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

1.	**Module Title:** Sensitive tools for the assessment of environmental and human risk
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 7 Hours (a) Other (Analysis of documents and cases of study)…..4 Hours (a) Other (Research topic presentation)……3 Hours (a) Other (private study) 36 Hours (b) **Teaching Strategy:** Theorical lectures will be given in order to teach students in the topic of the course, taking always into consideration to motivate the student in the learning activity. The theorical contents will be put in practice developing analysis of different cases of study and research topic presentations. The systematic analysis of documents and situations of all kinds, whether written texts or audiovisual documents, is a type of task in which what is sought is to systematically observe situations or products elaborated to draw conclusions about a structure and value. Students can learn a lot by observing and analysing what others do and how they do it. To some extent, this type of task has a certain similarity with the systematic observation of reality, but it differs because it allows a more relaxed work in which the process of contrasting opinions plays a very important role in broadening the points of view about these types of issues may exist and are relevant in this type of learning. Moreover, students will have to make an oral presentation to be evaluated, what will allow the student to acquire communication skills.
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:** Basic knowledge of Biology, Biochemistry and Statistics.
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 content of this module addresses the acquirement of the knowledge related to biomonitoring environmentally polluted areas using biomarkers of exposure, effect and susceptibility, in order to be included as early warning tools in environmental/human risk assessment. Together with this main aim, the use of different biomonitoring species will be analysed as sentinel species in laboratory and field ecotoxicological studies.
15.	**Learning Outcomes:** After completing this module the student should have acquired the knowledge related with biomarkers for Environmental Risk Assessment and the applications and limitations that the inclusion of biomarkers provide in Environmental Risk Assessment. Moreover, the students should be able to design and apply biomarkers in Environmental Risk Assessment Programmes that include the biomonitoring of different areas.
16.	**Summary of Course Content:** - Sources of environmental contamination. Implications in human risk. - Environmental Risk Assessment. Monitoring tools. - Sensitive tools for the assessment of environment and human risk: biomarkers. - Types of biomarkers. Applications and limitations of the use of biomarkers for biomonitoring: a regulatory framework.
17.	**Key Skills Taught:** Ecotoxicology. Biochemistry. Communication skills.

18.	**Assessment Methods:** Students will need to select an anthropogenic source of contamination in the environment and a research article where biomarkers had been selected for monitoring of this source of contamination. They will have to analyse the research work : -Describing the state of research of the selected source of contamination and the possible adverse effects. Justify and define your main aims. - Explaining the research work. Defining the areas of study and the methodology chosen: species (depending on what you want to assess sediment, water), biomarkers (exposure, effects depending on the source of contaminants: metals, organic compounds). - Discussing the particular input the biomarkers selected and the information that they could provide in the environment risk assessment. - Analysing the research answering these questions: Would you use another battery of biomarkers? Is the study performed in a proper way taking into consideration the variability of biomarkers? Would you use other species? This approach will be presented by the student in a 5 min oral presentation.
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)

Aguirre-Martinez GV, Buratti S, Fabbri E, DelValls TA, Martin-Diaz ML. 2013a. Using lysosomal membrane stability of haemocytes in Ruditapes philippinarum as a biomarker of cellular stress to assess contamination by caffeine, ibuprofen, carbamazepine and novobiocin. J Environ Sci China 25: 1408-1418.

Aguirre-Martinez GV, Buratti S, Fabbri E, DelValls TA, Martin-Diaz ML. 2013b. Stability of lysosomal membrane in Carcinus maenas acts as a biomarker of exposure to pharmaceuticals. Environ Monit Assess 185: 3783-3793.

Aguirre-Martinez GV, DelValls TA, Martin-Diaz ML. 2016. General stress, detoxification pathways, neurotoxicity and genotoxicity evaluated in Ruditapes philippinarum exposed to human pharmaceuticals. Ecotox Environ Saf 124: 18-31.

Blaise C, Gagné F, Pellerin J, Hansen PD.1999. Measurement of a vitellogenin-like protein in the hemolymph of Mya arenaria (Saguenay Fjord, Canada): A potential biomarker for endocrine disruption. EnvToxicol 14:4 55–465.

Blaise C, Trottier S, Gagné F, Lallement C, Hansen P-D.2002. Immunocompetence of bivalve hemocytes as evaluated by a miniaturized phagocytosis assay. Environ Toxicol. 17: 160–169.

Bolognesi C. 1990. Carcinogenic and mutagenic effects of pollutants in marine organisms: a review. In Grandjean E (ed), Carcinogenic, mutagenic, and teratogenic marine pollutants: impact on human health and the environment, Portfolio Publishing Company, The Woodland, TX, USA, pp 67-83.

Bolognesi C, Rabboni R, Roggieri I. 1996. Genotoxicity biomarkers in M. Galloprovincialis as indicators of Marine Pollutants. Comp Biochem Phys C 2: 319-323.

Gagné F, Blaise C, Pellerin J, Pelletier E, Douville M, Gauthier-Clerc S, Viglino L. 2003. Sex alteration in soft-shell clams (Mya arenaria)in an intertidal zone of the St. Lawrence River (Québec, Canada). Comp Biochem Phys C 134: 89–198.

Viarengo A, Lowe D, Bolognesi C, Fabbri E, Koehler A. 2007. The use of biomarkers in biomonitoring: a 2-tier approach assessing the level of pollutant-induced stress syndrome in sentinel organisms. Comp Biochem Physiol C 146:281–300.

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 “Chemical analysis of water quality”

22. **Start Date:**

April, First Year, Second Semester

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

Yes