



(*)Facultade de Bioloxía

Presentación

<http://bioloxia.uvigo.es/en/faculty/presentation>

Dean Team

(*)
<http://bioloxia.uvigo.es/gl/facultade/equipo-decanal>

Web

<http://bioloxia.uvigo.es/en/>

(*)Máster Universitario en Bioloxía Mariña

Subjects

Year 1st

Code	Name	Quadmester	Total Cr.
V02M098V01101	The Marine Environment: Physical Oceanography	1st	3
V02M098V01102	Marine Botany	1st	3
V02M098V01103	Marine Zoology	1st	3
V02M098V01104	Marine Microbiology	1st	3
V02M098V01105	Marine Ecology	1st	3
V02M098V01106	Physiology of Marine Organisms	1st	6
V02M098V01107	Molecular Basis of Adaptation to the Marine Environment	1st	3
V02M098V01108	Techniques to Study Marine Organisms	1st	3
V02M098V01109	Experimental Design and Information Resources	1st	3
V02M098V01201	Sampling Techniques for Identification of Marine Organisms and Communities	2nd	6
V02M098V01202	Cartography, GIS and Remote Sensing	2nd	3
V02M098V01203	Environment Management: Socio-economics, Environmental Education and Legislation	2nd	3

V02M098V01204	Conservation Biology	2nd	3
V02M098V01205	Genetic Diversity and its Application to Study of Marine Organisms	2nd	6
V02M098V01206	Marine Pollution and Ecotoxicology	2nd	3
V02M098V01207	Biology of Exploited and Potentially Exploitable Species	2nd	6
V02M098V01208	Evaluation and Exploitation of Coastal Resources	2nd	3
V02M098V01209	Fishery and Exploitation of Fishery Products	2nd	3
V02M098V01210	Spatial Statistics and Modelling	2nd	3
V02M098V01211	Invasive Species and Fouling	2nd	3
V02M098V01212	Biology of the Development of Marine Organisms	2nd	3
V02M098V01213	Toxicity and Detoxification Mechanisms of Xenobiotic Compounds	2nd	3
V02M098V01214	Marine Genomics	2nd	3

Year 2nd

Code	Name	Quadmester	Total Cr.
V02M098V01301	Internships	1st	18
V02M098V01302	Final Year Dissertation	1st	12

IDENTIFYING DATA				
The Marine Environment: Physical Oceanography				
Subject	The Marine Environment: Physical Oceanography			
Code	V02M098V01101			
Study programme	(*)Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	García Estévez, José Manuel Rubal García, Marcos			
Lecturers	García Estévez, José Manuel Rubal García, Marcos			
E-mail	jestevez@uvigo.es mrubalg@hotmail.com			
Web				
General description	Main properties of the oceanic basins and the sediments that the ocean. Physical properties of the seawater. Chemical Properties of the seawater. The movements of the sea: the marine currents and the oceanic circulation; the waves; the tides. The coast: coastal waters and sea magins.			

Competencies

Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CE1	Conocimiento físico-químico del medio oceánico y costero
CE13	Divulgación de conocimientos de la biología y el medio marinos: programas de formación y docencia; planificación y dirección de acuarios, museos, centros de interpretación ambiental, parques naturales y espacios naturales protegidos
CE14	Elaboración, discusión, interpretación, asesoramiento y peritaje de informes científico-técnicos, éticos, legales y socioeconómicos relacionados con el ámbito marino y pesquero
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad
CT5	Desarrollo de las habilidades de comunicación y discusión de planteamientos y resultados

Learning outcomes

Learning outcomes	Competences
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Comprise the meaning of Oceanography and know the main sources of his knowledge.	CB1 CB2 CB3 CB5 CG1 CG2 CG5 CE1 CT1 CT2
Purchase knowledges on the main strokes of the oceanic basins and his evolution to the step of the time.	CB1 CB3 CB5 CG1 CG2 CE1 CT1 CT2 CT3
Understand the origin and distribution of the sediments and his relation with other oceanic processes.	CB1 CB2 CB3 CG1 CG2 CE1 CT1 CT2
Know the penetration of the solar radiation in coastal and oceanic waters.	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CE1 CT5
Explain the behaviour of the temperature and the salinity of the waters of the ocean.	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG5 CE1 CE13 CT1 CT2 CT5
Know the applications of the diagram T-S in the analysis of the masses of water.	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CE1 CT1 CT2 CT3

