Universitat Autònoma de Barcelona

2018/2019

Laboratory II

Code: 100979
ECTS Credits: 3

Degree	Type	Year	Semester
2500502 Microbiology	OB	1	2

Contact

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Use of languages

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

Teachers

Joaquim Martí Clúa
Maria Soledad Martos Arias
Josefa Domenech Cabrera
Laia Guardia Valle

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. It is therefore 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 practical courses that make up the degree in Microbiology.

Objectives of the subject:

- Identify to the microscope various plant tissues and their cellular and extracellular components.
- Know how to 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
- Self-learning: 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 the concepts of Mendelian genetics (principles of segregation, genes and alleles, 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 kariotypes, 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

Skills

- Apply knowledge of theory to practice
- Communicate orally and in writing.
- Develop critical reasoning skills in the field of study and in relation to the social context.
- Display sensibility towards environmental, health and social matters.
- Identify and solve problems.
- Know and interpret microbial diversity, the physiology and metabolism of microorganisms and the genetic bases that govern their vital functions.
- Recognise the different levels of organization of living beings, especially animals and plants, diversity and bases of regulation of vital functions of organisms and identify mechanisms of adaptation to the environment.
- Work individually or in groups, in multidisciplinary teams and in an international context.

Learning outcomes

1. Analyse parameters of plant growth and development
2. Apply knowledge of theory to practice
3. Apply suitable methodologies for identifying and classifying animals and plants.
4. Carry out functional tests and determine, assess and interpret vital parameters in animals and plants.
5. Communicate orally and in writing.
6. Develop critical reasoning skills in the field of study and in relation to the social context.
7. Display sensibility towards environmental, health and social matters.
8. Identify and solve problems.
9. Interpret genetic variation in a population and between populations.
10. Obtain, use, conserve and observe animal and plant specimens.
11. Produce and work with genetic and physical maps.
12. Understand heredity mechanisms and the fundamentals of genetic improvement.
13. Work individually or in groups, in multidisciplinary teams and in an international context.

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, Rhodophyts 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: Determination of the water Potential in plant tissues

Session 2: Determination of the physiological effects of a plant hormone (cytokinins)

Session 3: Study of photosynthesis through Hill's Recitation

Sesson 4: Measurement of water relations: Incipient plasmolysis method

Session 5: Study of the induction of the nitrate reductase enzyme *in vivo*

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.

Methodology

This course will be taught in small groups of students (maximum of 24 per session) in the laboratory. Laboratory, dates and oficial 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 the attendance to all practices is mandatory andit 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 justified and unforeseeable cause, 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, a new day will be assigned to retake the practice. If the practice is no

longer taught and the student can not do it, it will not be counted as a lack of assistance. It is understood by justified cause: health problems (the corresponding medical justification must be presented) or serious personal problems.

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 bringthe corresponding Practices Manual that will be available in the Moodle platform, and a notebook to note the results of the work.

The field work 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.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Lab sessions of Module 3. Plant physiology	15	0.6	1, 2, 4, 8, 5, 13
Lab sessions of module 1. Systematics and plant diversity	9	0.36	2, 3, 6, 8, 10, 5, 13, 7
Lab sessions of module 2. Plant histology	10.5	0.42	2, 4, 8, 5, 13
Lab sessions of module 4. Genetics	15	0.6	2, 12, 11, 8, 9, 5, 7
Module 1. Field work	4	0.16	2, 3, 6, 8, 10, 13, 7
Type: Supervised			
Tutorials	1	0.04	1, 2, 3, 12, 6, 11, 4, 8, 9, 10, 5, 13, 7
Type: Autonomous			
Problem solving	3	0.12	1, 3, 12, 11, 4, 8, 9, 10
Study	9.5	0.38	1, 3, 12, 11, 4, 9, 10
Work writing	4	0.16	1, 2, 4, 7

Evaluation

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:**

Test consisting in a set of questions made at the end of each practical session: average of the mork obtained in each individual ssession.

Activity of learning and assessment at the end of the field work.
The attitude and participation in the practical sessions and the collaboration in the obtaining of 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 consist 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 practical 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 or superior to4 points (out of 10) in each of them. Students who have obtaineda final grade of lower than than 5 (out of 10) will have to takeasecond-cnahce exam, which will consist of a microscopic diagnostic test and a questionnaire.

Module 3. **Plant Physiology**: The last day of practical sessions will be a final written test. Attendance, attitude and the elaboration of the lab sessions report will also be considered.

Module 4. Genetics: A written test, with multiple choice questions, will be done at the end of each session. For the practical session that take 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 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 order to be able to pass the course, global 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-fulfilment of safety and biosafety regulations or the inappropriate use of the material and laboratory devices, lowering the final grade of the course.

It will be considered that a student obtains the **Non-evaluable** qualification when he/she has attended less than 80% of the scheduled sessions.

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 reassessmet 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. 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.

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 scourseis differentiated in modules, from the second enrolment, the repeating students willonly have to evaluate the specific modules that have not been exceeded.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Evaluation of Module 1. Systematics and plant diversity	26%	1	0.04	2, 3, 6, 8, 10, 5, 13, 7

Evaluation of Module 2. Plant hystology	22%	1	0.04	2, 4, 8, 5, 13
Evaluation of Module 3. Plant physiology	26%	1	0.04	1, 2, 4, 8, 5, 13
Evaluation of module 4. Genetics	26%	1	0.04	2, 12, 11, 8, 9, 5, 7

Bibliography

Modules 1 i 2

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- Bracegirdle, B. y Miles, P.H.: Atlas de estructura vegetal (ed. Paraninfo).
- Font i Quer, P. 1963. Diccionario de Botánica. (ed. Labor).
- Heywood, V.H. 1985. Las plantas con flores. Ed. Reverté.
- Izco, J. et al. 2004. Botánica. (McGraw-Hill-Interamericana)
- 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.
- Masclalns, 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 Botànica. 9ª (ed. Omega).

Module 3

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