



IDENTIFYING DATA

Global Change and Marine Ecosystems

Subject	Global Change and Marine Ecosystems			
Code	V10M153V01208			
Study programme	Máster Universitario en Oceanografía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	1st	2nd
Teaching language	#EnglishFriendly Spanish Galician English			
Department				
Coordinator	Sobrino Garcia, Maria Cristina			
Lecturers	Álvarez Salgado, Xose Antón González Castro, Bernardino Martínez García, Sandra Sobrino Garcia, Maria Cristina Teira Gonzalez, Eva Maria			
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General description	The subject is focused to the study of the main processes of global change that affect to the biology of the ocean in different levels of organisation. For this *desglosa the results of observational and experimental studies directed to determine the effect of the global change on populations, communities and marine ecosystems, by means of masterclasses, practices of laboratory, resolution of practical cases and seminars.			

Training and Learning Results

Code	
A2	Students who can apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study
A4	Students who can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and nonspecialist audiences clearly and unambiguously
A5	Students who have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous.
B1	The students will understand in a detailed and based form the theoretical and practical aspects and the work methodology of the oceanography
B2	The students will interpret the behaviour of the global oceanic system and their controlling factors.
B3	The students will be able to deepen in the main oceanographic processes and their spatiotemporal scales
B5	The students will be able to develop the sufficient autonomy to participate in research projects and scientific collaborations, especially in interdisciplinary contexts
C1	The students will be able to obtain advanced and relevant knowledge, of skilled and multidisciplinary character, in the field of the oceanography and their application to the marine environment
C3	The students will analyse situations and specific oceanographic conditions related with the global change
C4	The students will be able to apply in the practice the obtained knowledge and issue resolutions and judgments in the different oceanography fields
D1	The students will know and will be able to apply the scientific method in the academic and research fields.
D2	The students will possess the handle skills in the laboratory that allow them to develop autonomous work.
D3	The students will be able to communicate the obtained information and their conclusions in a effective way to the general public, to other scientists and to the competent authorities, listening and answering of effective form and, using an appropriate language to the audience and to the context
D4	The students will be able to understand the need and obligation to perform a continuous training, to a large extent autonomous, for the scientific development, updating the knowledges, skills and attitudes of the professional competences along the life.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
The students will learn the importance of the human effect on the biogeochemical processes to scale global and temporary scales, its repercussions for the marine environment and the sustainability of the ecosystems.	A5 B3 B5 D1 D4
The students will work their skills to express the ideas and knowledge about the topic by oral and written communications.	A2 A4 B2 B3 C3 C4 D3
The students will learn laboratory or field methodologies that will help them to interpret the results showed in the scientific publications related with the field of the Global Change	B1 C1 D2

Contents	
Topic	
SUBJECT 1.	Introduction and reflections to start with a course of global change.
SUBJECT 2.	Global change versus climatic change. Natural environmental variability and antropogenic. The biology of the ocean under global change: answers to different levels of organisation. Multiple factors of stress. Adaptation and acclimation.
SUBJECT 3.	Temperature and nutrients in the context of the global change. Metabolic theory of the ecology.
SUBJECT 4	Effect of the degradation of ozone layer and the increase of the UV radiation on the marine ecosystems. The ozone cycle. UVR penetration in the aquatic environment. Photodegradation and photo inhibition. Direct and indirect effects of UV radiation on marine organisms.
SUBJECT 5.	Impact of the global change on the oxygen cycle in the oceans: expansion of the suboxic and anoxic zones.
SUBJECT 6.	Impact of the global change on the carbon cycle in the oceans: storage of antropogenic carbon and acidification. Effect of CO2 increase on marine organisms and ecosystem
SUBJECT 7.	Impact of the global change on the nitrogen and phosphorus cycles: antropogenic fertilisation by atmospheric and continental drivers.
SUBJECT 8.	Impacts of the global change in the structure and operation of the planktonic communities. Distribution and abundance of functional key groups. Changes in the structure of the communities and in food webs. Interdecadal trends in primary production.
SUBJECT 9.	Fisheries overexploitation. The magnitude of fishing. Effect of fishing on populations and ecosystem. Overexploitation: types, causes and solutions. Overexploitation and the future of fishing.
SUBJECT 10.	Impact of global change on coastal ecosystems. Effects on benthic communities.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	26	26	52
Seminars	6	22	28
Problem solving	0	6	6
Laboratory practical	9	9	18
Seminars	4	4	8
Presentation	4	8	12
Objective questions exam	1	0	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Exhibition by part of the professor of the concepts but notable of the matter.