Purchase knowledges of the basic strokes of the oceanic circulation, superficial and subsuperficial, waves and tides.	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CE1 CE13 CE14 CT1 CT2 CT5
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Contents

Topic	
The OCEANOGRAPHY.	Concept and divisions. Historical development of the Oceanography.
The OCEANIC BASINS.	Origin and evolution of the oceans. The oceanic basins. The geological regions of the ocean. Geography of the current oceanic basins.
The OCEANIC SEDIMENTS.	Origin. Classification. Mechanisms of control of the accumulation of oceanic sediments. Distribution of the oceanic sediments.
PHYSICAL PROPERTIES OF THE WATER OF THE Mar.	Temperature. Salinity. Density. Solar radiation and illumination. Transparency and penetration of the light. Viscosity and superficial tension. Pressure. Propagation of the sound.
CHEMICAL PROPERTIES OF THE WATER OF THE Mar.	Chemical properties of the pure water. Chemical composition of the water of the mar. Classification of the chemical elements. Greater and lower constituents. Micronutrients. Gases dissolved. Organic matter.
The MOVEMENTS OF THE SEA: The MARINE CURRENTS And The OCEANIC CIRCULATION.	The marine currents. Types of currents. The oceanic circulation. Superficial circulation. Deep circulation. Circulation thermohaline and the big oceanic conveyor.
The MOVEMENTS OF THE SEA: The WAVES	Definition. Characteristics. Classification and types of waves. Origin of the waves. Interaction with the coast. Measurement and forecast of the wave regime. Energy of the waves and its usages. Biological importance of the waves.
The MOVEMENTS OF THE SEA: The TIDES	Definition. Characteristics. Origin of the tides. Explanatory theories. Classification of the tides. Oceanic tides and anfdrómic systems. Measurement and forecast of the tides. Energy of the tides and its industrial use. Biological importance of the tides.
The COAST: COASTAL WATERS And SEA MARGINS.	The COAST. Coastal terminology. Classification and development of the coast. Coastal waters and sea margins. Deep seas.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	15	35	50
Mentored work	5	10	15
Seminars	1	0	1
Presentation	1.4	5.6	7
Objective questions exam	2	0	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	Exposition of the main concepts of the course and approach of interactive activities, where the students will be able to formulate questions and comments
Mentored work	Destined interactive sessions to integrate and apply the knowledges purchased in the masterclasses
Seminars	Effective transmission of the experience of the professor to the student
Presentation	Development of the competitions that allow the put in practice of the oceanographic knowledges purchased

Personalized assistance

Methodologies Description

Lecturing	It attended the *totalas questions risen pole students in real time
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Mentored work It follows the *desenvolvemete of the work in the classroom of personal and interactive way

Presentation It helps *à presentation of the contained that owes to have a correct exhibition.

Assessment

	Description	Qualification	Evaluated Competences			
Lecturing	Continuous evaluation; Follow-up of the work of the student: Attendance and active participation in the classes and in the debates generated	10	CB1 CB2 CB3 CB4 CB5	CG1 CG2 CG5	CE1 CE14	CT1 CT2 CT3 CT5
Mentored work	Continuous evaluation: Assessment of the interest and competence in the resolution of practical cases	5				
Presentation	Continuous Evaluation: Assessment work carried out during the course	5				
Objective questions exam	Evaluation by written test	80				

Other comments on the Evaluation

In the second announcement to evaluation will realise by means of a proof written final, keeping the qualifications obtained in the activities evaluated positively along the course.

