

FORM FOR SUBMISSION OF MODULE FOR A EUROPEAN JOINT MASTERS

1.	Module Title: Microbial potential for the attenuation of contaminants in coastal ecosystems and bioremediation
2.	Module Code:
3.	Maximum Number of Students: 15
4.	Total ECTS Credits: 2 ECTS
5.	Month: First year, second semester
6.	Notional Learning Hours (Please fill a number in box): (a) Contact Time - e.g in the classroom, or fieldwork (b) Private Study - reading time, preparing and taking assessments Format of Teaching: Lectures Hours 8 (a) Laboratories or Practicals Hours 6 (a) Other (private study) Hours 36 (b) Teaching Strategy: Lectures Practical classes
7.	Convener: Alfonso Corzo Sokratis Papaspyrou Emilio Garcia Robledo
8.	Institution: University of Cádiz
9.	Level (Please tick Y): Master Degree
10.	Language(s) of Tuition: English
11.	Pre-requisites:

	It is unlikely that there will be prerequisites beyond the entrance qualifications for a science-based Masters programme.
12.	Co-requisites: None
13.	Programme(s) for which module is core: Erasmus Mundus Joint Master Degree in Water and Coastal Management (WACOMA)
14.	Module Description - The Purpose or Aims: The course is intended to highlight the problems pollutants cause and reasons for their persistence in the environment and to demonstrate the role that microbial communities play in the clean-up of organic and inorganic compounds that are either accidentally or deliberately released into the environment. The different metabolic abilities of microbes to degrade or transform pollutants as well as the various bioremediation strategies based on the use of different groups of microorganisms will be covered. The advantages and disadvantages of using bioremediation will be made clear.
15.	Learning Outcomes: <ul style="list-style-type: none"> - Introduce the concept of pollution and its different forms - Illustrate the importance of biological systems in the treatment of pollution and pollution prevention. - Introduce the metabolic abilities of micro-organisms for the degradation or transformation of pollutants that is exploited in the treatment of wastes and contamination. Look at specific examples of biological treatment of pollution and polluting materials, such as phytoremediation, treatment of wastewater and the bioremediation of marine oil spills. - Attendants to this course will acquire knowledge on the role and importance of microorganisms in the environment and how the knowledge can be applied in the field or the laboratory.
16.	Summary of Course Content: <ul style="list-style-type: none"> - Introduction: What is bioremediation? Types of pollutants, extent of contamination, contamination issues. - Microbial Bioremediation: A Potential Tool for Restoration of Contaminated Areas - How to apply bioremediation: bioremediation methods. Limitations to bioremediation - Hydrocarbons: Soils and Marine Oil Spills - Heavy Metals and Radionuclides - Nanotoxicity and Nanotechnology. - Microbial Indicators for Monitoring Pollution and Bioremediation - Application of Molecular Techniques for the Assessment of Microbial Communities in Contaminated Sites and mining of useful genes - Bioremediation Using Extremophiles. - Phycoremediation Coupled with Generation of Value-Added Products

	<p>- Practical session. Experiment applying bioremediation principles.</p>
17.	<p>Key Skills Taught:</p> <p>Designing, planning and undertaking pollution assessment. Selecting and applying the appropriate bioremediation strategy. Basic environmental microbiology laboratory skills. Performing different chemical analyses. Analysis and interpretation of data. Preparing relevant reports and recommendations.</p>
18.	<p>Assessment Methods:</p> <p>Continuous assessment by interacting with students during lectures. Level of participation during laboratory practicals (questions, discussions, reports), as well as final report based on laboratory work.</p>
19.	<p>Assessment Criteria:</p> <p>A successful candidate should have or be able to do the following:</p> <p>Threshold A basic understanding of the appropriate science and modelling approach and a reasonable understanding of the model results and their implications.</p> <p>Good A good understanding of the science and correct model results which are presented and interpreted to a good standard, with some reference to independent literature data and results.</p> <p>Excellent A good to excellent understanding of the science and correct model results which are presented and interpreted to a high standard, with plenty of references used for comparisons and to critically evaluate the results.</p>
20.	<p>Resource Implications of Proposal and Proposed Solutions:</p> <p>Specific Resource Implications for Students:</p> <p>Vipin Chandra Kalia, Prasun Kumar (Editors) (2017) Microbial Applications Vol.1. Bioremediation and Bioenergy. Springer International Publishing AG. DOI 10.1007/978-3-319-52666-9. ISBN 978-3-319-52665-2 Stephen P. Cummings (2010) Bioremediation. Methods and Protocols. Humana Press. ISBN 978-1-60761-438-8 DOI 10.1007/978-1-60761-439-5 Surajit Das (2014) Microbial Biodegradation and Bioremediation. Elsevier Inc. ISBN: 978-0-12-800021-2 Ronald M. Atlas, Jim Philp. (2005) Bioremediation: applied microbial solutions for real-world environmental cleanup. ASM Press. ISBN 1-55581-239-2</p>

21.	Does this module replace existing provision? If so, please indicate modules to be replaced: The module fits in the area of "Ecotoxicology evaluation of risk in water and coastal management"
22.	Start Date: First year, second semester
23.	Is it intended that the module be available every year? Yes