

**Laboratory II**

Code: 100979  
ECTS Credits: 3

**2024/2025**

Degree	Type	Year
2500502 Microbiology	OB	1

## Contact

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## Teachers

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## Teaching groups languages

You can view this information at the [end](#) of this document.

## Prerequisites

Students are advised to review the scientific-theoretical content on which this course is based.

It is also advisable that this course be taken simultaneously or subsequently to the rest of the courses scheduled for the first semester of the first year of the degree in Microbiology.

In order to take this course, students must pass the safety and biosafety tests before the first practical session, which will be found in the corresponding educational Moodle space. The pdf documents generated when passing the tests must be presented on the first day of class. Also, it is necessary to know and accept the operating rules of the laboratories of the Faculty of Biosciences. In addition, it is imperative that the student follows the rules of work indicated by the teaching staff. For safety reasons, if the two tests have not been passed, or the student does not wear a lab coat and safety glasses, access to the lab will not be allowed.

## Objectives and Contextualisation

This is a compulsory, nuclear course of the degree of Microbiology, which introduces students, together with the course Integrated Laboratory I, in the experimentation in a Biology laboratory. Therefore, it is a course of lab work in which the scientific-technical concepts with the practices are continually related. The skills and

knowledge acquired enable the student to attend the rest of the practical courses that make up the degree in Microbiology.

In addition to the Learning Outcomes listed in the following section, students upon completing this subject will be able to:

- Identify to the microscope various plant tissues and their cellular and extracellular components.
- Apply basic histological techniques for microscopic diagnosis.
- Manipulate and prepare various plant materials and test solutions to calculate their water potential.
- Analyze the different osmotic states of the cell with respect to its environment and determine the osmotic balance.
- Study the importance of light in the photosynthetic reaction and see how we can intervene artificially.
- Quantify the activity of a phytohormone and an enzyme by means of a bioassay.
- Recognize the fundamental structures of the plant groups and their function.
- Develop the ability to describe these structures using a scientific language.
- Synthesize the knowledge acquired with the team compilation of a collection of plants.
- Recognize the key species of plants because of their importance: representatives of evolutionary groups, landscape components, or their economic value.
- Recognize the morphology of *Drosophila* and learn about the life cycle and the cytogenetics of this organism in order to manipulate it at the genetic level.
- Experimenting with the concepts of Mendelian genetics (principles of segregation, genes, and alleles, the relationship of dominance, type of inheritance, concepts of genotype and phenotype, recombination) in the development of a genetic map of three markers, using *Drosophila* As a model.
- Use different cytogenetic techniques for the preparation and observation of chromosomes. Identify normal karyotypes and mutant karyotypes, and learn how to relate them to a certain phenotype.
- Apply computer simulation tools to observe the dynamics of genetic variation in populations.
- Use basic techniques for extraction, manipulation, and analysis of nucleic acids.

## Learning Outcomes

1. CM18 (Competence) Integrate knowledge and skills for the design of experiments in the field of microbiology and the interpretation of their results working individually and in teams.
2. KM25 (Knowledge) Describe the theoretical foundations and instrumentation used in basic and advanced experimental techniques in microbiology and other related sciences, including sterilization and microbial load reduction procedures in industrial, clinical and experimental environments.
3. KM26 (Knowledge) Identify the principles and standards of good laboratory and biosafety practices.
4. SM25 (Skill) Manage computer resources for the treatment of experimental data within the field of microbiology and other biosciences.

## Content

The course is made up of four modules, with the contents indicated below:

Module 1. Systematics and Plant Diversity

Session 1: Macroscopic algae: Feophytes, Rhodophytes and Chlorophytes.

Session 2: Terrestrial plants: Briophytes (Hepatic and moss); Pteridophytes (Equisets and Ferns)

Session 3: Terrestrial Plants: Spermatophytes (Gymnosperms and Angiosperms)

Session 4: Field trip: Type of vegetation and Mediterranean landscape

## Module 2. Plant Histology

Session 1: Feulgen method for staining nuclear DNA in *Allium cepa* root-tips: Feulgen method in samples mounted in glycerol. Microscopic examination of the cell wall structures. Microscopic examination of the meristems.

Session 2: Microscopic identification of the parenchyma and mechanical and dermal tissues.

Session 3: Microscopic identification of vascular tissues.

## Module 3. Plant Physiology

Session 1: Water relations: measurement of water potential and observation of plasmolysis.

Session 2: Photosynthesis - Hill's reaction in isolated chloroplasts and its inhibition by DCMU - Demonstration of the need for CO<sub>2</sub>.

Session 3: Measurement of transpiration rate and velocity under different environmental conditions - Stomatal morphology.

Session 4: Study of nitrate reductase enzyme activity induced by nitrate.

