

**Laboratory I**

Code: 100980  
ECTS Credits: 3

**2024/2025**

Degree	Type	Year
2500502 Microbiology	OB	1

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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 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.

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

- 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.
- 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).
- 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.
- Analyze statistically the physiological data obtained and write a report.
- 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.

## 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 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 and respiratory physiology.

Session 2: Acquisition and study of the 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.

### Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory introduction	1	0.04	KM26
Laboratory seasons of module 1. Cell biology	10	0.4	CM18, KM25, KM26, SM25
Laboratory seasons of module 2. Zoology	10	0.4	CM18, KM25, KM26, SM25
Laboratory seasons of module 3. Animal histology	10.5	0.42	CM18, KM25, KM26, SM25
Laboratory seasons of module 4. Animal fisiology	10.5	0.42	CM18, KM25, KM26, SM25

Laboratory seasons of module 5. Biochemistry	12	0.48	CM18, KM25, KM26, SM25
Type: Supervised			
Tutorials	1	0.04	CM18, KM25
Type: Autonomous			
Problem solving	3	0.12	CM18, KM25, SM25
Study	8	0.32	CM18, KM25, SM25
Written work	4	0.16	CM18, KM25, SM25

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 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 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.

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 Module 1	20%	1	0.04	CM18, KM25, KM26, SM25
Evaluation of Module 2	20%	1	0.04	CM18, KM25, KM26, SM25
Evaluation of Module 3	20%	1	0.04	CM18, KM25, KM26, SM25

Evaluation of Module 4	20%	1	0.04	CM18, KM25, KM26, SM25
Evaluation of Module 5	20%	1	0.04	CM18, KM25, KM26, SM25

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, starting the day after the practical session, will submit a questionnaire-like report to the Virtual Campus that will have been answered outside the laboratory. The teaching team of the practice will indicate the delivery deadline. 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.

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 mark of the course.

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. The delivery of reports cannot be retake and the non-delivery on the indicated date implies a zero in this activity.

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.

Single assessment:

The students who choose the single assessment must do the laboratory practices in face-to-face sessions since they are mandatory teaching activities. This single assessment system will be applied to modules 1 (Cellular Biology), 2 (Zoology) and 3 (Animal Histology), and will consist 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 60% of the final grade for the subject. This single assessment test will be done coinciding with the same date set in the calendar for the last assessment activity. The same criteria will be applied to pass the subject and the same retake system as for the continuous assessment. The review of the final grade follows the same procedure as for the continuous assessment. Modules 4 (Animal Physiology) and 5 (Biochemistry) do not include the single assessment system.

## **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.

Barrett KE, Barman SM, Brooks HL, Yuan JX-J. Ganong. Fisiología Médica. McGraw-Hill Interamericana de España SL, 26a ed, 2020.

Fox SI. Fisiología Humana. McGraw-Hill Educación, 14a ed, 2017.

Hall JE, Hall ME. Guyton y Hall. Tratado de Fisiología Médica. Elsevier, 14a ed, 2021.

Koeppen BM, Stanton BA. Berne & Levy Physiology. Elsevier, 7a ed, 2017.

López, J, Fernández A. Fisiología del ejercicio. Editorial Médica Panamericana, 3a ed, 2006.

Pocock G, Richards CD, Richards DA. Human Physiology. Oxford University Press, 5a ed, 2017.

Silbernagl S, Despopoulos A. Fisiología. Texto y Atlas. Editorial Médica Panamericana, 7a ed, 2009.

Tortora GJ, Derrickson BH. Principles of Anatomy and Physiology. Médica Panamericana, 15a ed, 2021.

Tresguerres J.A.F. Fisiología Humana. McGraw-Hill Interamericana de España SL, 4a ed, 2010.

Widmaier EP, Raff H, Strang KT. Vander's Human Physiology. The Mechanisms of Body Function. McGraw-Hill Education, 15a ed, 2018.

#### 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. Traducción: 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.

### Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	711	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	711	Catalan/Spanish	first semester	morning-mixed

(PLAB) Practical laboratories	712	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	713	Catalan/Spanish	first semester	morning-mixed

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