

Degree programme	Type	Course
Biomedical Sciences	OB	1

Contact lecturer

Name : Sandra Guallar Garrido

Email : sandra.guallar@uab.cat

Teaching staff

Esther Julian Gomez

Sandra Guallar Garrido

Group languages

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

Prerequisites

Although there are no official prerequisites, students are advised to review the 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 Biomedical Sciences degree, as well as of the other subjects that are simultaneously taught during the second semester.

Objectives

This is a compulsory subject of the Biomedical Sciences degree that introduce students to the microbial world, giving a general vision of microorganisms in connection with the rest of the living organisms, and the different environments in which microorganisms live.

This subject, given its introductory approach, providing the most basic concepts and competences related to Microbiology. Students can therefore deepen in the following courses the rest of subjects that are part of the nucleus of the Biomedical Sciences degree.

Objectives of the subject:

1. To broadly recognize the microbial diversity and to know how to distinguish the characteristics that define the different microbial groups.
2. Identify the different structures, as well as the composition of the prokaryotic cell.
3. To know the metabolic versatility of the different microbial groups, particularly that of prokaryotes.
4. To know the genomic variability of microorganisms and the main mechanisms for the exchange of genetic

information in prokaryotes.

5. Recognize the main relationships of microorganisms with living beings and the physical environment they inhabit.
6. To know the role of microorganisms in the development of human societies, as well as their current and future applications.
7. To know how to perform basic calculations to determine microbiological parameters.
8. To understand basic laboratory techniques to work experimentally with microorganisms.

Learning outcomes

- CM26 (Design methods, applications and experiments in the fields of immunology and microbiology to provide innovative responses to societal needs and demands.) Design methods, applications and experiments in the fields of immunology and microbiology to provide innovative responses to societal needs and demands.
- CM27 (Draw on knowledge and skills in the fields of clinical microbiology and immunology, working individually or in groups, to prepare and present a written or oral presentation of scientific work in these fields.) Draw on knowledge and skills in the fields of clinical microbiology and immunology, working individually or in groups, to prepare and present a written or oral presentation of scientific work in these fields.
- KM33 (Describe the theoretical foundations of immunological and microbiological techniques.) Describe the theoretical foundations of immunological and microbiological techniques.
- KM34 (Define the main mechanisms by which the immune system and microorganisms contribute to a pathology.) Define the main mechanisms by which the immune system and microorganisms contribute to a pathology.
- SM29 (Use digital resources for communication, searching for information and data processing in the field of immunology and microbiology.) Use digital resources for communication, searching for information and data processing in the field of immunology and microbiology.
- SM31 (Interpret the results of a scientific project by analysing the scientific literature and databases specialising in immunological, immunopathological or microbiological problems.) Interpret the results of a scientific project by analysing the scientific literature and databases specialising in immunological, immunopathological or microbiological problems.

Contents

INTRODUCTION

Topic 1. The world of microorganisms: The history of Microbiology: human societies and microorganisms. Discovering microorganisms. Levels of organization. Main differences between viruses and cellular organisms. Prokaryotic and eukaryotic organization. Groups and denomination of microorganisms.

STRUCTURE AND FUNCTION OF PROCARIOTES

Topic 2. The prokaryotic cell: Size and morphology. The cytoplasm. The nuclear region. Cytoplasmic membrane

Topic 3. Surrounded by the prokaryotic cell and mobility: Structure and function of the cell wall. Capsules and mucous layers. Main motility mechanisms.

Topic 4. Intracellular Inclusions and differentiation Forms: Functional and reservation inclusions. Endospores- Filaments and micelia. Spores and cysts.

GROWTH AND MICROBIAL CONTROL

Topic 5. The cell cycle of prokaryotes: Binary fission. Cell division and control.

Topic 6. Microbial growth and continuous cultivation of microorganisms: Cell growth and population growth. Influence of environmental factors on cell growth. Concepts of the continuous cultivation of microorganisms.

Topic 7. Control of microbial growth by chemical agents: antimicrobial agents. Differences between antiseptics, disinfectants and chemotherapeutic agents. Resistance to antimicrobials.

MICROBIAL PHYSIOLOGY

Topic 8. Global metabolic scheme: Energy sources, carbon and reducing power. Biosynthetic strategy. Processes for obtaining energy.

Topic 9. Types of microorganisms according to their nutrition: Organotrophic litotrophy and phototrophy. Autotrophy and heterotrophy. Respiration, fermentation and photosynthesis

BACTERIAL GENETICS

Topic 10. The genome of prokaryotes: Structure of the genome. Size and topology. Extrachromosomal genetic material.

Topic 11. Mechanisms of genetic transfer: Conjugation, transformation and transduction.

VIROLOGY

Topic 12. Concept of virus. Structure and morphology of viral particles. Classification and diversity.

APPLIED MICROBIOLOGY

Topic 13. Environmental, medical and industrial microbiology: Environmental microbiology: aerial, terrestrial and aquatic environments, main features. Host-microbe relationship. Industrial and food microbiology. Microbial biotechnology.