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

Other comments

It is recommended to work actively the subject in a continuous way during the course.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of the uncertain and unpredictable evolution of the sanitary alert caused by the *COVID-19, the University of Vigo establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or partially face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a more agile and effective way when being known in advance (or with a wide *antelación) by the students and the *profesorado through the tool normalised and institutionalised of the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===

* educational Methodologies that keep

All

* educational Methodologies that modify

Stage no face-to-face:

The methodologies (lesson *magistral, presentation, seminar and work *tutelado) will make of telematic form by means of *Moodle or similar platforms.

Stage partially face-to-face:

The methodologies (lesson *magistral, presentation, seminar and work *tutelado) will make of face-to-face mixed way and telematic using the platform mentioned in the previous point.

* Mechanism no face-to-face of attention to the students (*tutorías)

personalised Attention and *grupal (video, audio) when the students pose questions by means of *Moodle or similar platforms. It will use also the email for the personalised attention and in group.

* Modifications (if they proceed) of the contents to give do not proceed

* additional Bibliography to facilitate the car-learning does not proceed

* Other modifications

=== ADAPTATION OF THE EVALUATION ===

* Test already made
keep the *percentages

Lesson *magistral *Evaluacion continuous: Follow-up of the work of the student: Assistance and active participation in the classes *expositivas and debates generated in these : [previous Weight 10%] [Weight Proposed10%]

Work *tutelado *Evaluacion continuous: Assessment of the interest and competition in the resolution of practical cases : [previous Weight 5%] [Weight Proposed5%]

Presentation *Evaluacion continuous: Assessment work made : [previous Weight 5%] [Weight Proposed 5%]

Examination of objective questions Evaluation students : [previous Weight 80%] [Weight Proposed 80%]

* pending Proofs that keep
keep the *percentages

keep the *percentages

Lesson *magistral *Evaluacion continuous: Follow-up of the work of the student: Assistance and active participation in the classes *expositivas and debates generated in these : [previous Weight 10%] [Weight Proposed10%]

Work *tutelado *Evaluacion continuous: Assessment of the interest and competition in the resolution of practical cases : [previous Weight 5%] [Weight Proposed5%]

Presentation *Evaluacion continuous: Assessment work made : [previous Weight 5%] [Weight Proposed 5%]

Examination of objective questions Evaluation students : [previous Weight 80%] [Weight Proposed 80%]

* Proofs that modify

Any

* New proofs

Any

* additional Information

The presentations will make using *Moodle or analogous platform and the examination of questions of development in a no face-to-face stage will make by means of a questionnaire *Moodle or similar.

IDENTIFYING DATA				
Marine Botany				
Subject	Marine Botany			
Code	V02M098V01102			
Study programme	(*)Máster Universitario en Biología Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	García Estévez, José Manuel Peña Freire, Viviana			
Lecturers	García Estévez, José Manuel López Rodríguez, María del Carmen Peña Freire, Viviana			
E-mail	jestevez@uvigo.es vpena@udc.es			
Web				
General description	(*)Estudio de los principales organismos (fitoplancton y fitobentos) que se desarrollan en el medio marino, así como de los factores que condicionan su distribución.			

Competencies	
Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
CG6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
CE2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
CE3	Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros
CE7	Catalogación, evaluación, conservación, restauración y gestión de áreas marinas y litorales protegidos. Elaboración, asesoramiento legal y ejecución de planes de ordenación del litoral
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma
CT5	Desarrollo de las habilidades de comunicación y discusión de planteamientos y resultados

Learning outcomes	
Learning outcomes	Competences
New	CB1 CB3 CB4 CG6 CT1
New	CG1 CE2 CE3 CE7
New	CB2 CE7 CT1 CT5

