COURSE DESCRIPTION

COURSE DETAILS

Title (of the course): **BIOTECNOLOGÍA AMBIENTAL**
Code: 101556
Degree/Master: **GRADO DE CIENCIAS AMBIENTALES** Year: 4
Name of the module to which it belongs: OPTATIVO
Field: BIOTECNOLOGÍA AMBIENTAL
Character: OPTATIVA Duration: SECOND TERM
ECTS Credits: 6.0 Classroom hours: 60
Face-to-face classroom percentage: 40.0% Study hours: 90
Online platform: Moodle

LECTURER INFORMATION

Name: ROLDÁN RUIZ, MARIA DOLORES (Coordinator)
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PREREQUISITES AND RECOMMENDATIONS

Prerequisites established in the study plan

Students can register in this subject only if they have completed previously 60 credits (on basic formation) plus at least 60 credits (on compulsory subjects). The knowledge of English language (B1 level) is compulsory.

Recommendations

The knowledge of English language (B2 or higher level) is highly recommended.

INTENDED LEARNING OUTCOMES

CB7	Capacity to work in a team valuing leadership capacity and the organisation of work teams.
CB9	Capacity to apply key theoretical knowledge to the resolution of problems.
CE6	Be capable of applying statistic methods to data related to environmental problems.
CE14	the ability to evaluate and prevent environmental risks

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OBJECTIVES

The main object of this subject is to provide a general knowledge in biological treatments to reduce environmental hazards, such as xenobiotic ornatural compounds. Specific objectives are described as followed:1. To identify the main sources of contamination as well as the chemical structure of the pollutants causing environmental risks. 2. To learn the basic knowledge in biochemistry, molecular biology and biotechnology to successfully apply the methodology in thebioremediation techniques. 3. To integrate theoretical and practical learning to solve environmental cases through the application of biotechnology. 4. To understand the impact of biotechnology in the current society with advantages and disadvantages of different biotechnologies. The studentswill learn how to deal with different bibliographical resources as well as to compare and to relate concepts to further apply them to thebioremediation techniques.The interest in new technology methods based on the use of metabolic capacities of microorganisms to remove pollutants will be student under ascientific point of view, considering the possible ethical problems related with the utilization of genetic modified microorganisms in nature.

CONTENT

1. Theory contents

1. Theory contents:
Therory will be delivered by Prof. María Dolores Roldán Ruiz.
Chapter 1. General introduction. Water and weak interactions. Structure and function of glucids.
Chapter 2. Amino acids and protein scaffolding.
Chapter 3. Enzymes: kinetics, inhibition and regulation of activity.
Chapter 4. Nucleotides and nucleic acids: structure, function and metabolism.
Chapter 5. Introduction to Environmental Microbiology. Chemical and biological pollution. Treatments of residues and prevention of contamination.
Chapter 6. The carbon cycle.
Chapter 7. The nitrogen and sulfur cycles. Environmental hazards related to biogeochemical cycles.
Chapter 8. Bioremediation with microorganisms.
Chapter 9. Biodegradation of natural compounds.
Chapter 10. Biodegradation of xenobiotic compounds.

2. Practical contents

2. Practical content:

The practical classes will be delivered by Prof. Alfonso Olaya Abril in the classroom or in the laboratory.
2.1 In the classroom, case studies will be solved related to:
2.1.1 pH and physic-chemical properties of proteins.
2.1.2 Enzymology.
2.1.3 Informatic analyses of biological components (proteins/genes).
2.2. In the laboratory, designed experiments will be based on:
2.2.1. Assimilation of nitrate or cyanide by heterotrophic bacteria. Media culture preparation and physiological characterization of bacteria grownin the presence of hazardous pollutants.
2.2.2. PCR (polymerase chain reaction) detection of mutant strains defective in the nitrate or cyanide assimilation pathways.

SUSTAINABLE DEVELOPMENT GOALS RELATED TO THE CONTENT

Good health and well-being
Quality education

COURSE DESCRIPTION

Gender equality
Clean water and sanitation
Affordable and clean energy
Industry, innovation and infrastructure
Sustainable cities and communities
Responsible consumption and production
Climate action

METHODOLOGY

Methodological adaptations for part-time students and students with disabilities and special educational needs

Individual adjustements will be made for part time or disabled students.
In the case of students with special educational needs, profesors will meet with these students to establish the most appropriate adaptations for each particular case, following the indications of the report issued by the Inclusive Education Unit (Unidad de Educación Inclusiva).

