

Laboratory I

Code: 100980
ECTS Credits: 3

Degree	Type	Year	Semester
2500502 Microbiology	OB	1	1

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

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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

Other comments on languages

It is possible that some sessions will not be performed in the vehicular language

Teachers

Octavi Martí Sistac
Laura Tusell Padrós
Andros Maldonado Linares
Carlos Barcia Gonzalez
Carla Canal Capdevila
Francesc Muñoz Muñoz

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 practice 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 Laboratorio Integrado II, 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 the practical courses that make up the degree in Microbiology.

Objectives of the subject:

- Apply spectrophotometry as a method of quantifying biomolecules.
- Separate and analyze polypeptides by denaturing electrophoresis on polyacrylamide gel (PAGE-SDS).
- Perform some of the most common chromatography in the analysis and separation of biomolecules.
- Perform simple enzymatic trials that allow analyzing the catalytic capacity of enzymes.
- Familiarize the student with the use of a conventional optical microscope by observing different cellular structures as well as visualizing different biological processes.
- Introduce some of the techniques used in electron microscopy to identify different structures and cell organs in microphotographs.
- Know how to apply basic histological techniques for microscopic diagnosis.
- Identify to the microscope various animal tissues and their cellular and extracellular components.
- Correct use of optical material for wildlife observation (binocular magnifier, microscope)
- Know how to use some basic techniques and electrophysiology to acquire physiological variables in humans.
- Study the cardiovascular adaptation to physical exercise in healthy individuals, and conduct an experiment in this sense, following the principles of the scientific method.
- Know how to analyze statistically the physiological data obtained and write a report.
- Know the use of dichotomous keys for the determination of animals.
- Recognize the anatomical and morphological characteristics of the different animal groups
- Identify and locate the species of animals observed taxonomically.
- Integrate the experimental data with the theoretical information of the processes analyzed.

Competences

- Apply knowledge of theory to practice
- Communicate orally and in writing.
- Design experiments and interpret the results
- 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.
- 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.
- Use molecular and immunological techniques in the characterisation of microorganisms and materials of biological origin.
- Work individually or in groups, in multidisciplinary teams and in an international context.

Learning Outcomes

1. Apply knowledge of theory to practice
2. Apply suitable methodologies for identifying and classifying animals and plants.
3. Carry out functional tests and determine, assess and interpret vital parameters in animals and plants.
4. Communicate orally and in writing.
5. Design experiments and interpret the results
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. Identify suitable techniques for detecting, quantifying and purifying biological molecules and for determining protein structure.
10. Isolate and culture cells and tissues from multicellular organisms.

11. Obtain, use, conserve and observe animal and plant specimens.
12. Work individually or in groups, in multidisciplinary teams and in an international context.

Content

The course is made up of five modules with the contents indicated below*:

Module 1. Cell Biology

Session 1: Introduction to the conventional optical microscope: the plant cell.

Session 2: Introduction to the conventional optical microscope: the animal cell.

Session 3: Introduction to the electronic microscope.

Session 4: Mitotic cell division: obtaining temporary preparations of meristematic weed root tissue.

Session 5: Meiotic cell division: the study of meiotic preparations for lobster testicle.

Module 2. Zoology

Session 1: Introduction to animal parasitism: Observation and recognition of Platyhelminths and Nematodes.

Session 2: Observation and recognition of Molluscs and Annelids

Session 3: Observation and recognition of Arthropods

Session 4: Observation and recognition of Chordates

Module 3. Animal Histology

Session 1: Initiation to the histological techniques for the processing of animal material. Microscopic identification of the epithelial, connective and adipose tissues.

Session 2: Elaboration and staining of blood smear of sheep. Microscopic identification of the blood and cartilage and bone tissues.

Session 3: Microscopic identification of the muscular and nervous tissues.

Module 4. Animal Physiology

Session 1: Effects of physical exercise on cardiovascular physiology in humans.

Session 2: Acquisition and study of the human electrocardiogram in various situations.

Session 3: Statistical analysis of the data obtained, interpretation of the results, and extraction of conclusions.

