in a ppt and create a video that they will post on the subject's moodle. All this work will be done in class with the guidance of the teachers.

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 projects where students divided into groups of 3-5 will have to design a scientific experiment, to analyze the offer of vegetable products available in markets and supermarkets, among others.

Laboratory practices

Some of the topics covered in the theory class are visualized through laboratory testing. The student became familiar with protocols and techniques of Applied Plant Physiology and have to analyze the results from theirown experiments. The student will be able to access the protocols and guides of practices through the Virtual Campus.

Field trips

A visit to an plant agrobiotechnology research center.

Tutorial

In tutorials, the professor tries to help the students to solve their doubts about the concepts of the subject and guide them in their studies.

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.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of lab practice	15%	1	0.04	2, 9
Evaluation of seminar	15%	0	0	1, 15, 14, 2, 9, 10, 12, 11, 13
Evaluation of the video from the flipped class	5%	0	0	2, 9, 12, 11
Examinations of lecture program	65 %	4	0.16	14, 4, 3, 5, 6, 7, 8, 10

The evaluation is based on the following items:

Written exams that include the evaluation of the contents of the lectures. There will be two eliminatory tests ('parcials') corresponding to the two equitable 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 note is 50%.

The weight of the theory grade in the final qualification is 65%. The task coming from the flipped classes, which will end with the presentation of a video accompanied by a PowerPoint, will have a weight of 5% in the final grade.

To improve the mark, or to pass the failure exams, the students can do a final recovery examination of the failure part. The minimum mark to pass this exam is 5.0.

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 Evaluable" if the weight of all conducted evaluation activities is less than 67% of the final score.

If you want to improve your grade you can present to the final exam and you waive the previously former mark and only the mark of the recovery exam will be counted.

The laboratory practices will be evaluated with a theoretical exam that will be done individually once finished the practical work and that will represent 80% of the practical grade. The elaboration of the lab notebook will be done in group and will represent the remaining 20% of the internship grade. The lab notebook will be delivered via the Virtual Campus one week after finishing the practices.

The lab practice note represents 15% of the final mark of the subject. Attendance is mandatory. Inthe event of a justified absence, the lab session or sessions can be recovered through assistance to anothergroup or, if that is not possible, by means of a substitute work. There is no practice recovery exam.

Seminars: Seminars will account for 15% of the final mark. Attendance is mandatory and they cannot be retaken.

The subject will be approved when the student obtains a minimum final grade of 5 points out of 10 in each of the parts (theory, laboratory practices and seminars).

The presentation to the final examination of recovery in any case means that the student has presented and will be evaluated.

Students who cannot attend an individual assessment test for just cause (such as illness, death of a first-degree relative or accident) and provide the official documentation corresponding to the Degree Coordinator, will have the right to perform the test in question on another date.

Students who take the single evaluation must do the laboratory practices (PLAB) in face-to-face sessions together with the students of the continuous evaluation. It is a mandatory requirement to approve the practical sessions, which will count the 15% of the final mark. Attendance at the seminars (SEM) will not be compulsory and students who choose for this option will have to do 3 of the 6 seminars that make up the subject in

continuous assessment format. It will be the teaching staff who will choose the seminars to be taken by the students in the single evaluation option. The delivery of the SEM works will take place on the same day that has been set for the synthesis test.

The single evaluation consists of a single summary test (with questions to develop, linking key concepts and solve real cases) on the contents of the entire theory program.

The mark obtained in the synthesis test count the 70% of the final mark of the subject, the mark obtained in the practical is 15%, and the seminars the remaining 15%.

The single evaluation test will coincide with the same date set for the final continuous evaluation test and the same recovery test will bedone as for the continuous assessment.

To pass the subject you must obtain a final grade of at least 5 points out of 10 in each of the parts (synthesis test, PLAB and SEM).

Bibliography

https://www.sciencedirect.com/book/9780120445653/plant-pathology

Chrispeels, M.J., Sadova, D.E.: Plant Genes and Crop Biotechnology. 2nd ed. Jones & Bartlett Publ., Sudbury, 2003.

Neals S.C. (ed) Plant Biotechnology: Principles Techniques and Aplications. Wiley cop., 2008.

FORBES JC, WATSON RD.: *Plants in Agriculture*. Cambridge University Press, Cambridge 1992.

HARTMANN, H.T. et al. Plant Propagation. Principles and Practice. 7th ed. Prentice Hall. 2001.

JIMENEZ DIAZ, R; LAMO DE ESPINOSA, J.: *Agricultura Sostenible*. Mundi Prensa, 1998.

NIATU, JN. Advances in Plant Pathology. InTech Publisher. Electronic book. 2018. DOI: 10.5772/intechopen.71796. ISBN: 978-1-78923-609-5
https://www.intechopen.com/books/advances-in-plant-pathology

Wik, M. Function and biotechnology of plant secondary metabolism. 2nd edition Wiley Blackwell 2010.

Infography prepared by the Library Facility that would help the search of electronic books:
https://ddd.uab.cat/record/22492

Software

None

Language list

Name	Group	Language	Semester	Turn
(PLAB) Practical laboratories	241	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	242	Catalan/Spanish	first semester	afternoon

(PLAB) Practical laboratories	243	Catalan/Spanish	first semester	afternoon
(SEM) Seminars	241	Catalan	first semester	morning-mixed
(SEM) Seminars	242	Catalan	first semester	morning-mixed
(SEM) Seminars	243	Catalan	first semester	morning-mixed
(TE) Theory	24	Catalan/Spanish	first semester	morning-mixed