

Degree	Type	Year
2500502 Microbiology	FB	1

Contact

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Teachers

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Teaching groups languages

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Prerequisites

It is advisable to review plant cell structure and function, fundamentals of Biochemistry.

Objectives and Contextualisation

The course aims to introduce students to the basic knowledge of plant biology from the perspective of both structural and functional fundamentals.

Plants and microorganisms have a close evolutionary and functional relationship that has often resulted in a strong mutual dependency. Evident examples include significant symbioses such as the formation of mycorrhizae or the symbiotic fixation of atmospheric nitrogen, but also phytopathological interactions, which are highly important in agriculture, and saprophytic interactions, which are essential for the cycling of mineral nutrients in ecosystems.

To understand these complex interactions, which are the primary educational objectives of advanced courses, students must first acquire the ability to recognize the different levels of plant organization, the basic vital functions, and their regulation by internal and external factors.

To facilitate the learning process, the course is divided into two modules that respectively cover structural and functional fundamentals with the following objectives:

Module 1: Plant Physiology

Integration of knowledge regarding the functioning of plants at different organizational levels within the whole organism and their regulation by internal and environmental factors.

Module 2: Plant Cytology and Histology

A broad understanding of the diversity of plant cells and the ability to distinguish the cytophysiological characteristics that define the different tissues of plants.

Learning Outcomes

1. CM05 (Competence) Evaluate the global dynamics of natural systems at different scales of analysis to provide innovative responses to societal demands and care for the environment.
2. CM06 (Competence) Integrate knowledge and skills from the field of biology, working individually and in groups, to prepare and present in writing or orally and publicly a scientific work.
3. KM08 (Knowledge) Define the structure, organization and functioning of the different types of cells, tissues and physiological systems in living organisms.
4. SM06 (Skill) Relate the main biophysical, cellular, molecular and biochemical bases of physiological systems with their functioning.
5. SM07 (Skill) Characterise the tissues of living organisms attending to the morphology, micro- and ultramicroscopic structure and cytophysiology of their components.

Content

Module 1: Plant Physiology

- 1.1. Peculiarities of plant life: nutrition and form.
- 1.2. Water requirement: Concept of water potential; Osmotic relationships and growth.
- 1.3. Absorption and transport of water.
- 1.4. Mineral requirements: plant mineral nutrition. Plant-soil relationships.
- 1.5. Absorption and transport of nutrients.
- 1.6. Plants and light. Photosynthetic pigments; Transformation of energy.
- 1.7. Reductive Carbon Assimilation; C3 metabolism.
- 1.8. Photorespiration.
- 1.9. C4 y CAM metabolism.
- 1.8. Reductive assimilation of nitrogen and sulfur.
- 1.9. Secondary metabolism, pathways, functions and applications.
- 1.10. Regulation of growth and development by internal factors: Phytohormones and genetic regulation.
- 1.11. Regulation by external factors. Sensory and regulation systems for flowering. Photoperiodism, thermoperiodism and vernalization.
- 1.12. Seed dormancy and germination.
- 1.13. Fruit formation and maturation.
- 1.14. Senescence and abscission.

1.15. Exploring the functions of the microbiome in the physiology of plants: An Integrated Approach.

Module 2: Plant Cytology and Histology

2.1 Special features of plant cell. Cell wall. Tissue concept in Phanerogams.

2.2 Meristems. Apical meristems, cambium and phellogen.

2.3 Parenchyma: tissue organization. Root endodermis. Transfer cells.

2.4 Mechanical tissues. Collenchyma. Sclerenchyma. Sclerenchyma cells.

2.5 Xylem. Tracheids and vessel elements. Fibers and xylem parenchyma.

2.6 Phloem. Sieve tubes and sieve tube elements. Phloem parenchyma. Sclereids and phloem fibres.

2.7 Dermal tissue. Epidermis. Periderm.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Seminars	8	0.32	CM05, CM06, KM08, SM06, SM07
Theory classes	37	1.48	CM05, CM06, KM08, SM06, SM07
Type: Supervised			
Tutorials	6	0.24	CM05, CM06, SM06
Type: Autonomous			
Literature review	7.5	0.3	CM05, CM06, KM08, SM06, SM07
Public speaking preparation	10	0.4	CM05, CM06, KM08, SM06, SM07
Study	65	2.6	CM05, CM06, KM08, SM06, SM07
Text reading	7.5	0.3	CM05, CM06, KM08, SM06, SM07
Work composition	5	0.2	CM05, CM06, KM08, SM07