CONTENT PROBLEMS AND TECHNIQUES

Session 1. Microscopic technique

Optical and electronic microscopy applied to microorganisms. In vivo observation of microorganism. Fixing and staining. Simple, differential and specific stains.

Session 2. Microscopic observations

Analysis of microscopic images. Identification of morphologies and microbial structures.

Session 3. Culture and isolation techniques

Nutritional requirements of microorganisms. Composition of the culture media. Types of culture media. Isolation of microorganisms. Culturing methods. Methods for the identification of microorganisms.

Sessions 4 and 5. Problems about basic microbiology

Experimental design. Calculation of concentrations. Viable and total counting concept. Concept of viable but non-cultivable microorganisms.

Session 6 and 7. Problems on microbial growth and control

Experimental design. Population growth curve. Calculation of parameters. Survival curves for different treatments.

Session 8. Resolution and presentation of proposed problems

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Seminars preparation	11	0.44	
Individual supervision	1	0.04	
Theoretical classes	17	0.68	
Classroom practices	7	0.28	
Study	30	1.2	
Problems resolution	5	0.2	

The subject of Fundamentals of Microbiology and Virology consists on two modules which have been programmed in an integrated way. The student will have to relate throughout the course the content and programmed activities to achieve the competences indicated in section 5 of this guide.

The two modules are the following:

Participatory theoretical classes: The student must acquire the scientific and technical knowledge of this subject by attending these classes and complementing them with the personal study of the topics explained. At the beginning of the course, students will receive a detailed calendar of the topics that will be dealt with throughout the course, as well as the bibliography that they will have to consult to prepare each theoretical class, and for the personal study of the topics explained. The teaching of each subject will be based on a theoretical exposition and on a brief discussion of the same. In addition, for each topic, the student will have a series of questions that will allow him/her to reflect and work personally on the topics covered.

Classroom practices: These classes are sessions aiming to:

- A) work on methodological aspects,
- B) facilitate the understanding of the knowledge exposed in the theoretical classes,
- C) to train the student to design basic experiments on Microbiology and,
- D) make a bridge between the participatory theoretical classes and the practical work of the laboratory, with the aim of integrating the theoretical knowledge with the practical classes.

The student will receive proposals of problems that will have to be developed during the course both in class and individually. In addition, the bibliography that will be consulted and the relation of each session with the subjects treated in the participative theoretical classes will also be indicated.

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

Multiple-choice test (classroom practices)	12.5 %	1	0.04	CM26, CM27, KM33, KM34, SM29, SM31
Written and oral presentation	25%	1	0.04	CM26, CM27, KM33, KM34, SM29, SM31
Multiple choice test (theoretical concepts)	50%	1.5	0.06	CM26, KM33, KM34, SM31
Multiple choice test (proposed works)	12.5%	0.5	0.02	CM27, SM29, SM31

The evaluation of the subject will be individual and continued through the following tests:

Assessment module for theoretical classes (50% of the overall score).

A written multiple-choice test in which the student must demonstrate their degree of achievement of theoretical concepts. In order to approve this module, the student must get at least 5 in this test.

Evaluation module for classroom practices (50% of the overall score).

The evaluation of this activity will consist of the following tests:

- a) Written and oral presentation of a work related to a microorganism proposed by the teaching staff (25%)
- b) A written multiple-choice test corresponding to the practical problems done during the classroom practices and corresponding to the oral presented works (25%)

These tests will have a weight of 5 out of 10 points each one. To pass this module the student must obtain at least 5 in each of the tests.

The written and oral presentation will be carried out the last week of classes. All the written multiple-choice tests will be carried out the scheduled date for the evaluation of the subject.

To pass the subject, a grade of 5 or higher must be obtained in each module. Otherwise, the student must take the scheduled recovery exam at the end of the semester for the module not passed and achieve a grade of 5 or higher. The maximum grade that can be obtained on the recovery exam is 5.

To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as "No Avaluable" if the weight in of all conducted evaluation activities is less than 67% of the final score.

Single assessment

The students who choose the single assessment must do the written work in group and the oral presentation of the seminars in face-to-face sessions since they are mandatory teaching activities. The evaluation will be the same as for the continuous assessment.

The single assessment consists of a final exam that will contain questions on the whole theoretical content of the subject, questions about the oral presentations and questions about the problems, as it is in the continuous assessment. This final assessment will correspond to the 75% of the final score of the subject: 50% corresponding to the theoretical part and 25% corresponding to the seminars. This single assessment test will be held coinciding with the same date for the last continuous assessment test. The same criterion will be applied to pass the subject as for the continuous assessment. The same retake system as for the continuous assessment will be applied. The revision of the final qualification will follow the same procedure as for the continuous assessment.

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.

En aquest enllaç, es pot trobar una infografia que ha preparat el Servei de Biblioteques per facilitar la localització de llibres electrònics: <https://ddd.uab.cat/record/224929>

OTHER EXCELLENT CONSULTATION 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-Crussí ; 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.

Blogs

<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	51	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	511	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	512	Catalan	second semester	morning-mixed