Universitat Autònoma de Barcelona

2023/2024

Environmental Biotechnology

Code: 100955
ECTS Credits: 6

Degree	Type	Year	Semester
2500253 Biotechnology	OT	4	1

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

Antonio Sanchez Ferrer

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 subjects.

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Objectives and Contextualisation

- Understand the role of microorganisms as agents of environmental change.

- Know the microorganisms involved in the processes of environmental bioremediation.

- Apply the general bases of the Bioprocess Engineering to complete systems of environmental bioremediation of the three vectors: water, air and solids.

Competences

- Apply general laboratory security and operational standards and specific regulations for the manipulation of different biological systems.

- Comply with ethical principles and legislation in the manipulation of biological systems.
- Describe the principles behind the design and functioning of bioreactors and calculate, interpret and rationalise the main parameters in transport phenomena and the matter and energy balances in bioindustrial processes.
- Identify the genetic, physiological and metabolic properties of microorganisms with potential for application to biotechnological processes and the possibility of manipulating microorganisms.
- Interpret experimental results and identify consistent and inconsistent elements.
- Learn new knowledge and techniques autonomously.
- Make an oral, written and visual presentation of one's work to a professional or non-professional audience in English or in one's own language.
- Read specialised texts both in English and one's own language.
- Reason in a critical manner
- Search for and manage information from various sources.
- Think in an integrated manner and approach problems from different perspectives.
- Work individually and in teams

Learning Outcomes

1. Describe environmental legislation at local, regional and global levels.
2. Describe the properties of microorganisms that can potentially be used in environmental biotechnology processes: bioremediation, biorecovery and pest control.
3. Describe the scientific principles applied by environmental biotechnology.
4. Explain the operational and safety rules in place in an environmental biotechnology laboratory.
5. Explain the technologies, tools and techniques of environmental biotechnology.
6. Interpret experimental results and identify consistent and inconsistent elements.
7. Learn new knowledge and techniques autonomously.
8. Make an oral, written and visual presentation of one's work to a professional or non-professional audience in English or in one's own language.
9. Read specialised texts both in English and one's own language.
10. Reason in a critical manner
11. Search for and manage information from various sources.
12. Think in an integrated manner and approach problems from different perspectives.
13. Work individually and in teams

Content

1. Introduction to Environmental Microbiology

2. Aerobiology: The atmosphere. Bioaerosol dispersion. Methods in aerobiology.

3. Microbial interactions with inorganic pollutans: 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.Microbial communities and waste treatment: Microbial communities in landfills and composting plants. Microbial communities in biological treatment of wastewater.

7. Air treatment: Organic and inorganic pollutants in the air. Quantification of pollutants in polluting gas streams. Biological processes of air purification: Biofilters, Percolating filters, Bioscrubbers.

8. Biological processes of water purification I: Process classification. Environmental parameters and water quality standards. Aerobic processes.

9. Biological water purification processes II : Elimination of nutrients. Anaerobic processes. Technology selection criteria.

10. Biological processes for the purification and recovery of solid waste: Characteristics of the waste: Typologies and biodegradability. Biological treatment processes: Composting and / or Methanisation. Ecoparcs.

7. Biodegradation and bioremediation of organic pollutans

8. Biological control of pathogens and pests

Methodology

Teaching methodology and training activities

The subject 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:

Theoretical 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 Moodle space.

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.

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	32	1.28	1, 3, 2, 5
Seminars	10	0.4	7, 11, 8, 9, 10, 13

Visits	8	0.32	4, 5, 6
Type: Supervised			
Tutorials	4	0.16	3, 2
Type: Autonomous			
Bibliographic search	16	0.64	11
Individual reading	20	0.8	7, 9, 12, 13
Individual study	35	1.4	7, 13
Preparation of oral presentaions	15	0.6	8

Assessment

Continuous evaluation

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

Assessment module of the theoretical classes (60% 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 30 % of the global grade, but it will only be average if the mark of the tests is greater than 4.5, otherwise the student will have to recover the subject at a Final exam

Seminar evaluation module (25% 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).

If the student has not participated in the preparation and defense of a seminar, he is not able to retake it.

To pass the subject, you must obtain a grade 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 subject at the end of the semester, as long as they have been evaluated in a minimum of 2/3 of these assessments.

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.

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 grade obtained in this synthesis test will account for 60% of the final grade of the subject and must be equal to or greater 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 25% of the final grade of the subject. The delivery of evidence from the seminars will follow the same procedure as the continuous assessment. The seminar module is compulsory, as is the visits module. It is a requirement to have passed the seminar module and to have attended the organized visit to take the single assessment test. The grade obtained in the seminar module corresponds to 25% of the final grade and the visits module the remaining 15% and must always be 5 or higher.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Seminars assessment	25	2	0.08	7, 11, 8, 9, 12, 10, 13
Theory assessment: Engineering	30	3	0.12	1, 3, 2, 5, 12
Theory assessment: Microbiology	30	3	0.12	1, 3, 2, 5, 12
Visits assessment	15	2	0.08	4, 5, 6

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Software

No specific software is needed in this subject.