

Environmental Microbiology

Code: 101015
ECTS Credits: 6

Degree	Type	Year	Semester
2500502 Microbiology	OB	3	2

Contact

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Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Maria Ramos Martínez Alonso
Marc Llíros Dupré

Prerequisites

It is necessary to know Catalan or Spanish as the different teaching activities are taught in these languages.

Although there are no official prerequisites, students are advised to review concepts that refer to the microbial world, previously studied in Microbiology and Microbial Ecology courses.

Objectives and Contextualisation

Environmental Microbiology is a mandatory subject, nuclear in the degree of Microbiology. It is a diverse discipline that ranges from the study of pathogens in drinking water to the relationship between microorganisms and geochemistry. Microorganisms are intimately involved in the geochemical cycles, transport and transformation of the elements in nature, including pollutants. Learning and understanding these processes allow us to use microorganisms to solve environmental problems.

The objectives of the subject are:

- . Understand the role of microorganisms as agents of environmental change
- . Recognize microorganisms as indicators of alteration of an ecosystem
- . Understand microbial processes aimed to solve environmental problems.

Skills

- Apply suitable methodologies for taking samples and characterising and manipulating microbial populations and communities in natural and artificial ecosystems, and establish the relationships between these and those with other organisms.
- Apply tools based on microorganisms to assess the environmental impact of human activity, and to recover contaminated environments.
- Communicate orally and in writing.

- Use bibliography or internet tools, specific to microbiology or other related disciplines, both in English and in the first language.
- Work individually or in groups, in multidisciplinary teams and in an international context.

Learning outcomes

1. Apply suitable sampling strategies and techniques for different types of environments.
2. Characterise populations and communities of microorganisms from environmental and industrial samples.
3. Communicate orally and in writing.
4. Know bioremediation and biorecovery strategies based on the use of microorganisms.
5. Know procedures and strategies based on microorganisms for pest and disease control.
6. Know the different bioindicators and bioassays based on microorganisms that allow evaluation of environmental impact.
7. Recognise the role of microorganisms as causal agents of deterioration.
8. Use bibliography or internet tools, specific to microbiology or other related disciplines, both in English and in the first language.
9. Work individually or in groups, in multidisciplinary teams and in an international context.

Content

1. **Introduction** to Environmental Microbiology
2. **Aerobiology**: The atmosphere. Bioaerosol dispersion. Methods in aerobiology.
3. **Microbial interactions with inorganic pollutants**: Nitrates. Acid mine drainage. Heavy metals.
4. **Biofilms**: Surface colonization. Biofilm structure. Biofouling. Biodeterioration. Biotechnological applications.
5. **Drinking water**: Treatment. Water quality testing. Waterborne microbial diseases
6. **Biological treatment of solid and liquid wastes**: Landfills. Composting. Anaerobic digestion of solid waste. Wastewater treatment.
7. **Biodegradation and bioremediation of organic pollutants**
8. **Biological control of pathogens and pests**

Methodology

Teaching methodology and training activities

The course of Environmental Microbiology consists of three modules, which have been programmed in an integrated way, so the student will have to relate throughout the course the content and activities programmed in order to achieve the skills indicated in this Guide

The three modules are the following:

Theory lectures: Lectures represent the main activity to be carried out in the classroom and allow to transmit basic concepts to a large number of students in relatively short time. They will be complemented with Power Point presentations and diverse teaching material that will be delivered to the students through the Virtual Campus.

Seminars These are sessions of work in groups with a small number of students, based on topics proposed by the teaching team, that the students will work independently and that will be discussed or exposed later in the

classroom. Attendance to this activity is mandatory.

Visits. Two visits to waste treatment facilities have been programmed in order to bring the student closer to a real situations. This is a mandatory activity.

Additional information:

In order to support the training activities indicated above, students will be able to take individual tutorials with the teaching staff.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Lectures	30	1.2	6, 4, 5, 7
Seminars	10	0.4	1, 6, 4, 5, 7, 3, 9, 8
Visits	6	0.24	4
Type: Supervised			
Tutorials	3	0.12	6, 4, 5, 7, 3
Type: Autonomous			
Bibliographic search	20	0.8	8
Individual reading	15	0.6	8
Individual study	35	1.4	6, 4, 5, 7, 9, 8
Preparation of oral presentations	10	0.4	3, 9, 8
Writting papers	15	0.6	3, 9

Evaluation

The assessment of the course will be individual and continuous through the following tests:

Assessment module of the theoretical classes (70% of the global grade): During the course, two written tests of evaluation of this module, which are eliminatory, will be programmed. Each of the tests will have a weight of 32.5% of the global grade, but it will only be averaged if the mark of the tests is greater than 4.5, otherwise the student will have to retake all the subject at a Final exam

Each test will consist of two types of questions:

Short answer questions aimed at assessing whether the key conceptual objectives have been achieved.

Multiple choice and / or true / false test questions, which will allow to evaluate a large part of the subject.

The final grade of this module will be completed with 5%, corresponding to the presentation at the end of each lecture a maximum of 10 multiple choice test questions, that reflect the concepts and relevant aspects of the issue covered.

Seminar evaluation module (30% of the overall grade): The assessment will include the following aspects:

Oral presentation of the work done (15% of the overall grade).

Writing tests (10% of the overall grade).

The preparation of 10 multiple choice test questions corresponding to the seminar (5% of the overall grade).

To pass the course, you must obtain a score of 5 or higher in each module and have assisted to the visits activities.

Students who do not pass any of the written tests of the modules will be able to retake them in the scheduled date for the assessment of the course at the end of the semester, as long as they have been evaluated in a minimum of 2/3 of these activities.

The re-assessment of the theory module will be done in a single written global test. Also on this same date, students wishing to improve their grade may present to an **overall examination** of the subject, which will include questions from all three modules. In this case, the presentation of the student in the re-assessment examination involves the renunciation of the qualification previously obtained.

It will be considered that a student will obtain the Non-Evaluable qualification if he / she carries out less than 67% of the evaluation activities.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Elaboration of questions from each topic	5	0	0	6, 4, 5, 7, 3, 8
Seminars assessment: oral presentation	15	1	0.04	1, 2, 6, 4, 5, 7, 3, 9, 8
Seminars assessment: preparation of multiple choice test questions	5	0	0	6, 4, 5, 7, 3, 8
Seminars assessment: writing tests	10	1	0.04	1, 2, 6, 4, 5, 7, 3, 9, 8
Theory assessment: Part 1	32,5	2	0.08	6, 4, 5, 7, 3, 8
Theory assessment: Part 2	32,5	2	0.08	6, 4, 5, 7, 3, 8

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