Session 5: Cytokinin bioassay on barley leaf segments.

## Module 4. Genetics

Session 1: Introduction to the biology and morphology of *Drosophila*.

Session 2: Elaboration of a genetic map of three markers.

Session 3: Observation of chromosomes and mutations.

Session 4: Genetic variability: blood groups.

Practice 5: Dynamics of genetic variation in populations.

## Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lab seasons of module 1. Field work	4	0.16	CM18, KM25, KM26
Lab seasons of module 1. Systematics and plant diversity	9	0.36	CM18, KM25, KM26, SM25
Lab seasons of module 2. Plant histology	10.5	0.42	CM18, KM25, KM26, SM25
Lab seasons of module 3. Plant physiology	15	0.6	CM18, KM25, KM26, SM25
Lab seasons of module 4. Genetics	15	0.6	CM18, KM25, KM26, SM25
Laboratory introduction	1	0.04	KM26
Type: Supervised			
Tutorials	1	0.04	CM18, KM25, SM25

Type: Autonomous

Problem solving	3	0.12	CM18, KM25, SM25
Study	8.5	0.34	CM18, KM25, SM25
Written work	4	0.16	CM18, KM25, SM25

This course will be taught in small groups of students (maximum of 24 per session) in the laboratory. Laboratory, dates, and official schedule for the performance of the lab sessions are detailed in the Moodle space of the course and in the space of the Degree.

Each student is assigned to a group for all lab sessions and will not be able to move to another group without the permission of the person in charge of the course.

In order to acquire the skills of the course, attendance at all practices is mandatory and it must be with punctuality. Once the teacher has begun the explanation of the session, the entrance of students in the classroom will be not allowed.

If a student, due to a justified cause according to the faculty's evaluation criteria (general considerations on assessment tests), has not been able to attend a practical session, he/she must contact the professor responsible for the course and present the corresponding justification. In this case and if possible, a new day will be assigned to retake the practice.

Students will have a Manual of Practical sessions for each Module before the beginning of the practical sessions. It is a requirement that the student read comprehensively the protocols prior to their attendance at each session.

It is compulsory for students to wear his or her own lab coat in all practical sessions that are carried out in the laboratory, and also laboratory glasses in the sessions indicated by the teaching staff. In addition, each student will have to bring the corresponding Practices Manual that will be available in the Moodle platform, and a notebook to note the results of the work.

The fieldwork session will be carried out jointly for all three lab session groups.

The tutorials will be carried out at the office of the teaching staff and/or using the TICs.

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

### Continuous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of Module 1. Systematics and plant diversity	26%	1	0.04	CM18, KM25, KM26, SM25
Evaluation of Module 2. Plant histology	22%	1	0.04	CM18, KM25, KM26, SM25
Evaluation of Module 3. Plant physiology	26%	1	0.04	CM18, KM25, KM26, SM25
Evaluation of module 4. Genetics	26%	1	0.04	CM18, KM25, KM26, SM25

The evaluation of the course will be individual and continued. The weight of the evaluation of Module 2 on the final grade is 22%, while that of the other modules is 26%. It will be necessary to obtain a score equal or superior to 5 in each one of the practical modules separately to be able to pass the course.

The evaluation of each module will be done in the following way:

Module 1. Systematics and Plant Diversity:

A test consisting of a set of questions made at the end of each practical session: average of the marks obtained in each individual session (75% of the mark).

The activity of learning and assessment at the end of the fieldwork (25% of the mark).

The attitude and participation in the practical sessions and the collaboration in obtaining the material will be considered in his case.

Module 2. Plant Histology: The evaluation system is organized in the following sections:

1) Evaluation of the contents at the end of each practical session (50% of the mark). This test consists of a set of questions as well as recognition of microscopic structures. The final grade of this section is obtained from the average of the grades obtained in each practice session.

2) Test of microscopic diagnostic test (50% of the mark).

In order to be able to weigh the notes obtained in each section, it will be essential that students get a score equal to or superior to 4 points (out of 10) in each of them. Students who have obtained a final grade of lower than 5 (out of 10) will have to take a second-chance exam, which will consist of a microscopic diagnostic test and a questionnaire.

Module 3. Plant Physiology: A final individual written test will be done that represents an 80% of the mark. The practice notebook will be carried out in groups and will account the remaining 20% of the mark. The notebook will be delivered via Virtual Campus until one week after the end of the practical course.

Module 4. Genetics: A written test, with multiple-choice questions, will be done at the end of each session. For the practical session that takes place in the computer room, there will also be a written test at the end of the session (80% of the final mark of the practical sessions), and in addition, a written work must be delivered (20 % of the final mark of the module). The mark of each session has the same weight on the final grade of the module.

