FORM FOR SUBMISSION OF MODULE FOR A EUROPEAN JOINT MASTERS

1.	**Module Title:** Invasive Alien Species
2.	**Module Code:** (not necessary yet)
3.	**Maximum Number of Students:** not applicable
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 10 Hours (a) Laboratories or Practicals 5 Hours (a) Other (computer workshops) Hours Other (private study) 36 Hours (b) **Teaching Strategy:** Lectures – Workshops – Tutorials – Fieldwork whenever possible
7.	**Convener:** Ph. D. Ignacio Hernández, Professor, Division of Ecology (module coordinator) Ph. D. Macarena Ros. Postdoctoral researcher, Division of Ecology. Ph. D. Juan García de Lomas. Honorary colaborator, Department of Biology Ph. D. Maria Altamirano, Permanent Lecturer in Botany (external) Ph. D. Antonio Román, Lecturer in Botany (external)
8.	**Institution:** University of Cadiz / Agencia de Medio Ambiente y Agua de Andalucía (AMAYA)/ University of Malaga
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:** European Joint Masters in Water and Coastal Zone Management
14.	**Module Description - The Purpose or Aims:** Invasive Alien Species is a WACOMA course aiming at providing knowledge on the causes and consequences of the introduction of organisms to geographical areas outside their native range, as well as monitoring and mitigating strategies. Invasive alien species are recognized as one of most serious threats to biodiversity, and thus to ecosystem services, human health and livelihood. Interest in this topic has exponentially increased among ecologists, environmental managers and policy makers during the last years. How organisms move around the world, why some species become invasive, the ecological and economic impacts, and the management of alien species are key questions that will be examined in the Invasive Alien Species WACOMA modules. The module will consist of four units, beginning with a general overview and history of invasions science and finishing with examples of real management/eradication of invasive species, covering all the stages of the invasion process, from their introduction to the ecological and economic impacts.
15.	**Learning Outcomes:** The Invasive Alien Species (IAS) Course at WACOMA is expected to contribute to students understanding of Alien species from a fundamental ecological and applied perspective, and at different levels of biological organization, from populations and communities to ecosystem functioning. Upon completion of this course, students should be able to: - Explain the history of the invasion science, from the pioneering work of Charles *Elton.* - Describe the theoretical bases of Invasion Biology. - Analyse the main introduction pathways, mechanisms and impacts of biological invasions. - Critically evaluate social, economic and ecological issues surrounding alien species. - Apply different tools for managing invasive species. - Search scientific papers in the main databases such as Web of Science or Google Scholar - Synthesize and orally expose relevant studies related to IAS from the literature. Students should be able to apply this knowledge in a variety of scenarios (e.g., research, management, policy making, education, conservation)

16.	**Summary of Course Content:** 1. Introduction to Biological Invasions. 1.1 Basic ecological concepts. 1.2 Invasion dynamics. 1.3 Vectors. 2. Monitoring key alien species: field survey in a hotspot for marine species introductions. 3. Invasive species impacts. 3.1 From species to ecosystem functioning 3.2. Invasive species in multi-stress scenarios 3.2. Evolutionary impact of invasive species 4. Management of Biological Invasions. 4.1. Decision making. Invasion risk analysis schemes. Protocols for selecting and prioritizing feasible actions. 4.2. Management strategies. Effective methods to manage plants and animals. Case studies. 4.3. International and National Regulations. Black and white lists.
17.	**Key Skills Taught:** - Development of a critical point of view about biological invasions in the context of global change. - Ability to apply theoretical concepts of biological invasions to practical cases. - Use of decision-making protocols related to detect potentially invasive species. - Use of decision-making protocols towards the selection of feasible actions related to eradicate, contain or control invasive alien species in the field. - To discern the strengths and weaknesses of current regulation approaches to slow down the introduction and spread of invasive alien species. - To select effective, selective control methods for a variety of invasive animals and plants aiming at recovering the invaded native ecosystem.
18.	**Assessment Methods:** Short-lectures. Each student will give a short lecture (5-10 min) synthesizing a paper dealing with some of the main subjects included in the course. The students could discuss with the lecturers about possible articles to select and should send the paper at least one week before their oral presentation.

19. **Assessment Criteria:**

A successful candidate should have or be able to do the following:

Threshold

A basic understanding of the Invasive Alien Species as part of the global change and a source of impacts for biodiversity, human health and livelihood.

Good

A good understanding of the processes, pathways and mechanisms related to biological invasions. A good ability to select effective, selective methods to manage invasive alien species. A good knowledge of the protocols that can be of help for decision-making in bioinvasion management and the main regulation approaches, with some reference to independent literature data and results.

Excellent

A good to excellent understanding of the processes, pathways and mechanisms related to biological invasions. A good to excellent ability to select effective, selective methods to manage invasive alien species. A good to excellent knowledge of the protocols that can be of help for decision-making in bioinvasion management and the main regulation approaches, 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)

Elton, C. S. (2000). *The ecology of invasions by animals and plants*. University of Chicago Press.

Ruiz, G. M. & Carlton, J. T. (Eds.). (2003).Invasive Species: Vectors and Management Strategies. Island Press, Washington, United States of America, ISBN 1-55963-903-2.

Richardson, D. M. (Ed.). (2011). *Fifty years of invasion ecology: the legacy of Charles Elton*. John Wiley & Sons.

Vitousek, P. M., Antonio, C. M., Loope, L. L., & Westbrooks, R. (1996). Biological invasions as global environmental change. *American scientist*, *84*(5), 468.

Olden, J. D., Comte, L., & Giam, X. (2018). The Homogocene: a research prospectus for the study of biotic homogenisation. *NeoBiota*, *37*, 23García-de-Lomas, J., Vilà M., 2015. Lists of harmful alien organisms: Are the national regulations adapted to the global world? Biological Invasions 17, 3081–3091.

Pimentel, D., Zuniga, R., Morrison, D., 2005. Update on the environmental and economic costs associated with alien-invasive species in the United States. Ecological Economics 52, 273–288.

Catford, J.A., Jansson, R., Nilsson, C., 2009. Reducing redundancy in invasion ecology by integrating hypotheses into a single theoretical framework. Diversity Distrib 15, 22–40

Specific Resource Implications for Students:

21.	**Does this module replace existing provision? If so, please indicate modules to be replaced:** The module fits in the area of "Biology of aquatic organisms"
22.	**Start Date:** First year, second semester
23.	**Is it intended that the module be available every year?** Yes