

Degree programme	Type	Course
Biology	OB	2

Contact lecturer

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Teaching staff

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Group languages

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

Prerequisites

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

Objectives

This is a compulsory subject of the degree of Biology, which introduces students to the microbial world, giving a general vision of microorganisms, in connection with other living beings and the different environments in which microorganisms live.

This subject, given its introductory approach, gives the most basic concepts and competences related to Microbiology, so that students can go into the following courses in the rest of subjects that are part of the subject called Microbiology.

Objectives of the subject:

To broadly recognize the microbial diversity and to know how to distinguish the characteristics that define the different microbial groups.

Identify the different structures, as well as the composition of the prokaryotic cell.

Understand the metabolic versatility of the prokaryotes.

To know the main mechanisms for the exchange of genetic information between prokaryotes.

Describe the microbial growth and the physical and chemical processes that are used for its control.
Understand and know how to apply basic laboratory techniques to work experimentally with microorganisms.
Understanding how microorganisms are related to humans.

Learning outcomes

- CM22 (Integrate the potential of the different microbial groups in different areas of biology to provide innovative responses to the needs and demands of society.) Integrate the potential of the different microbial groups in different areas of biology to provide innovative responses to the needs and demands of society.
- CM24 (Evaluate as a team and collaboratively solve problems and case studies in the field of microbiology, developing interpersonal and collaborative work skills inherent to the professional environment.) Evaluate as a team and collaboratively solve problems and case studies in the field of microbiology, developing interpersonal and collaborative work skills inherent to the professional environment.
- KM38 (Describe the diversity of the microbial world, including the structure, classification and evolution of prokaryotes and viruses.) Describe the diversity of the microbial world, including the structure, classification and evolution of prokaryotes and viruses.
- KM39 (Describe the genetic bases of microorganisms, both prokaryotes and viruses, and their gene transfer mechanisms.) Describe the genetic bases of microorganisms, both prokaryotes and viruses, and their gene transfer mechanisms.
- KM40 (Identify micro-organisms in pure cultures and in complex samples using current methodologies for the classification of micro-organisms.) Identify micro-organisms in pure cultures and in complex samples using current methodologies for the classification of micro-organisms.
- SM36 (Apply conventional microbiological techniques that allow the differentiation of the different microbial groups in different areas and diagnose infections caused by micro-organisms.) Apply conventional microbiological techniques that allow the differentiation of the different microbial groups in different areas and diagnose infections caused by micro-organisms.
- SM37 (Summarise, for the different microbial groups, their role in the environment and in element cycles, their environmental implications, in symbiotic and industrial processes, and their role as causative agents of disease or toxicological problems.) Summarise, for the different microbial groups, their role in the environment and in element cycles, their environmental implications, in symbiotic and industrial processes, and their role as causative agents of disease or toxicological problems.

Contents

THEORETICAL CLASS CONTENT

Topic 1. The world of microorganisms: History of Microbiology. Main differences between viruses and cellular organisms. Prokaryotic and eukaryotic organization. Groups and classification of microorganisms. Concept of species in prokaryotes, pangenome, and metagenome. Morphology, structure, and composition of viruses. Concept of virus.

Topic 2. The prokaryotic cell: Size and morphology. Cytoplasm. Nucleoid region. Cytoplasmic membrane.

Topic 3. Prokaryotic cell envelopes and motility: Structure and function of the cell wall. Capsules and slime layers. Main mechanisms of motility.

Topic 4. Intracellular inclusions and differentiation forms: Functional and storage inclusions. Endospores. Filaments and mycelia. Spores and cysts. Fruiting bodies.

Topic 5. Microscopy techniques: Optical and electron microscopy applied to microorganisms. Observation of microorganisms in vivo. Fixation and staining. Simple, differential, and specific stains.

Topic 6. The prokaryotic cell cycle: Binary fission. Generation time. Exponential growth. Batch culture. Continuous culture. Influence of environmental factors on cell growth.

