Microbiology

Code: 101025
ECTS Credits: 6

2025/2026

Degree	Type	Year
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

Although there are no official prerequisites, students are advised to review concepts that refer to the microbial world, previously studied.

Likewise, it is convenient to have a good knowledge of the subjects studied during the first semester of the Microbiology degree, as well as the rest of the subjects that are studied simultaneously during the second semester.

Objectives and Contextualisation

This is a mandatory core course in the Microbiology degree, which introduces students to the microbial world, providing a general overview of microorganisms, in connection with other living beings and the different environments in which they live.

Given its introductory nature, this course provides the most basic concepts and competencies related to Microbiology, so that students can delve deeper into subsequent courses in the rest of the subjects that form the core of the Microbiology degree.

Course objectives:

- Recognize, in broad terms, microbial diversity and distinguish the characteristics that define different microbial groups.
- Identify the different structures, as well as the composition of the prokaryotic cell.

- Describe the metabolic versatility of different microbial groups, particularly that of prokaryotes.
- Analyze the genomic variability of microorganisms and the main mechanisms of genetic information exchange in prokaryotes.
- Distinguish the main relationships of microorganisms with living beings and the physical environment they inhabit.
- Recognize the role of microorganisms in the development of human societies, as well as their future applications.
- Calculate basic microbiological parameters.
- Apply basic laboratory techniques to work experimentally with microorganisms.

Learning Outcomes

1. CM09 (Competence) Critically review the scientific contributions of women to the study of microorganisms and other sciences related to microbiology.
2. CM10 (Competence) Integrate knowledge and skills from the field of microbiology, working individually and in groups to prepare and present in writing or orally and publicly a scientific work either in English or in one's own language.
3. KM14 (Knowledge) Indicate the structural characteristics of microorganisms, paying special attention to the differences between acellular entities, prokaryotic organisms and single-cell eukaryotes.
4. KM15 (Knowledge) Describe the metabolic and functional diversity of the microbial world, distinguishing the characteristics that define the different taxonomic groups.
5. KM16 (Knowledge) Identify the main relationships established by microorganisms with each other, with other living beings, with their environment and in general with the ecosystem, and the methods for studying these interactions.
6. SM12 (Skill) Apply basic microbiological techniques in the laboratory, including the manipulation of materials and samples under aseptic conditions.
7. SM13 (Skill) Relate the basic genetic components, structures and processes of replicative microorganisms and entities with their functions and the different ecophysiological mechanisms of adaptation to their environment.
8. SM14 (Skill) Discover the role of microorganisms as causative agents of diseases in humans, animals and plants and the processes used to control them.

Content

THEORETICAL CONTENT

Unit 1. The microbial world. History and human societies and microorganisms. Discovering microorganisms. Levels of organization. Main differences between viruses and cellular organisms. Prokaryotic and eukaryotic organization. Groups and names of microorganisms.

Unit 2. Morphology, structure and chemical composition of viruses. Concept of virus. Morphology of viral particles: icosahedral, helical and complex symmetries. Structure of the viral envelope. The viral genome. Enzymes.

Unit 3. Virus-host cell relationships. Viral cycle: one-step growth. Adsorption and penetration. Genome replication. Assembly and release of the virions. Possible effects of viral multiplication on the host.

Unit 4. Diversity of viruses. Criteria for Classification of Viruses (ICVT). Nomenclature. Classification of Baltimore. Prokaryotic and eukaryotic viruses. Other subcellular infectious agents.

Unit 5. The prokaryotic cell. Size and morphology. Cytoplasm and cytoskeleton. Nuclear region. Organelles, microcompartments and inclusions

Unit 6. Cellular envelopes. Prokaryotic cytoplasmic membrane. Bacterial cell wall. S. layers. Capsules and mucous layers. Cell wall of archaea.

Unit 7. Appendixs and mobility. Forms of differentiation. Prokaryotic fimbriae and flagella. Mobility by fimbriae and flagella. Chemotaxis. Endospores, filaments and mycelium. Spores and cysts. Fruitful bodies

Unit 8. The genome of prokaryotes. Size, topology and number of chromosomes. Genomic reduction. Mobile genetic elements: plasmids, transposons, prophages, elements integrative and conjugative, chromosomal islands. Integrons: Capture of genes

Unit 9. Genetic variability in prokaryotes. Mutagenesis and vertical gene transfer. Horizontal gene transfer mechanisms.