Module 5. Biochemistry

Session 1: Determination of the concentration of glucose by a colorimetric method and preparation of buffer dissolutions. The spectrum of absorption of a compound derived from glucose.

Session 2: Chromatography of gel filtration, and electrophoresis of PAGE-SDS

Session 3: Enzymatic acid phosphatase activity. Determination of initial velocities to calculate kinetic parameters.

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

Methodology

This course will be taught in small groups of students with a maximum of 24 students per laboratory session.

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 subject.

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 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 corresponding module. It is a requirement that the student read comprehensively the protocol of practices 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 tutorials will be carried out at the office of the teaching staff and/or using the TICs.

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			
Laboratory introduction	1	0.04	
Laboratory seasons of module 1. Cell biology	10	0.4	1, 10, 6, 5, 8, 11, 4, 12, 7
Laboratory seasons of module 2. Zoology	10	0.4	1, 2, 6, 5, 8, 11, 4, 12, 7
Laboratory seasons of module 3. Animal histology	10.5	0.42	1, 10, 6, 5, 8, 4, 12, 7

Laboratory seasons of module 4. Animal fisiology	10.5	0.42	1, 6, 5, 3, 8, 4, 12, 7
Laboratory seasons of module 5. Biochemistry	12	0.48	1, 6, 5, 8, 9, 4, 12, 7
Type: Supervised			
Tutorials	1	0.04	1, 2, 10, 6, 5, 3, 8, 9, 11, 4, 12, 7
Type: Autonomous			
Problem solving	3	0.12	1, 2, 10, 6, 5, 3, 8, 9, 11, 4, 12, 7
Study	8	0.32	2, 10, 3, 9, 11
Written work	4	0.16	1, 2, 10, 6, 5, 3, 8, 9, 11, 4, 7

Assessment

The evaluation of the course will be continued. The weight of the evaluation of each module is 20% of the final mark of the course and each of the practical modules must be passed with a score equal to or superior to 5.

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

Module 1. Cell Biology: At the end of each practice session the student will have to complete a questionnaire in order to assess if he/she has assimilated the specific objectives that have been worked on. The practical note of the Cell Biology module will be calculated as the average grade of the 5 practice questionnaires.

Module 2. Zoology: At the end of each practice the student will have to answer a questionnaire to evaluate that he/she has achieved the knowledge and the specific skills of each practice. The grade of this module will be calculated from the average mark of the questionnaires.

Module 3. Animal Histology: The evaluation system is organized in the following sections:

1) Assessment of the contents at the end of each practice (50% of the mark). This test consists of a questionnaire and the recognition of microscopic structures. The grade in this section is obtained from the average mark obtained in each practice.

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

In order to be able to gauge the notes obtained in each section, it will be essential that the student obtains a score equal to or greater than 4 points (out of 10) in each of them. Students who have obtained a final grade of less than 5 (out of 10) will have to take a recovery exam, which will consist of a microscopic diagnostic test and a questionnaire.

Module 4. Animal Physiology: The continuous draw up of the practices report will be evaluated, with their final delivery, which will include a part (60% of the mark) made in reduced groups (about 4 people) and an individual part / by pairs (40% of the mark), following the *ad hoc* guide that the professor will provide. The mark of the report may be modulated by the assessment of the student's attitude during the practical sessions.

Module 5. Biochemistry: The attitude of the student in the laboratory will be assessed, such as timeliness, carrying the Manual previously worked at home for the student, and his work in the laboratory. The student the day after the practical session will deliver a questionnaire that will be answered outside the laboratory. The evaluation of the attitude will represent 25% of the mark, and the evaluation of its degree of use, through the questionnaire presented, will represent the other 75% of the note in this module.

*Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

General Issues:

Since attendance to the activities programmed in this course is mandatory, the absence of any of the sessions must be justified and may not exceed 20%. In order to be able to pass the subject, it is required global attendance of at least 80% of the programmed sessions 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 mark 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.