MODULE 1 (Plant Physiology)

The content of this module is delivered through 25 lectures and 5 seminars of 1 hour each (5 hours).

Lectures

During the theory classes, the faculty will explain the content of the syllabus outlined in the "contents" section above. Personal study with the help of specific bibliography, along with class notes, is recommended.

Seminars

These sessions aim to foster critical thinking among students through the analysis and/or discussion of cases and problems, public presentation of projects, answering questions related to the topics covered in lectures, and conducting an up-to-date research project, among other activities.

Tutorials

Tutorials will be conducted on a personalized basis in each instructor's office (schedule to be arranged). Tutorials are used to clarify concepts, reinforce acquired knowledge, and facilitate student study.

MODULE 2 (Plant Cytology and Histology)

The content of this module is delivered through 12 lectures and 3 seminars of 1 hour each (3 hours).

Seminars

The 3 scheduled seminars are designed to help students acquire group work skills and critical reasoning. The class will be divided into groups of 4 to 6 students, each working on a specific topic from the syllabus for subsequent oral presentation and collective discussion. The organization of groups and the assignment of topics will take place during the first seminar. In the remaining seminars, some student groups will submit their proposed topic in writing to the instructor. These groups will then orally present the topic to the rest of the class using the available classroom resources.

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
Citology and Histology Exam	26.7	2	0.08	CM05, CM06, KM08, SM07
Homework and seminar and tutorial participation, Plant Physiology module	13	0	0	CM05, CM06, KM08, SM06
Plant Physiology exam	54.3	2	0.08	CM05, CM06, KM08, SM06
Work, Oral presentation, Qualific. inter-group and intra-group. Citology and Histology Module	6	0	0	CM05, CM06, KM08, SM07

The specific and transversal competencies of this course will be continuously assessed through written tests (exams), thematic written assignments, completed questionnaires, oral presentations, and participation in seminars.

Each module is evaluated independently. Students must pass both modules to pass the course. The final grade is calculated by weighting the grades of each module based on the number of credits for each [Module 1: 4 credits; Module 2: 2 credits]. The weighting for each module is as follows: Module 1: 67% of the course grade, Module 2: 33% of the course grade.

To participate in the retake, students must have been previously assessed in a set of activities that account for at least two-thirds of the total grade of the course or module. Therefore, students will receive a grade of "Not Assessable" if the activities performed account for less than 67% of the final grade.

Repeating students only need to retake the specific modules they have not passed.

Evaluation of Module 1: Plant Physiology

The final grade for this module will be based on the results of the following continuous assessment activities:

Written Tests: These account for 80% of the final module grade. Two partial tests will be conducted, each representing 40% of the grade. **Seminars:** Attendance at seminars is mandatory and represents 20% of the overall grade. A minimum score of 5 is required in each activity (tests and seminars) to calculate the final grade. A minimum overall grade of 5 is needed to pass the module.

If a student cannot attend the exam for a justified reason, they must attend the retake session and are entitled to one additional exam if they fail. Unjustified absences from one or more seminars will result in a 15% reduction in the seminar grade.

Unique Evaluation

The unique evaluation consists of a comprehensive test on the module's theoretical content (questions to develop, concept relationships, real case resolution). This test will be conducted on the same day, time, and place as the module's theoretical exam. The retake test will also be held on the same day, time, and place as the course retake.

- Unique Evaluation: 80% of the grade.
- Seminar Attendance: Mandatory, not subject to single evaluation, and follows the continuous evaluation process.

To pass the course, a minimum final grade of 5 out of 10 is required in both the single evaluation and the seminars.