Seminars	Work of practical character guided by the professor. It can have individual character or of group. The communication of scientific works in international congresses
Problem solving	Resolution of a practical case: Impact of the global change in the Estuary of Vigo.
Laboratory practical	Laboratory practical classes:
	1) Determination of metabolic taxes: phytoplankton primary production. Photosynthesis-Irradiance curves 2) Multivariate statistical techniques
Seminars	Group tutorials to supervise the work that has to be defended at the end of the course. The students will have to show the advances and argue their proposals to the professor and the rest of the students.
Presentation	Oral defense of a topic related to the subject. The topic will be chosen by the student. The defence of the work will consist of roughly 15 min presentation supported by computer (i.e. power point or similar) and discussion of the main questions made by the professor and/or students. A written report of the work can be required if necessary.

Personalized assistance

Methodologies	Description
Lecturing	The student that wish to be attended in a one-to-one tutorial will be scheduled between 13:00 and 15:00 h. The student shall previously contact the corresponding professor by email.
Seminars	The student that wish to be attended in a one-to-one tutorial will be scheduled between 13:00 and 15:00 h. The student shall previously contact the corresponding professor by email.
Problem solving	The student that wish to be attended in a one-to-one tutorial will be scheduled between 13:00 and 15:00 h. The student shall previously contact the corresponding professor by email.
Laboratory practical	The student that wish to be attended in a one-to-one tutorial will be scheduled between 13:00 and 15:00 h. The student shall previously contact the corresponding professor by email.
Seminars	In group.

Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	It will be scored with a written test.	30	A5	B3	C1	D4
Seminars	Presentation of an oral communication to congress (poster).	20	A2	B2 B3 B5	C1 C4	D1 D3
Problem solving	Presentation of report with results of a practical case.	20			C1 C3 C4	
Laboratory practical	It will be scored with a written test.	10			C1 C4	
Presentation	Preparation and presentation of a scientific work related with the subject. The follow-up of the work will do by means of tutorías in group and the evaluation will make in base to the contribution and implication of the students during the tutorías in group, the quality of the work written and the oral presentation of the same.	20	A5	B2 B3	C1 C3	D1 D3

Other comments on the Evaluation

The evaluation of the theoretical (masterclasses) and practical (practices of laboratory) knowledge attained by the students will be carry out in one written test. It is mandatory to obtain a minimum note of 5/10 in every methodology to pass the subject.

The date of the written test will be published in <http://masteroceanografia.com/horarios/>

All tests can be evaluated on the second chance.

It is required taht all the students that course this matter have a responsible and honest behaviour. It is considered inadmissible any form of fraud (copy or plagiarism) directed to falsify the level of knowledge and skills reached in all type of proof, report or work. The fraudulent behaviours will suspend the subject during a complete course. An internal register will be carried out and a disciplinary file can be open in case of recurrence.

Sources of information

Basic Bibliography

Intergovernmental Panel on Climate Change (IPCC), **Fifth assessment report (Climate Change 2014: Synthesis Report)**, 2014

Hilborn, R. and Hilborn, U., **Overfishing. What everyone needs to know**, Oxford University Press, 2012

Gattuso & Hansson, **Ocean acidification**, Oxford University Press, 2011

Bode et al., **Cambio climático y oceanográfico en el Atlántico del norte de España**, Instituto Español de Oceanografía, 2012

Complementary Bibliography

Barange et al., **Marine ecosystems and global change**, Oxford University Press, 2010

Zeebe & Wolf-Gladrow, **CO₂ in seawater: equilibrium, kinetics, isotopes.**, Elsevier Oceanography Series, 2005

Recommendations

Subjects that are recommended to be taken simultaneously

Atmosphere-Ocean Interaction/V10M153V01207

Palaeoclimatology and Paleoceanography/V10M153V01206

Subjects that it is recommended to have taken before

Biological Oceanography/V10M153V01CF103

Physical Oceanography/V10M153V01CF101

Chemical Oceanography/V10M153V01CF102