General Issues:

Since attendance to the activities programmed in this course is mandatory, the absence must be justified and may not exceed 20%. In any case, that 20% cannot be accumulated in a single module. The maximum absence in each module will be decided by the teaching team depending on the distribution of the contents and skills in the different sessions of each of the modules. If this value is exceeded, the subject will be graded as Non-Evaluable. In order to be able to pass the course, attendance of at least 80% of the programmed sessions is required, and obtain the minimum qualification fixed for each module.

The teaching staff can penalize non-correct attitudes of the student in the laboratory, such as the lack of punctuality, non-fulfillment of safety and biosafety regulations or the inappropriate use of the material and laboratory devices, lowering the final grade of the course.

The students who do not pass the evaluations of the different modules of the subject will be able to retake them at the scheduled date at the end of the semester. The reassessment of module 1 (Systematics and plant diversity) will include a Questionnaire with contents of the 3 laboratory sessions and field work and the analysis of a minimum of 4 macro and microscopic samples. The reassessment of module 2 (Plant Histology) will consist of a microscopic diagnostic test and a Questionnaire. The reassessment of modules 3 (Plant Physiology) and 4 (Genetics) will consist of a written exam where the concepts worked in the practical sessions will be evaluated. The delivery of reports cannot be retake and the non-delivery on the indicated date

implies a zero in this activity.

Students who ultimately do not obtain the minimum qualification required to be able to pass each one of the modules of the integrated laboratory, will not pass the course although the average of the marks of the different modules is greater than 5. In this case, the final maximum grade Of the subject will be a 4.

Since this course is differentiated in modules, from the second enrolment, the repeating students will only have to evaluate the specific modules that have not been exceeded.

Single assessment:

The students who choose the single assessment must do the laboratory practices and fieldwork in face-to-face sessions since they are mandatory teaching activities. The single assessment consists of a final exam that may contain multiple choice questions, short questions and problems to develop on theoretical and practical contents of the practices and microscopic diagnosis. The grade obtained in this synthesis test is 83% of the final grade for the subject. This single assessment test will be carried out coinciding with the same date set in the calendar for the last continuous assessment test. The same criteria will be applied to pass the subject as for the continuous assessment.

The delivery of reports, evaluations during fieldwork and the attitude and participation in the practices will be the remaining 17% and will be carried out on the same dates set for the continuous evaluation. For the single assessment option, the same retake system and review of the final grade and the same criteria for passing each module and the subject will be applied as for the continuous assessment system.

## Bibliography

Modules 1 i 2

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- Bracegirdle, B. y Miles, P.H.: Atlas de estructura vegetal (ed. Paraninfo).
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- Heywood, V.H. 1985. Las plantas con flores. Ed. Reverté.
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- Krommenhoek, W., Sebus, J. y van Esch, G.J.: Atlas de Histología vegetal (ed. Marbán).
- Ledbetter, M.C. y Porter, K.R.: Introduction to the fine structure of plant cells (ed. Springer).
- Llistosella, J.; Sanchez-uxart, A. 2003. L'herbari. Arbres, arbusts i lianes. Ed. Universitat de Barcelona
- López González, G. 2001. Los árboles y arbustos de la Península Ibérica e Islas Baleares. Tomos I y II. Ed. Mundi-Prensa.
- Masclans, F. 1990. Guia per a conèixer els arbres. 9ª ed. Ed. Montblanc-CEC. Barcelona.
- Masclans, F. 1990. Guia per a conèixer els arbusts i les lianes. 8ª ed. Ed. Montblanc-CEC. Barcelona.
- Roland, J.C. y Roland, F.: Atlas de Biologie végétale (ed. Masson).
- Román, B.: Tejidos vegetales (ed. Bruño).
- Salvo Tierra, E. 1990. Guía de helechos de la Península Ibérica y Baleares. Ed. Pirámide. Madrid.
- Strasburger, E. et al. 2004. Tratado de Botánica. 9ª (ed. Omega).

Module 3

- Barceló, J. et al. 2005. Fisiología Vegetal, Ed. Pirámide, Madrid
- Taiz L i Zeiger E. 2010. Plant Physiology. 5th edition, Sinauer, Sunderland, MA (USA)

Module 4

- Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C., Carroll, S.B. 2008. Genética. 8a edició. McGraw-Hill /Interamericana de España.
- Pierce, Benjamin A. 2010. Genética. Un enfoque conceptual", 3ª edición, Editorial Médica Panamericana

## Software

There is no specific software associated with this subject

## Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	711	Catalan/Spanish	second semester	morning-mixed
(PCAM) Field practices	711	Catalan/Spanish	second semester	morning-mixed
(PCAM) Field practices	712	Catalan/Spanish	second semester	morning-mixed
(PCAM) Field practices	713	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	711	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	712	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	713	Catalan/Spanish	second semester	morning-mixed

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