

Environmental Microbiology

Code: 101015
ECTS Credits: 6

Degree	Type	Year	Semester
2500502 Microbiology	OB	3	2

Contact

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Teaching groups languages

You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Teachers

Maria Ramos Martinez Alonso

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.

Competences

- 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 two 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 two 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.

Additional information:

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

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	30	1.2	6, 4, 5, 7
Seminars	16	0.64	1, 6, 4, 5, 7, 3, 9, 8
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	36	1.44	6, 4, 5, 7, 9, 8
Preparation of oral presentations	10	0.4	3, 9, 8
Writing papers	15	0.6	3, 9

Assessment

Continuous 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 35% of the global grade, but it will only be averaged if the mark of the tests is greater than 4, otherwise, the student will have to retake the part of the subject with a mark lower than 4 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 will allow us to evaluate a large part of the subject.

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

Work done and 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.

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 grades 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.

Students wishing to take the grade improvement test must communicate it by mail to the teacher responsible for the subject.

Single assessment

The single assessment consists of a single summary test in which the contents of the entire theory program of the subject will be assessed. The test will consist of short-answer questions aimed at assessing whether the key conceptual objectives of the subject have been achieved and multiple-choice and/or true/false test-type questions, which will allow a large part of the content to be assessed. The grade obtained in this synthesis test will account for 70% of the final grade of the subject and must be equal to or higher than 5. The single assessment will be done on the same day as the 2nd part of the subject.

The evaluation of the seminar module will follow the same process as the continuous evaluation. The grade obtained will account for 30% of the final grade of the subject. The seminar module is compulsory for all sessions. It is a requirement to have passed the seminar module (grade of 5 or higher) to take the single assessment test. In the same way, the delivery of evidence from the seminars will follow the same procedure as the continuous assessment.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Seminars assessment: Work done and oral presentation	15	0	0	1, 2, 6, 4, 5, 7, 3, 9, 8
Seminars assessment: preparation of multiple choice test	5	0	0	6, 4, 5, 7, 3, 8

questions

Seminars assessment: writing tests	10	1	0.04	1, 2, 6, 4, 5, 7, 3, 9, 8
Theory assessment: Part 1	35	2	0.08	6, 4, 5, 7, 3, 8
Theory assessment: Part 2	35	2	0.08	6, 4, 5, 7, 3, 8

Bibliography

Atlas RM, Bartha R (2002). Ecología microbiana y microbiología ambiental. 4ª ed., Pearson Educación SA.

Alexander, M. 1999. Biodegradation and Bioremediation. 2d ed. Academic Press

Bitton, G. 2003. Encyclopedia of environmental microbiology. Wiley , John & sons.

Bitton, G. 1999. Wastewater microbiology. 2d ed. Wiley Series in Ecological and applied microbiology.

Doyle, R.J. 2001. Methods in Enzymology. Microbial growth in biofilms. Volume 337. Academic Press.

Hurst, Crawford, Garland, Lipson, Mills & Stetzenbach. 2007. Manual of environmental microbiology. 3th Edition. ASM Press.

Jenkins, D. et a. 1993. Manual of the causes and control of activated sludge bulking and foaming. 2nd edition. Lewis Publishers, Inc.

Jjemba, PK. 2004. Environmental Microbiology. Principles and applications.. Science Publishers.

Lynch, J.M. & J.E. Hobbie. 1988. Micro-organisms in action: concepts and applications in Microbial Ecology. Blackwell Scientific Publications.

Madigan M, et al., (2015). Brock, biología de los microorganismos, 14ª ed., Pearson Educación SA.

Madigan MT, Bender KS Buckley DH, Sattley WM, Stahl DA (2021). Brock. Biology of microorganisms, 16ª ed., Pearson SA.

Madsen, E.L. 2008. Environmental Microbiology: from genomes to biogeochemistry. Blackell Publishing.

Pepper, I. L., Gerba, C. P. & Gentry T. J. 2015. Environmental Microbiology. 3th ed. Academic Press.

Maier, R. M. , Pepper, I. L. & Gerba, C. P. 2009. Environmental Microbiology. 2nd ed. Academic Press.

Palmisano, A.C. & M.A. Barlaz. 1996. Microbiology of solid waste. CRC.

Rittmann, B. E. & P.L. McMarty. 2001. Biotecnología del medio ambiente. Principios i aplicaciones. McGraw Hill.

Senior, E. 1995. Microbiology of landfill sites. 2nd ed. CRC.

Wiley J, Sherwood LM, Woolverton CJ (2008). Microbiología de Prescott, Harley y Klein, 7ª ed., MacGraw-Hill.

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Software

No specific software is needed in this subject.