Topic 7. Microorganism cultivation, identification methods, and preservation systems: Culture media for

isolating bacteria, viruses, and fungi. Nutritional requirements of microorganisms. Composition of culture media. Microorganism identification methods. Preservation systems.

Topic 8. Microbial growth control: Physical, mechanical, and chemical control of growth. Antimicrobial agents. Differences between antiseptics, disinfectants, and chemotherapeutic agents. Antimicrobial resistance.

Topic 9. General metabolic overview: Metabolic diversity. Sources of energy, carbon, and reducing power. Biosynthetic strategies. Energy-generating processes. Types of microorganisms based on nutrition. Lithotrophy, organotrophy, and phototrophy. Autotrophy and heterotrophy.

Topic 10. Fermentation: General characteristics of fermentation processes. End products and classification of fermentations. Fermentations without substrate-level phosphorylation. Syntrophy.

Topic 11. Respiration: Respiratory chains. Aerobic respiration. Respiration of inorganic and organic compounds by facultative organisms. Anaerobic respiration.

Topic 12. Photosynthesis: Photosynthetic pigments and organization of the photosynthetic apparatus. Photophosphorylation. Differences between oxygenic and anoxygenic photosynthesis.

Topic 13. The prokaryotic genome: Genome structure, genes, and operons. Size, topology, and number of chromosomes. Replication, transcription, and translation. Extrachromosomal genetic material. Plasmids and mobile elements. Genome study methods.

Topic 14. Mutagenesis and genome integrity maintenance: Spontaneous and induced mutations. Ames test. Mutant selection and phenotypic expression. Mechanisms for maintaining genome integrity.

Topic 15. Genetic transfer mechanisms: Conjugation, transformation, and transduction.

Topic 16. Microorganisms in their environment: Concept of microenvironment. Surface colonization and biofilm formation. Main characteristics of aerial, terrestrial, and aquatic environments. Trophic relationships among microorganisms. Microorganisms as agents of geochemical change. Key microorganisms involved in biogeochemical cycles.

Topic 17. Microbial diseases: Human diseases caused by microorganisms. Pathogens vs. parasites and their relationship with the host. Microbial pathogenicity mechanisms and virulence factors. Host defense mechanisms. Major human infectious diseases, epidemiology, and control.

Topic 18. Biotechnology: Basic principles of biotechnology. Products of genetic engineering. Expression of cloned genes. Protein production in bacteria and yeasts. Vaccine development through genetic engineering. Microbial biopolymers. Gene therapy in humans. Transgenic organisms.

Topic 19. Industrial microorganisms and their products: Microbiology for the healthcare industry. Primary and secondary metabolites. Production of vitamins, amino acids, and antibiotics. Microbial biotransformations. Microbial enzymes as industrial products.

Topic 20. Food industry microbiology: Microorganism growth in food. Food spoilage. Spoilage control. Foodborne diseases. Detection of foodborne pathogens.

SEMINAR CONTENT

Preparation and presentation by students of current topics in the field of microbiology.

LABORATORY PRACTICAL CONTENT

Practical 1. Methods for determining microbial concentration:

Microorganism counting: viable count and direct or total count (Breed method). Design of dilution banks and

plate inoculation.

Practical 2. Observation of microorganisms:

Observation of microorganisms in vivo using bright-field microscopy. Motility: hanging drop technique. Staining techniques for prokaryotes: simple and differential stains.

Practical 3. Isolation and identification of microorganisms:

Methods for isolating microorganisms. Selective and differential culture media. Streak plating. Biochemical tests for characterizing and identifying microorganisms.

Practical 4. Clinical microbiology. Antibigram:

Microorganism sensitivity to antibiotics. Disk diffusion technique.