Contents

Topic	
Generalities	Subject 1. Marine habitat. Introduction and general characters. Influential environmental factors in the photosynthetic organisms: light, temperature, substrata, hidrodinamism, tides, salinity, pH, nutrients and pollution. Interactions between organisms: predation, simbiosis, epibiosis, endobiosis, parasitism. Subject 2. Phytoplankton. General characters, importance, floristic groups and populational dynamics. Subject 3. Fitobentos. General characteristics of their communities. Classification of benthic organisms according to substrata. Adaptations to the habitat conditions. Morphological diversity, life histories, biological types and vital forms.
Diversity	Subject 4. Descriptive and systematic of red seaweeds (Rhodophyta): main groups and characteristic species. Subject 5. Descriptive and systematic of Brown seaweeds (Ochrophyta): main groups and characteristic species. Subject 6. Descriptive and systematic of green seaweeds (Chlorophyta): main groups and characteristic species. Subject 7. Descriptive and systematic of other benthic organisms: Cyanophyta, seagrass, fungi and lichens: main groups and characteristic species.
Ecology and biogeography	Subject 8. Ecology of the fotobent. Distribution of the marine organisms: vertical or zonation, temporal and spatial sucession. Diagrams of zonation of the seaboard and his nomenclature. Subject 9. Biogeography. Definition, methodology and indexes. Factors that influence in the distribution of the marine vegetables: temperature and latitude. Subject 10. Marine vegetation in the Atlantic North and Mediterranean. Subject 11. Marine vegetation of the Iberian Peninsula and of Galicia. Exposed coasts, semiexposed and protected sites. Diversity, descriptive and zonation.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	12	18	30
Seminars	8	24	32
Seminars	2	2	4
Mentored work	0	9	9

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	FACE-TO-FACE CLASSES FOR EXHIBITION, BY PART OF THE PROFESSOR, OF THE CONTENTS OF THE MATTER And THE DEVELOPMENT OF THE *TEMARIO, EXPLANATION OF CONCEPTS And APPROACH OF THE SEMINARS.
Seminars	AUTONOMOUS WORK OF THE STUDENT FOR THE STUDY And ASSIMILATION OF THEORETICAL And PRACTICAL CONCEPTS, AS WELL AS FOR THE RESEARCH OF INFORMATION And BIBLIOGRAPHY FOR THE REALISATION OF THE WORKS RELATED WITH THE SEMINARS.
Seminars	You INTERVIEW WITH THE *PROFESORADO FOR THE ADVICE And DEVELOPMENT OF THE ACTIVITIES OF THE MATTER IN THE PROCESS OF THE LEARNING.

Mentored work	WORKS/DOCUMENTS/INFORMATION ELABORATED BY THE STUDENT, OF AUTONOMOUS WAY, FOR THE DEVELOPMENT OF THE SEMINARS. ALWAYS, UNDER THE GUIDELINES OF THE PROFESSOR IN WHAT it CONCERNS To THEMATIC, QUESTIONS To DEVELOP And USES OF SOURCES OF INFORMATION.
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Personalized assistance

Methodologies Description

Seminars	It will attend to the students personally via face-to-face in the classroom, by telematic systems and by email, as well as in the office (Monday to Wednesday (4 to 6 p.m.).
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Assessment

	Description	Qualification	Evaluated	Competences
Lecturing	Evaluation by means of an objective proof written that will include ask type test, definitions, short questions and subjects to develop.	70	CB2 CB3 CB4	CG1 CG2 CE2 CE3 CE7 CT1 CT5
Seminars	Evaluation of the attitude and the degree of participation (asks/answer) by part of the student in each one of the seminars.	20	CB1 CB2 CB3 CB5	CG1 CG2 CG6 CE7 CT4
Mentored work	Evaluation of the content and quality of the work realised by the student in the thematic of the seminars.	10	CB2 CB4	CG6 CT1 CT5

Other comments on the Evaluation

It will necessary to obtain a mark of 5 over 10 in the exam.