Students who do not pass the evaluation of one or more modules of the course can retake them at the scheduled date at the end of the semester. The reassessment of modules 1 (Cell Biology), 2 (Zoology), 4 (Animal Physiology), and 5 (Biochemistry) will consist of a written exam where the concepts worked in the practical sessions will be evaluated. The reassessment of module 3 (Animal Histology) will consist of a microscopic diagnostic test.

Students who 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 mark of the different modules is greater than 5. In this case, the final maximum grade of the course 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 passed.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of Module 1	20%	1	0.04	1, 10, 4
Evaluation of Module 2	20%	1	0.04	1, 2, 6, 11, 4, 7
Evaluation of Module 3	20%	1	0.04	1, 6, 3, 8, 4
Evaluation of Module 4	20%	1	0.04	1, 6, 5, 3, 8, 4
Evaluation of Module 5	20%	1	0.04	1, 6, 5, 8, 9, 4, 12

Bibliography

Recommended books

Modules 1 i 3.

Boya, J.: Atlas de Histología y Organografía microscópica (ed. Panamericana).

Eroschenko, V.P.: Di Fiore's atlas of Histology (ed. Lea and Febiger).

Gartner, L.P. y Hiatt, J.L.: Atlas color de Histología (ed. Panamericana).

Kühnel, W.: Atlas color de Citología e Histología (ed. Panamericana).

Stanley, L.E. y Magney, J.E.: Coloratlas Histología (ed. Mosby).

Young, B. y Heath, J.W.: Histología funcional (Wheater) (ed. Churchill Livingstone).

Module 2.

Barrientos, J.A. Curso Práctico de Entomología. Ed. Universitat Autònoma de Barcelona (2004).

Chinery, M. Guía de los insectos Europa. 4a ed. Ed. Omega (2006).

De Iuliis, G., Pulerà, D. The dissection of Vertebrates. 3rd ed. Ed. Academic Press (2019).

Hickman, C.P., et al. Integrated Principles of Zoology. 17th ed. Ed. McGraw-Hill Education (2009).

Munilla-León, T. Prácticas de zoología general. Vol. 1, Invertebrados no artrópodos. Ed. Oios-Tau (1992).

Ruppert, E.E., Fox, R.S., Barnes, R.D. Invertebrate zoology: a functional evolutionary approach. 7th ed. Ed. Thomson-Brooks/Cole (2004).

Module 4.

López, J i Fernández A. Fisiología del ejercicio. 3a ed., Médica Panamericana (2006).

Fox, SI. Fisiología humana. 10a ed., McGraw-Hill/Interamericana de España (2008).

Guyton, AC i Hall, JE. Tratado de fisiología médica. 11a ed., McGraw-Hill Interamericana (2006).

Silbernagl, S i Despoupoulos, A. Fisiología: texto y atlas. 7a ed., Editorial Médica Panamericana (2009).

Tortora, GJ i Derrickson, B. Principios de anatomía y fisiología. 11a ed., Médica Panamericana (2006).

Module 5.

McKee, T i McKee, JR. "Bioquímica. La base molecular de la vida" (2009). 4ª edición. McGraw-Hill-Interamericana.

Murray, RK i col. "Harper. Bioquímica ilustrada" (2013). 29ª edición. McGraw-Hill-Interamericana.

Nelson, DL and Cox, MM. "Lehninger-Principles of Biochemistry". (2013) 6ª ed. Freeman. Traducció: Nelson, DL and Cox, MM. "Lehninger-Principios de Bioquímica". (2009) 5ª. ed. Ed. Omega.

Tymoczko, JL, Berg, JM, Stryer, L. "Bioquímica. Curso básico". (2014). Reverté

Horton, HR, Moran, LA, Scrimgeour, KG, Perry MD, Rawn JD. "Principios de Bioquímica". 2008. 4ª ed. Prentice-Hall. Pearson Educación. México

Voet, D, Voet, JG. "Biochemistry" (2010), 4ta ed. Wiley

Software

Module 4. Animal Physiology: MS Office, BSL-Biopac Student Lab, vassarstats.net.

For the rest of the modules, there is no specific software associated.