Evaluation of Module 2: Plant Cytology and Histology

The competencies of this module will be assessed through continuous evaluation, including various tests, written assignments, and public presentations. A minimum grade of 5 is required to pass this module. The evaluation system is divided into two sections, each independently assessed and assigned a specific weight in the final module grade:

- **Written Tests (80% of the overall grade):** Individual knowledge assessment through multiple-choice exams. A written test will be conducted at the end of the Histology syllabus. Students scoring below 4 (out of 10) cannot combine this with seminar grades and must take the retake exam.
- **Seminars (20% of the overall grade):** Assessment of each group's analytical and synthesis abilities, group work skills, and oral presentation skills. Seminar evaluations are as follows:
 - Written Work (50%): The instructor evaluates the submitted work from each group of students (scored out of 10).
 - Oral Work (20%): The instructor evaluates the presentation skills of each group (scored out of 10).
 - Inter-Group Evaluation (15%): Each group evaluates other presenting groups (scored out of 10).
 - Intra-Group Evaluation (15%): Each student within a group evaluates their peers (scored out of 10).

Attendance: Mandatory. Unjustified absences result in penalties:

- 1 missed session = 20% reduction in seminar grade.
- 2 missed sessions = 40% reduction in seminar grade.
- 3 or more missed sessions = 80% reduction in seminar grade.

Unique Evaluation

The unique evaluation of the "Plant Cytology and Histology" module consists of a comprehensive test on theoretical content. This test will be held on the same day, time, and place as the module's theoretical exam. The retake test will also be on the same day, time, and place as the course retake.

- Unique Evaluation: 80%.
- Seminar Attendance: Mandatory, follows the continuous evaluation process.

General Considerations

Written tests can be passed with partial exams (corresponding to module content) or the final recovery test for both modules. Students who miss or fail any partial test can retake the respective parts during the scheduled final exam at the end of the semester. Those who miss all partial tests cannot attend the retake.

Grade Improvement

Students can take a grade improvement exam for each module. These exams will be held on the same day as the course retake. To improve the grade, students must take the final module exam, and the latest exam grade will be considered (replacing previously achieved grades).

Bibliography

Module 1

Azcon Bieto J & Talón M. Fundamentos de Fisiología Vegetal, 2nd Ed, McGraw-Hill, Interamericana (2013).

Barceló, J. et al. Fisiología Vegetal, Ed. Piràmide, Madrid 2005

Taiz L & Zeiger E. Plant Physiology, 6th edition, Sinauer, Sunderland, MA (USA, 2014); Other resources for Plant Physiology and Development, 7ed Instructor: Resources (https://learninglink.oup.com/access/taiz7e-student-resources#tag_all-chapters).

Relevant references

Barceló, J. et al. Fisiología Vegetal, Ed. Piràmide, Madrid 2005

Module 2

Esau, K.: Anatomía vegetal (ed. Omega) Fahn, A.: Anatomía vegetal (ed. Piràmide)

Mauseth, J.D.: Plant Anatomy. (ed. Benjamin/Cummings)

Paniagua, R. y col.: Citología e Histología vegetal y animal (ed. McGraw-Hill)

Digital documents:

<https://mmegias.webs.uvigo.es/descargas/descargas.php>

<http://www.hiperbotanica.net/>

http://wzar.unizar.es/acad/histologia/paginas/Atlas_inicio.htm

https://editorial.unam.edu.ar/images/documentos_digitales/978-950-579-064-7.pdf

<http://www.facmed.unam.mx/deptos/biocetis/atlas2013A/>

Relevant references

Esau, K.: Anatomía vegetal (ed. Omega)

Mauseth, J.D.: Plant Anatomy. (ed. Benjamin/Cummings)

Software

No software is needed

Language list

Name	Group	Language	Semester	Turn
(SEM) Seminars	711	Catalan/Spanish	second semester	morning-mixed
(SEM) Seminars	712	Catalan/Spanish	second semester	morning-mixed
(TE) Theory	71	Catalan/Spanish	second semester	afternoon