Unit 10. Concept of species, pangenome and metagenome. Reflection on the concept of species. Exceptions. Pangenome. Concepts of metagenomics, microbiota and microbiome.

Unit 11. The cell cycle of prokaryotes. Binary division. Cell division and control. Diversity of the prokaryotic cell cycle.

Unit 12. Microbial growth and continue culture of microorganisms. Population growth. Basic concepts of continue culture. Environmental factors affecting microbial growth.

Unit 13. Control of microbial growth by physical, mechanical and chemical agents. Kinetics of death. Mechanical procedures, Physical agents. Antimicrobial agents. Differences between antiseptics, disinfectants and chemotherapeutic agents. Examples. Antimicrobial resistance.

Unit 14. Metabolism: global scheme. Sources of energy, carbon and reducing power. Metabolic classes. Processes to obtain energy. Biosynthetic strategy. Nitrogen fixation.

Unit 15. Phototrophy. Anoxigenic and oxygenic photosynthesis. Pigments and organization of thephototrophic apparatus. Cyclic photophosphorylation. External donors of electrons. Inverse flow of electrons.

Unit 16. Chemolitotrophy and Chemoorganotrophy. Inverse flow of electrons. Examples of chemolithotrophs. Organic substrats as energy donors.

Unit 17. Respiration. Respiratory chains. Aerobic respiration. Inorganic and organic compounds as final acceptors of electrons. Respiration of both facultative and obligate anaerobic prokaryotes.

Unit 18. Fermentation. General characteristics of a fermentation process. Classification of fermentations. Examples.

Unit 19. Diversity of prokaryotes. The origin of life and biological diversification. Microbial systematics: taxonomy and phylogeny. Taxonomic ranges. Phylogenetic trees. Bibliograpic references of prokaryotic systematics.

Unit 20. The archaea. Differential characteristics. *Phylum Euryarchaeota*: methanogens, extreme halophiles and hyperthermophiles. *Phylum Crenarchaeota*: hyperthermophiles and others.

Unit 21. Gram negative bacteria I. *Phylum Proteobacteria*. Differential features and examples.

Unit 22. Gram negative bacteria II. Other *phyla* of Gram negative bacteria. Differential features and examples.

Unit 23. Gram-positive bacteria and mycoplasmas. *Firmicutes*, *Tenericutes* and *Actinobacteria*.

Unit 24. Microorganisms in their environment. Concept of microenvironment. Aerial, terrestrial and aquatic environments. Trophic relationships in microorganisms.

Unit 25. Biogeochemical cycles. Microorganisms as agents of geochemical change. Example: The nitrogen cycle.

METHODOLOGY, PROBLEMS AND CURRENT TOPICS CONTENT

Session 1. Microscopic technique.

Session 2. Planting and isolation technique.

Session 3. Microscopic observations.

Sessions 4 and 5. Problems on basic Microbiology.

Session 6 and 7. Problems on microbial growth and control.

Session 8. Current topics in Microbiology

LABORATORY PRACTICES CONTENT

Practice 1. Preparation of culture media, reagents and material for Microbiology.

Practice 2. Aseptic technique and methods of culture.

Practice 3. Methods for determining microbial concentration.

Practice 4. Isolation of microorganisms.

Practice 5. Microscopic technique.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory practices	15	0.6	SM12, SM12
Lectures	30	1.2	CM09, KM14, KM15, KM16, SM13, SM14, CM09
Seminars and problems classes	8	0.32	CM09, CM10, KM14, KM15, KM16, SM13, CM09
Type: Supervised			
tutorials	4	0.16	CM09, CM10, KM14, KM15, KM16, SM13, SM14, CM09
Type: Autonomous			
Elaboración de una presentación sobre temas actuales en Microbiología	10	0.4	CM10, CM10
Individual reading	17	0.68	CM09, KM14, KM15, KM16, SM13, SM14, CM09
Individual study	50	2	CM09, KM14, KM15, KM16, SM13, SM14, CM09
Problems resolution	10	0.4	CM09, CM10, KM14, KM15, KM16, SM13, SM14, CM09

The Microbiology course consists of three modules, which have been designed in an integrated manner so that students are required to connect the content and activities of all three modules throughout the course in order to achieve the course competencies.