Face-to-face activities

Activity	Large group	Medium group	Total
Assessment activities	3	-	3
Case study	-	15	15
Group presentation	-	1	1
Lab practice	-	9	9
Lectures	30	-	30
Tutorials	-	2	2
Total hours:	***33***	***27***	***60***

Off-site activities

Activity	Total
Analysis	10
Exercises	10
Information search	10
Reference search	5
Self-study	55
Total hours	***90***

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WORK MATERIALS FOR STUDENTS

Case studies
Exercises and activities
References

EVALUATION

Intended learning	Case Studies	Exams	Laboratory Practice	Practice Book
CB7	X		X	X
CB9	X	X	X	X
CE14		X		
CE6			X	
Total (100%)	***50%***	***30%***	***10%***	***10%***
Minimum grade	***5***	***5***	***5***	***5***

(*)Minimum mark (out of 10) needed for the assessment tool to be weighted in the course final mark. In any case, final mark must be 5,0 or higher to pass the course.

Attendance will be assessed?:

No

General clarifications on instruments for evaluation:

To succeed students will have to obtain a final score of 5 out of 10.
The calification obtained in each tool or instrument of evaluation will be kept, if they are succeded, for all deadlines of the same academic year.
The practice notebook, laboratory practices and case studies will be part of the continuous evaluation and they can be recovered (in case of not presented or failed) in all the official calls established for this course. The laboratory notebook will consist of the elaboration of a practice memory. In the laboratory practices the attendance and participation of the student will be evaluated. The theoretical content of the subject will be evaluated in the exam. The case study will consist of problem solving, bioinformatics analysis, making a poster, preparing summaries, etc.
Calification of practical activities in the laboratory will be kept for students who have undertaken this subject for more than one academic year.

Clarifications on the methodology for part-time students and students with disabilities and special educational needs:

Specific learning conditions will be provided for part-time students or disabled students.

Clarifications on the evaluation of the extraordinary call and extra-ordinary call for completion studies:

The same criteria used for ordinary deadlines.

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Qualifying criteria for obtaining honors:

As previously stated by UCO (article 80 of the UCO Regulation).

BIBLIOGRAPHY

1. Basic Bibliography

1. Nelson DL y Cox MM. Lehninger Principles of Biochemistry, seventh Edition. Omega, 2018.
2. Nelson DL y Cox MM. Lehninger. Principios de Bioquímica, 7ª Ed. Omega, 2018.
3. Ramesh KV. Environmental Microbiology. MJP Publisher, 2019.
4. Barton L, McLean RJC. Environmental Microbiology and Microbial Ecology, 2019.
5. Dash S y Dash H.Elsevier. Microbial Biodegradation and Bioremediation: Techniques and case studies for environmental pollution, Elsevier, 2021.

2. Further reading

1. McKee T y McKee JR. Bioquímica. La Base Molecular de la Vida, 6ª Ed. McGraw-Hill-Interamericana, 2014.
2. Atlas RM y Bartha R, Ecología Microbiana y Microbiología Ambiental, 4ª ed., Addison-Wesley, 2002.
3. Nelson DL y Cox MM. Lehninger. Principios de Bioquímica, 6ª Ed. Omega, 2014.
4. Chandra R. Advances in Biodegradation and bioremediation of industrial waste. CRC Press, 2015.
5. Wild JR, Varfolomeyev SD, Scozzafava A. Perspectives in Bioremediation: Technologies for Environmental Improvement. Springer, 2013.

COORDINATION CRITERIA

Joint activities: lectures, seminars, visits ...

SCHEDULE

Period	Assessment activities	Case study	Group presentation	Lab practice	Lectures	Tutorials
1# Fortnight	0,0	3,0	0,0	3,0	6,0	0,0
2# Fortnight	0,0	3,0	0,0	3,0	6,0	0,0
3# Fortnight	0,0	3,0	0,0	3,0	6,0	0,0
4# Fortnight	0,0	3,0	0,0	0,0	6,0	0,0
5# Fortnight	0,0	3,0	0,0	0,0	6,0	0,0
6# Fortnight	0,0	0,0	0,0	0,0	0,0	2,0
7# Fortnight	3,0	0,0	1,0	0,0	0,0	0,0
Total hours:	***3,0***	***15,0***	***1,0***	***9,0***	***30,0***	***2,0***

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The methodological strategies and the evaluation system contemplated in this Course Description will be adapted according to the needs presented by students with disabilities and special educational needs in the cases that are required.