TEACHING MODULES INFORMATION
EMJMD WACOMA (academic year 2018/19)

1.	**Module Title:** Integrated tools to determine environmental quality.
2.	**Module Code:** (not necessary yet)
3.	**Maximum Number of Students:** 24
4.	**Total ECTS Credits:** 2 ECTS
5.	**Month: April-June** 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 2 Hours (a) Other (Analysis of documents and cases of study)…..5 Hours (a) Other (Computer Practices)……7 Hours (a) Other (Private study)……..……36 Hours (b) **Teaching Strategy:** Theoretical lectures will be given in order to involve the students in the topic of the course, taking always into consideration to motivate the student in the learning activity. Students will analyse different real cases. The theoretical contents will be put in practice analysing real data sets under computer practical lectures in order to be able to calculate pollution indexes using statistical approaches. As far as computer simulation practices are concerned, the teacher can simulate the reality before the students and teach them to analyze and solve the real problems that in the future will have to face. Simulation is a teaching-learning resource when real problems are not accessible to students and need for their professional future to have solved similar problems in an artificial situation, without being conditioned by responsibility, respect for the client, high costs, etc.
7.	**Convener:** María Laura Martín Díaz
8.	**Institution:** University of Cadiz
9.	**Level (Please tick Y):** Master degree
10.	**Language(s) of Tuition**: English

11.	**Pre-requisites:** • Not special requirements are need except some background in contamination, bioaccumulation, bioavailability of contaminants and toxicity analysis. • Recommendable to have some experience dealing with statistical tools (ANOVA, Factor analysis, and some trigonometry). .
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:** Weight of evidence (WoE) frameworks for integrating and interpreting multiple lines of evidence are discussed, focusing on sediment quality assessments, and introducing a series of ten papers on WoE. Approaches to WOE include individual lines of evidence (LoE) as well as combined LoE (indices, statistical summarization, logic systems, scoring systems, and best professional judgment [BPJ]). The application of WoE, based on multiple LoE, is discussed relative to the published literature. The content of this module addresses the development of skills to integrate different sets of data which include different LoEs: from contamination to biological effects, aiming to quantifying pollution and quality guidelines. This will allow the establishment of a model to integrate the contamination and its effects in order to determine the pollution index. Students will learn to interpret effects associated with the contamination, detect those contaminants of concern and calculate environmental quality guidelines and their use for the integrated coastal area management.
15.	**Learning Outcomes:** After completing this module the student should be able to perform monitoring research work that addresses environmental pollution assessment. Moreover, the student will be able to propose environmental quality guidelines for marine environment protection.
16.	**Summary of Course Content:** - Design and application of an integrated methodology for the evaluation of environmental quality. - Interpretation and analysis of a data set that contains values related with contamination and toxicity. - Integration of different Lines Of Evidence (LOE). Principal Component Analysis. - Determine the pollution index of contaminated areas and environmental quality guidelines. - Propose a protocol of use of Environmental Quality guidelines for an integrated coastal area management.
17.	**Key Skills Taught:** Ecotoxicology. Analytical Chemistry. Statistical Approach. SPSS Statistical Programme and Principal Components Analysis.

18.	**Assessment Methods:** Students will be supplied by a research data set to determine pollution indexes and environmental quality guidelines. They will work on this data set using Principal Components Analysis, integrating data belonging to contamination and toxicity. Students will have to submit a report in which it will have to be described the Weight of Evidence Approach and the different Lines of Evidence (LOEs), the definition of the Factors obtained after the Multivariate analysis, and the calculation of pollution indexes. This will be presented in a word format.
19.	**Assessment Criteria:** A successful candidate should have or be able to do the following: ***Threshold*** A basic understanding of the appropriate science and modelling approach and a reasonable understanding of the model results and their implications. ***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. ***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.

20. **Resource Implications of Proposal and Proposed Solutions:**

(Recommended Bibliography: compulsory, optional, other sources of information)

CCME (Canadian Council of Ministers of the Environment), 2003. Canadian Water Quality Guidelines for Protection of Aquatic Life e Guidance for Site-Specific Application of Water Quality Guidelines in Canada and Procedures for Deriving Numerical Water Quality Objectives. Winnipeg, MB, Canada.

CCME, 2007. A protocol for the derivation of water quality guidelines for the protection of aquatic life 2007. In: Canadian Environmental Quality Guidelines. Winnipeg, MB, Canada. Available at: http://ceqg-rcqe. ccme.ca/.

Chapman, P.M., Anderson, J., 2005. A decision-making framework for sediment contamination. Integr. Environ. Assess. Manag. 1, 163-173.

Chapman, P.M., Hollert, H., 2006. Should the sediment quality triad become a tetrad, a pentad, or possibly even a hexad? J. Soils Sed. 6, 4-8.

Chapman, P.M., McDonald, B.G., 2005. Using the sediment quality triad in ecological risk assessment. In: Blaise, C., F□erard, J.-F. (Eds.), Small-Scale Freshwater Toxicity Investigations, Hazard Assessment Schemes, vol. 2. Kluwer Academic Press, Netherlands, pp. 305-330.

Chapman, P.M., Smith, M., 2012. Assessing, managing and monitoring contaminated aquatic sediments. Mar. Pollut. Bull. 64, 2000-2004.

Chapman, P.M., McDonald, B.G., Lawrence, G.S., 2002. Weight of evidence frameworks for sediment quality and other assessments. Hum. Ecol. Risk Assess. 8, 1489e1515.

Chapman,P.M.,1990.Thesedimentqualitytriadapproachto determining pollution-induced degradation. Sci. Total Environ. 97-98, 815-825.

Specific Resource Implications for Students:

Computers with internet access should be available at all classes. Students can use their own laptops. Programmes to use include Power Point and Internet Acces to Science Direct.

21. **Does this module replace existing provision? If so, please indicate modules to be replaced:**

The module fits in the area of "Ecotoxicological Evaluation of Risk in Water and Coastal Management"

22. **Start Date:**

April, First Year, Second Semester

23. **Is it intended that the module be available every year?**

Yes