Practical 5. Ubiquity:

Observation of microorganism presence in various environments.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Individual tutorials	4	0.16	CM22, CM24, KM38, SM37
Theoretical classes	30	1.2	CM22, CM24, KM38, KM39, KM40, SM36, SM37
Preparation of seminars	12	0.48	CM22, CM24, KM38, KM39, SM37
Seminars	7	0.28	CM22, CM24, KM38, KM39, SM37
Study	67	2.68	CM22, KM38, KM39, KM40, SM36, SM37
Practical classes	12	0.48	CM24, KM40, SM36
self-learning	10	0.4	CM22, KM38, KM39, KM40, SM37

Theoretical classes The student must acquire the scientific-technical knowledge of this subject attending these classes and complementing them with the personal study of the topics explained. The teaching of each subject will be based on a theoretical exposition and in a brief discussion of the same.

Seminars. In the seminars, students will develop topical issues in the world of microbiology in working groups. They will give a written summary and an oral presentation. Attendance at the seminars is mandatory.

Practical classes of laboratory. The objectives of these activities are: a) facilitate the understanding of the knowledge exposed in the theoretical classes, b) acquire manual dexterity, c) know how to interpret results and d) acquire the ability to work with microorganisms.

Attendance at the practical classes is mandatory in order to be able to acquire the competences of the subject. To be able to attend it, it is necessary for the student to justify having passed the security tests that will be found in the Virtual Campus. In addition, the student must comply with the regulations of work in a microbiology laboratory that he/she will find indicated in the Manual. In order to achieve a good performance and acquire the competencies corresponding to this activity, it is essential that the student make a comprehensive reading of the proposed practices before their completion.

Tutorials. The students will be able to conduct individual tutorials with the teachers of the subject whenever they want to request an appointment.

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	Weight	Hours	ECTS	Learning outcomes
Assessment of theoretical contents	30%	3	0.12	CM22, KM38, KM39, KM40, SM37
Assessment of theoretical contents	30%	3	0.12	CM22, KM38, KM39, KM40, SM37
Evaluation of practical contents	20%	1	0.04	KM40, SM36
Evaluation of seminars	20%	1	0.04	CM22, CM24, KM38, KM39, SM37

Scheduled Assessment Activities

1) Theoretical Classes

The evaluation of the theoretical content of the course, corresponding to the knowledge acquired in lectures, will be carried out through two written exams. Each of these exams must be passed with a grade equal to or higher than 5. To pass this part of the course, both written exams must be passed with a grade equal to or higher than 5. Each exam accounts for 30% of the final grade.

2) Practical Classes

Attendance at all laboratory sessions is mandatory. The evaluation of the practical classes will be based on a written exam. To pass this part of the course, students must obtain a minimum grade of 5 on the written exam and must have attended all practical sessions, having correctly completed the scheduled experiments in each.

3) Seminars

Attendance at all seminar sessions is mandatory. Students will be assessed on the oral presentation of a current topic in the field of microbiology, its discussion, and the submission of a summary of the topic presented. To pass this part of the course, a minimum grade of 5 must be obtained.

Each part must be passed in order to pass the course. The weight of each part in the final grade is as follows: 60% for the theoretical part, 20% for the practicals, and 20% for the seminars.

Resit Exams

Theoretical Part Resit Exam

Students who do not achieve a minimum grade of 5 in the theoretical exams may take a resit exam for the exam they did not pass. The maximum grade that can be obtained in this resit exam is 5.

Practical Part Resit Exam

Students who do not achieve a minimum grade of 5 in the practical part may take a resit exam covering the entire practical component. The maximum grade that can be obtained in this resit exam is 5.

Seminar Part Resit Exam

Students who do not achieve a minimum grade of 5 in the seminar component may take a resit exam covering

the entire seminar content. The maximum grade that can be obtained in this resit exam is 5.

To be eligible for resit exams, students must have been previously assessed in a set of activities that account for at least two-thirds of the total course grade. Therefore, students will receive a grade of \"Not Assessable\" if the completed assessment activities account for less than 67% of the final grade.

Single Assessment

Students opting for the single assessment must attend and pass the laboratory practicals (PLAB) and seminars in person. Attendance is mandatory. The evaluation criteria and weight of these components will be the same as in the continuous assessment model.

