



IDENTIFYING DATA

Pollution, Bioindication and Bioremediation

Subject	Pollution, Bioindication and Bioremediation			
Code	V02M123V01110			
Study programme	(*)Máster Universitario en Ciencias Biológicas: Biología Molecular, Computacional e Ambiental e Bio-Industrias			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	1st	1st
Language				
Department				
Coordinator	Alonso Vega, María Flora			
Lecturers	Alonso Vega, María Flora Bellas Bereijo, Juan Domingo Devesa Rey, Rosa			
E-mail	florav@uvigo.es			
Web				
General description	Pollution, a big problem for Biological Systems. Types of pollutants and ecosystems that are affected. Bioindication, how to establish limits and how to detect pollutants in the ecosystems. Bioremediation, using biological techniques for remediation of polluted sites.			

Competencies

Type A	Code	Competences Specific
	A1	(*)To know the scientific method and the correct use of the scientific terminology as well as to acknowledge the contribution that scientific research provides to the overall knowledge and professional practice.
	A2	(*)Ability to describe and to analyse biological diversity, the mechanisms determining the interactions with the biotic and abiotic environment and being able to select those which might have technical applications.
	A3	(*)Ability to manage and/or to develop basic tools for validating and analysing data by means of statistics and bioinformatics.
	A4	(*)To know the ethical and legal aspects governing the collection and the handling of biological samples, organisms and habitats.
	A5	(*)Ability to design, evaluate and implement models of biological structures, systems and processes.
	A6	(*)To learn the sampling techniques and the instrumental methodologies, in the field and laboratory, for their application in the Biological Sciences
	A7	(*)To have an integrated view of the R&D processes and their possible transfer to the industrial sector. Planning and supervising facilities together with managing their human and economic resources.
	A8	(*)Ability to classify, evaluate, conserve, restore and manage natural and productive systems. Developing and implementing land management and sustainability plans.
	A9	(*)To understand and know how to apply quality control systems and safety protocols in any biological laboratory of the public or private sector.
	A10	(*)To acquire the professional ability to teach and spread Biology and to offer expertise advice for elaborating scientific, technical and socioeconomic biology reports. Address environmental consulting.

A11 (*)To perform an individual Master Project (critical and in-depth study) under the supervision of a tutor in a research or working environment demonstrating that skills have been acquired.

Type B Code Competences Transversal

B1	(*)Dissemination of results and conclusions of the biological studies, in oral and written English, through complex presentations that address ideas related with R&D in Biology.
B2	(*)Managing computational, laboratory, field and industrial techniques in order to obtain, process and apply the acquired information.
B3	(*)Disseminating and broadcasting ideas in contexts both academic and non-specialised.
B4	(*)Reflecting on social and ethical responsibilities.

Learning aims

Subject competences	Typology	Competences
Ability to describe and to analyse biological diversity, the mechanisms determining the interactions with the biotic and abiotic environment and being able to select those which might have technical applications.	Know How	A2 B1 B2 B3 B4
To know the ethical and legal aspects governing the collection and the handling of biological samples, organisms and habitats.	know	A4 B1 B2 B3 B4
To learn the sampling techniques and the instrumental methodologies, in the field and laboratory, for their application in the Biological Sciences	Know How	A6 B1 B2 B3 B4
To understand and know how to apply quality control systems and safety protocols in any biological laboratory of the public or private sector.	Know How	A1 A9 B1 B2 B3 B4
To acquire the professional ability to teach and spread Biology and to offer expertise advice for elaborating scientific, technical and socioeconomic biology reports. Address environmental consulting.	Know be	A10 B1 B2 B3 B4

Contents

Topic

(1) Bioremediation in aquatic environments:	(a) sediments as sinks of pollution; (b) Decontamination vs.detoxification; (c) Self-purification capacity of rivers; (d) The role of natural biofilms in detoxification; (e) Immobilization of adsorbents for decontamination in natural streams.
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Planning

	Personalized attention	Assessment	Ordinary class hours A	Face-to-face hours outside the classroom Guided academic environment B	Student's work factor C	Outside the classroom hours D	Total hours (A+B+D) E
Laboratory practises	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	7	0	0	63	70
Master Session	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	18	0	3.16667	57	75
Short answer tests	<input type="checkbox"/>	<input checked="" type="checkbox"/>	5	0	0	0	5

Total hours E:	150
Work load in UVIGO ECTS credits:	6

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Laboratory practises	Laboratory practises
Master Session	Description of the main topics of each lesson

Personalized attention

	Description
Master Session	Students would be able to explain their doubts to the teacher while the different activities are developed
Laboratory practises	Students would be able to explain their doubts to the teacher while the different activities are developed

Assessment

	Description	Qualification
Master Session	Teachers will explain the most important topics to show the problem of pollution in Biological Systems. How to detect and prevent the pollution will be also explained. Different techniques of bioremediation will be also explained.	0
Laboratory practises	Students will perform different techniques related to pollution, bioindication and bioremediation of the ecosystems in research labs.	0
Short answer tests	Questions about the different topics explained during master sessions and laboratory practises	100

Other comments and second call

Sources of information

Dharmendra Kumar Gupta, Plant-Based Remediation Processes, Springer, 2013

Ravendra Naidu, Chemical Bioavailability in Terrestrial Environments, Developments in Soil Science. Vol. 32. Elsevier, 2008

Garrison Sposito, The Chemistry of Soils, Oxford University Press, 2008

Domy C Adriano, Trace Elements in Terrestrial Environments. Biogeochemistry, Bioavailability and Risks of Metals, Springer, 2001

R.B. Clark, Marine Pollution, Oxford University Press, 2001

M.J. Kennish, Practical handbook of estuarine and marine pollution, CRC Press, 1997

M.J. Kennish, Ecology of estuaries: anthropogenic effects, CRC Press, 1992

C.H. Walker, Principles of ecotoxicology, Taylor & Francis, 2006

D. Connell, Introduction to ecotoxicology, Blackwell Science, 1999

D.J. Hoffman, Handbook of ecotoxicology, CRC Press, 2003

F. Moriarty, Ecotoxicology : the study of pollutants in ecosystems, Academic Press, 1999

Recommendations