The three modules are:

Participatory theoretical classes: Students must acquire the scientific and technical knowledge specific to the subject by attending these classes and complementing them with personal study of the explained topics. At the beginning of the course, students will receive a schedule outlining the topics to be covered throughout the term, as well as the bibliography to consult for preparing each theoretical session and for personal study. Each topic will be delivered through a theoretical presentation. Some topics may be prepared either under guidance or independently by the students and discussed later during the theoretical classes by responding to specific questions. Additionally, students will be provided with a set of questions to encourage personal reflection and deeper understanding of the topics.

Classes on methodology, problem-solving, and current topics: These are small-group sessions with the following goals: a) to address methodological and current issues, b) to support the understanding of concepts explained in theoretical classes, c) to enable students to design basic microbiological experiments, and d) to bridge the gap between theoretical content and laboratory practice by integrating theory with practical skills. At the start of the course, students will be given a schedule of session content along with required readings. A dossier with problem sets will also be provided for students to work through during the term. Sessions will take place in the classroom, where methodological aspects, problem-solving, and current microbiological topics will be discussed. Students will work in groups of 5 to 7, and each group will solve the assigned problems. If needed, each group will select a spokesperson to present the reasoning behind their problem-solving process.

Laboratory practical sessions: At the start of the course, students will receive a practical manual detailing the experiments to be performed during the course. The goals of these sessions are to: a) enhance understanding of theoretical content, b) apply experimental designs developed in problem-solving sessions, c) acquire manual skills, d) interpret results, and e) integrate theoretical and practical knowledge.
Attendance at practical sessions is mandatory in order to acquire the corresponding competencies. To attend, students must have passed the biosafety and safety tests available on Moodle and must be familiar with and accept the rules of the Faculty of Biosciences laboratories. Additionally, students must comply with the microbiology laboratory work regulations outlined in the Manual. To achieve good performance, students must thoroughly read the assigned experiments before carrying them out.

Supervised activities in the course may include group or individual tutorials to support the learning process. Individual tutorials will usually take place in the instructors' offices.

Autonomous activities for this course include: studying, reading academic texts, solving problems, and preparing materials for seminar sessions on current microbiology topics.

Additional information: To properly follow the course, students will have access to all the aforementioned documentation through the course's Moodle space.

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
Assessment of laboratory practices	20%	1	0.04	CM09, KM14, KM15, KM16,

				SM12, SM13, SM14
Evaluation of the methodology sessions, problems and current topics	20%	1	0.04	CM09, CM10, KM14, KM15, KM16, SM13, SM14
Theory assessment I	24%	2	0.08	CM09, KM14, KM15, KM16, SM13, SM14
Theory Assessment II	36%	2	0.08	CM09, KM14, KM15, KM16, SM13, SM14

The course assessment will be individual, either continuous or single, through the following components:

Continuous Assessment

1. Theoretical Classes Module (60% of the final grade):
Two written exams will be scheduled throughout the course to assess this module. These are cumulative, meaning the second exam will include all theoretical content from the course. The first exam will account for 24% and the second for 36% of the total grade. To pass this module, the weighted average of the two exams must be 5 or higher (out of 10).

If the student obtains a higher grade in the second exam than in the first, the final grade for the module will be that of the second exam.

Each exam will include one or two short-answer questions (worth up to 2 points out of 10) and a maximum of 60 multiple-choice and/or true/false questions (worth up to 9 points out of 10).

If the module is not passed, it may be retaken on the scheduled date at the end of the semester. In this case, the maximum possible grade will be 8 out of 10.

2. Methodology and Problem-Solving Classes Module (20% of the final grade):
This component will consist of:

a) Problem-solving in class (1.5 out of 10).
b) Presentation of current topics in microbiology (1.5 out of 10).
c) A written test with up to 20 multiple-choice questions on methodological aspects and the solution of up to six problems (7 out of 10). This will be held onthe same day as the first theoretical module exam.

To pass this module, a minimum grade of 5 on the written test is required. If not passed, the test may be retaken at the end of the semester, with a maximum possible grade of 8 out of 10.