Sources of information

Basic Bibliography

Complementary Bibliography

Lobban, C.S. & P.J. Harrison, **Seaweed ecology and physiology**, 1994
 Graham, L. E., J. M Graham & L. W. Wilcox, **Algae**, 2009
 Dawes, C.J., **Marine Botany**, 1997
 Lüning, K., **Seaweeds their environment, biogeography and ecophysiology**, 1990
 Reviere, B de, **Biologie et phylogénie des algues, tome 1, 2**, 2002, 2003
 Hoek, C. van den, D.G. Mann, H.M. Jahns, **Algae: An Introduction to phycology**, 1995
 Guiry & Guiry, <http://www.algaebase.org/>, 2020
 Green, E.P. & F.T. Short, **World Atlas of Seagrasses**, 2003
 Guillén, J.E., Ruiz, J.M, Otero, M, Díaz-Almela, E., **Atlas de las praderas marinas de España**, 2015
 Hurd, C.L., P.J. Harrison, K. Bischof & C.S. Lomman, **Seaweed Ecology and Physiology**, Cambridge, 2014

Recommendations

Subjects that continue the syllabus

Biology of Exploited and Potentially Exploitable Species/V02M098V01207
 Invasive Species and Fouling/V02M098V01211
 Sampling Techniques for Identification of Marine Organisms and Communities/V02M098V01201

Subjects that are recommended to be taken simultaneously

Marine Ecology/V02M098V01105
 Physiology of Marine Organisms/V02M098V01106
 Marine Zoology/V02M098V01103

Other comments

To know general aspect of Botany and Phycology (diversity, systematic, reproductions, life histories).

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in

advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

None

* Teaching methodologies modified

Non-face-to-face scenario: all (master class, seminars and supervised work) will be carried out telematics

Partially face-to-face scenario: all (master class, seminars and supervised work) will be carried out in a mixed face-to-face and telematic way

* Non-attendance mechanisms for student attention (tutoring)

Microsoft Teams or Forms: Teaching telematic teaching. Personalized and group attention (video, audio or chat) when students raise questions; also on demand from teachers.

Moodle: Repository of documents and teaching aid, also for information and communication with the students through the forum. In parallel, Dropbox will be used to share documents.

Email: Personalized and group attention to questions required by students, as well as teacher notifications

* Modifications (if applicable) of the contents

Not applicable.

* Additional bibliography to facilitate self-learning

Not necessary because it will be uploaded in pdf to the document repository.

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

The percentages are maintained because the subject has no practical part and the theory can be taught and evaluated electronically.

Master class: [Previous weight 70%] [Purpose Weight 70%]

Seminar: [Previous weight 20%] [Purpose Weight 20%]

Supervised work: [Previous weight 10%] [Purpose Weight 10%]

* Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

The percentages are maintained because the subject has no practical part and the theory can be taught and evaluated electronically.

Master class: [Previous weight 70%] [Purpose Weight 70%]

Seminar: [Previous weight 20%] [Purpose Weight 20%]

Supervised work: [Previous weight 10%] [Purpose Weight 10%]

* Tests that are modified

[Previous test] => [New test]

None.

* New tests

Not applicable.

* Additional Information

IDENTIFYING DATA				
Marine Zoology				
Subject	Marine Zoology			
Code	V02M098V01103			
Study programme	(*)Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish Galician			
Department				
Coordinator	García Estévez, José Manuel Veiga Sánchez, María Purificación			
Lecturers	García Estévez, José Manuel Rubal García, Marcos Veiga Sánchez, María Purificación			
E-mail	jestevez@uvigo.es puri.sanchez@fc.up.pt			
Web				
General description	In this matter expose : - The models of organisation of the main groups of marine animals .- The morphological diversity and the adaptations to the different habitats, ways of life, feeding and reproduction. - The systematic of the main groups. - The fauna of the *sustratos rocky and **sedimentarios of the coastal and deep systems.			
Competencies				
Code				
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.			
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.			
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.			
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.			
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.			
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos			
CG6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad			
CE2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas			
CE14	Elaboración, discusión, interpretación, asesoramiento y peritaje de informes científico-técnicos, éticos, legales y socioeconómicos relacionados con el ámbito marino y pesquero			
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis			
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico			
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma			
CT7	Desarrollo de habilidades para la divulgación de ideas en contextos tanto académicos como no especializados			
Learning outcomes				
Learning outcomes				Competences
*Knowledge of wool *diversity of marine *organisms *and *his *adaptative *strategies				CB1 CB2 CG1 CT1 CT2
New				CB1 CB2 CG1 CE2 CT1 CT2