The single assessment consists of a single exam covering the entire theoretical syllabus. The grade obtained in this exam will account for 60% of the final grade. To pass this exam, a minimum grade of 5 must be obtained. The single assessment exam will be held on the same date scheduled for the final continuous assessment exam, and the same resit policy will apply.

Use of Artificial Intelligence

For this subject, the use of Artificial Intelligence (AI) technologies is permitted exclusively in support tasks, such as bibliographic or information searches, text correction or translations, or others at the discretion of the teaching staff. The student must clearly identify which parts have been generated with this technology, specify the tools used and include a critical reflection on how these have influenced the process and the final result of the activity. The lack of transparency in the use of AI in evaluable activities and seminars will be considered a lack of academic honesty and may lead to a partial or total penalty in the grade of the activity, or greater sanctions in serious cases.

Any irregularity committed during an assessment activity (academic misconduct, plagiarism, or improper use of AI, unless such use is expressly authorized in the course syllabus) that may lead to a significant alteration of the grade will result in that activity being graded as 0.

If the course syllabus stipulates that obtaining a minimum mark in this assessment is an essential requirement to pass the course, or if multiple irregularities occur in the assessment activities of the same course, the final grade for the course will be 0.

Furthermore, disciplinary proceedings may be initiated against any student who incurs any of these irregularities.

Bibliography

RECOMMENDED BIBLIOGRAPHY

- Martín González, Ana, et al. Microbiología esencial / coordinadores: Ana Martín González, Victoria Béjar, Juan Carlos Gutiérrez, Montserrat Llagostera, Emilia Quesada. Editorial Médica Panamericana, 2019

- Madigan, Michael T., et al. Brock Biology of Microorganisms Michael T. Madigan, Kelly S. Bender, Daniel H. Buckley, W. Matthew Sattley, David A. Stahl. 16th ed., Pearson, 2022.

- Willey, Joanne M., et al. Prescott's Microbiology / Joanne M. Willey, Hofstra University, Kathleen M. Sandman, Dorothy H. Wood, Durham Technical Community College. Eleventh edition, McGraw-Hill Education, 2020.

At this link, you can find an infographic prepared by the Library Service to help locate electronic books:
<https://ddd.uab.cat/record/224929>

OTHER EXCELENT BOOKS

- Tortora, Gerard J., et al. Microbiology : an Introduction / Gerard J. Tortora, Berdell R. Funke, Christine L. Case. 12th ed., global ed., Pearson, 2016.
- De Kruif, Paul, et al. Cazadores de microbios : los principales descubrimientos del mundo microscópico / Paul de Kruif ; introducción de Dr. Francisco González-Crussi ; traducción de Emilio Ayllón Rull. Capitán Swing Libros, 2021.
- Prats, Guillem, et al. Microbiología y parasitología médicas / director: Guillem Prats ; coordinador general: Tomàs Pumarola ; coordinadora científico-técnica: Beatriz Mirelis. 2.a edición, Editorial Médica Panamericana, 2023.
- Murray, Patrick R., et al. Medical Microbiology / Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller. Ninth edition, Elsevier, 2021.

OTHER:

<https://asm.org/podcasts/twim>

Blog *Small things considered*: <https://schaechter.asmblog.org/schaechter/>

Software

No specific software is needed in this subject.

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	12	Catalan	second semester	afternoon
(PLAB) Practical laboratories	121	Catalan	second semester	morning-mixed
(SEM) Seminars	121	Catalan	second semester	afternoon
(PLABs) Suport a les pràctiques de laboratori	121	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	122	Catalan	second semester	morning-mixed
(SEM) Seminars	122	Catalan	second semester	afternoon
(PLABs) Suport a les pràctiques de laboratori	122	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	123	Catalan	second semester	morning-mixed
(PLABs) Suport a les pràctiques de	123	Catalan	second semester	morning-mixed

laboratori				
(PLAB) Practical laboratories	124	Catalan	second semester	morning-mixed
(PLABs) Suport a les pràctiques de laboratori	124	Catalan	second semester	morning-mixed