Universitat Autònoma de Barcelona

2023/2024

Bioremediation and Degradation of Industrial Pollutants

Code: 43333
ECTS Credits: 6

Degree	Type	Year	Semester
4314579 Biological and Environmental Engineering	OB	2	1

Contact

Name: Francisca Blánquez Cano

Email: paqui.blanquez@uab.cat

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

Basic knowledge on material and energy balances and stoichiometry.

Objectives and Contextualisation

The main goal is to understand the potential and mechanisms used by microorganisms to degrade environmental pollutants, their application in contaminated sites and the tools for monitoring the success of bioremediation.

Learning Outcomes

- CA21 (Competence) Propose the most suitable biodegradation strategy based on the type of contaminant and its current phase(s).
- CA22 (Competence) Summarise and interpret, in a logical and reasoned manner, information from biodegradability or molecular biology studies.
- KA21 (Knowledge) Interpret the basic concepts of applied microbiology for the design of a biological process.
- KA22 (Knowledge) Recognise the difference between biodegradation, degradation, mineralisation and other related concepts.

- SA24 (Skill) Differentiate the role of microorganisms in biodegradation processes, their role as bioindicators and their potential for the implementation of clean technologies.
- SA25 (Skill) Identify the factors that determine the effectiveness of a biodegradation process.

Content

This unit contains 7 sections:

1. Introduction (definition of basic concepts, strategies to implement a bioremediation project)
2. Metabolic and cometabolic principles involved in biodegradation. Diagnostic and monitoring tools.
3. Use of stable isotope techniques in bioremediation.
4. Assessment of biodegradability. Use of respirometric technics and anaerobic biodegradability tests. Toxicity tests.
5. Bioremediation technologies.
6. Soil remediation. Characteristics of soils. Case studies. Mangement of a soil bioremediation project.
7. Phytoremediation

Methodology

The subject is developed through theory classes, problems and tutorials.

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			
Case study	37	1.48	KA21, KA22, SA24, SA25, KA21
Type: Supervised			
Problem-based learning	15	0.6	CA21, CA22, KA21, KA22, SA24, SA25, CA21
Type: Autonomous			
Theory classes	95	3.8	CA21, CA22, SA24, SA25, CA21

Assessment

Evaluation activities include:

- Attendance and active participation (5%)

- Case study (20%)

- Oral presentation (25%)

- Exam (50%)

The minimum score to pass the course is 5 out of 10.

Retaking Final test: There will be a final test for those students who have not passed the continuous assessment. However, the folloing activities cannot be re-evaluated:

- Attendance and active participation (5%)

- Case study (20%)

- Oral presentation (25%)

Students have the right to the revision of the final grades of their evaluation activities. The date for reviewing the qualifications will be informed in a timely manner through the Moodle platform.

A distinction can be given to students who score 9.0 or higher in a subject. The number of distinctions awarded to students cannot be higher than 5% of the total number of students enrolled in a subject. If the total number of students is lower than 20 then only one distinction will be awarded.

The returning date of the corrected reports will be informed in a timely manner, so that students can to review the correction and improve the aspects that are necessary for the following reports.

Without prejudice to other disciplinary measures, and in accordance with current academic regulations, any irregularities committed by the student that could lead to a variation of the score of an evaluation act will be scored with a zero. Therefore, copying or allowing to copy a practice or any other evaluation activity will imply a zero (0) in the attitude note and, therefore, suspend the course.

Repeatersare obliged to pass the full course.

IMPORTANT:

This subject allows students to take advantage of a single evaluation, and as established by the UAB regulations, all evaluation activities will be carried out on the same day, which will be informed through the virtual campus.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exam	50%	0	0	CA21, CA22, SA24, SA25
Attendance and active participation	5%	0	0	CA21, CA22, KA21, KA22, SA24, SA25
Case study	20%	2	0.08	CA21, CA22, KA21, KA22, SA24, SA25
Oral presentation	25%	1	0.04	CA21, CA22, SA24, SA25

Bibliography

- Stroo, H. F., Lesson, A., Ward, C. H. Bioaugmentation for groundwater remediation. 2013. Springer.
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- McBean, E.A., Rovers, F.A., Farquhar, G.J. 1995. Solid waste landfill engineering and design. Prentice Hall

- Landfill Mining. Preserving Resources through Integrated Sustainable Management of Waste. Technical Brief from the World Resource Foundation.(http://www.enviroalternatives.com/landfill.html, Maig 2013).
- Gilbride KA, Lee D-Y , Beaudette LA. 2006. Molecular techniques in wastewater: Understanding microbial communities, detecting pathogens, and real-time process control. Journal of Microbiological Methods 66:1-20.
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- Environmental isotopes in biodegradation and bioremediation". Editors: C.M. Aelion; P. Höhnener; D. Hunkeler; R. Aravena. CRC Press. 2010. Boca ratón, FL. ISBN: 978-1-56670-661-2.
- A Guide for assessing biodegradation and source identification of organic ground water contaminants using compound specific isotope analysis (CSIA). 2009. Environmental Protection Agency, USA. Disponible a: http://bit.ly/21nWgWI
- Biotratamiento de residuos toxicos y peligrosos MA Levin and MA Gealt Ed Mc Graw-Hill 1997
- Environmental Degradation and transformation of organic chemicals AH Neilson and AS Allard CRC Press
- Clean Technology and the environment RC Kirkwood and AJ Longley Blackie Academic
- Treatment on contaminated soil R Stegmann and col Springer 2001
- Principios de Biorecuperación JB Eweis and col Mc Graw Hill, 1999
- Organohalide-respiring bacteria. L. Adrian and F. Löffler, 2016. Springer-Verlag Berlin Heidelberg. ISBN 978-3-662-49873-6.

Software

MS office (excel, word, ppt)