3. Laboratory Practical Module (20% of the final grade):
Assessment will be based on:

a) Practical skills, assessed through the submission of results during each lab session.
b) A written test with up to 20 multiple-choice questions on lab activities.

These components will be weighted 4 and 6 out of 10, respectively. To pass, the student must score at least 5 on the written test. If not passed, it can be retaken with a maximum score of 5, to which the practical skills grade will be added to calculate the final mark.

General Information:

To pass the course, students must obtain a final grade of 5 or higher in each module.

Students who pass the course and wish to improve their grade may take a global exam, scheduled on the same day as the resit exam. This exam will cover all three modules. Taking the global exam means waiving

the previous grade, which must be communicated in writing to the course coordinator at least 72 hours before the resit date.

To take part in the resit assessment, students must have been evaluated in components that account for at least two-thirds (67%) of the total grade of the course or module. Students will receive a "Not Assessable" grade if the evaluated components account for less than 67% of the final grade.

From the second enrollment onwards, students who have passed modules 2 and 3 in a previous year are not required to repeat them.

Use of Artificial Intelligence (AI) Technologies:

For this course, the use of AI is permitted only for support tasks such as literature or information searches, text corrections, translations, or others as determined by the instructor.
Students must clearly indicate which parts were generated using AI, specify the tools used, and include a critical reflection on how AI influenced the process and outcome. Lack of transparency regarding AI use will be considered academic dishonesty and may result in partial or total penalties, or more serious sanctions depending on severity.

Single Assessment

The single assessment consists of one comprehensive exam covering the entire syllabus. It includes three parts:

1. Theoretical Module Assessment:
   A synthesis exam with short-answer and multiple-choice/true-false questions to assess whether key conceptual objectives have been met. This will count for 60% of the final grade.

2. Methodology and Problem-Solving Module:
   A written exam with questions on methodological aspects and problem-solving. This will count for 20% of the final grade.

3. Practical Module:
   Assessment will include a written test on the practical sessions (12%) and the student's practical skills (8%), evaluated through submission of lab results during sessions. Attendance at all lab sessions is mandatory.

All written exams will be held on the same day, coinciding with the date and time of the second continuous assessment exam.

To pass the course, each part must be passed individually with a grade of at least 5 out of 10.

If the course is not passed, students may take a resit exam with the same format, in which they must pass any previously failed sections with a minimum of 5.

Bibliography

Books

Madigan, M.T., J.M. Martinko, K.S. Bender, D.H. Buckely, D.A. Stahl. 2015. Brock Biología de los Microorganismos. 14ª ed. Pearson Educación, S.A. ISBN:9788490352793. Recurso electrónico.

Madigan, M.T., K.S. Bender, D.H. Buckely, W.M. Sattley, D.A. Stahl. 2022. Brock Biology of microorganisms. 16ª ed. Pearson, S.A. ISBN-13: 978-1292404790.

Martín A., V. Béjar, J.C.Gutierrez, M. Llagostera y E. Quesada. 2019. Microbiología Esencial. 1ª edición. Editorial Médica Panamericana. ISBN: 9788498357868. Recurso electrónico.

Willey J., K.M. Sandman, D.H Wood. 2020. Prescott's Microbiology, 11th ed. McGraw-Hill Education. ISBN-13: 978-1260211887.

Library website: https://www.uab.cat/biblioteques/?suite=def

Blogs

MicroBio (http://microbioun.blogspot.com/)

Microbichitos (http://blogs.elpais.com/microbichitos/)

Esos pequeños bichitos (http://weblogs.madrimasd.org/microbiologia/)

Small Things Considered (http://schaechter.asmblog.org/schaechter/)

Curiosidades de la Microbiología (http://curiosidadesdelamicrobiologia.blogspot.com/)

El Rincón de Pasteur de Investigación y Ciencia(https://www.investigacionyciencia.es/blogs/medicina-y-biologia/43/posts)

Software

Specific programmes are not needed

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	711	Spanish	second semester	morning-mixed
(PAUL) Classroom practices	712	Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	711	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	712	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	713	Catalan	second semester	morning-mixed
(TE) Theory	71	Catalan	second semester	morning-mixed