New	CB1 CB2 CG1 CE2 CT1 CT2
New	CB1 CB2 CG1 CE2 CT1 CT2
New	CB1 CB2 CG1 CE2 CT1 CT2
New	CB1 CB2 CB3 CB4 CB5 CG1 CG6 CE2 CE14 CT1 CT2 CT4 CT7

Contents

Topic

Architectural patterns of the animals.	The form and the corporal design like adaptation to the means **bentónico and **pelámico . Colonial forms and **gregarias . The skeletal *structures . The movements. Systems of defence. **Coloracións . Shelters and territoriality. Interspecific *relations . The feeding. The asexual *reproduction .
**Poríferos	The *individualisation . The *sustrato and the **hidrodinamismo like *determinantes of the corporal form. The skeletal *trainings . The leak like way of life. Evolution of the types of organisation second the internal circuit of water. Asexual *and sexual reproduction.
*Metazoan **diblasticos	**Cnidarios . You form them *polyp and *jellyfish . Exclusive cells: the **cnidocitos . Classification.- **Hidrozoos . Individual and colonial forms. Colonies **hidroides **peláticas . **Hidromedusas . Colonies **peláticas mixed. Special structures for the *flotation , the trip and the capture of the food.- **Cubozoos .- **Escifozoos . Structure. The *swimming by **pulsacións **natatorias .- **Antozoos . Structure. Solitary forms, colonial and **pseudocoloniales . Colonies corneas. The coral reefs.- **Ctenóforos .
*Metazoan **triblasticos	**Turbelarios . **Gnatostomúlidos . **Gastrotricos . **Quinorrincos . **Nematodes . **Nemertinos . **Priapúlidos . **Caracteres Singular . Ways of life. Ecology.
Molluscs	Mantle, cavity **paleal and *radula .- **Solenogastros . **Caudofoveados . **Monoplacóforos . **Poliplacóforos . **Caracteres Singular . Ways of life. Ecology.- *Gasteropods . The ventilation **paleal . The *solidez of the *gusanillo *asymmetric . The reduction of the shell in the **Opisthobranchios . *Locomotion , *swimming and *flotation . Feeding. The put.-Bivalve. The shell. The mantle. The *ornamentación . The feeding. The **sifóns and the welding of the mantle. Mechanisms of burial, fixation and **retropropulsión . Bivalve **epifáunicos , **perforadores and **xilófagos .- **Escafópodos . **Caracteres Singular . Ways of life. Ecology.- Cephalopods. The shell. The *swimming . The capture of the preys. The courtship and the posture.

*Annelids **Poliquetos	The corporal model generalised. The *locomotion **parapodial. The *elytrons. The movements *excavadores. **Poliquetos **tubícolas, **perforadores, **intersticiais and **simbiontes. The **depredación. **Sedimentívoros No **seletivos and **seletivos superficial and **subsuperficiais. The leak.
**Sipuncúlidos. **Equiúridos	**Carácteres Singular. Ways of life. Ecology.
Crustaceans	Generalities: the corporal regionalisation and the appendix **birrámeo.- **Remípedios, **Cefalocáridos, **Maxilópodos. **Carácteres Singular. Ways of life. Ecology.- **Malacostráceos: **Filocáridos And **Eumalacostráceos. The *swimming **pleopodal and the fan discharge. Forms **reptantes: caves and shelters. Territoriality. **Decápodos **Braquiuros And **Anomuros: adaptative *diversity.
**Lofóforados	**Briozoos. Colonies **estoloniais, **incrustantes, **arbusculares and **foliáceas. Colonies **estenolaemadas, **ctenostomadas and **quilostomadas. **Avicularias And **vibracularias. The colonial growth. The *protrusion of the **lofóforo. The feeding.- Quotation of **Foronídeos, **Braquiópodos and **Ectoproctos. **Quetognatos. **Carácteres Singular. Ways of life. Ecology.
*Echinoderms	The *shell **dermatoesquelético, the *symmetry and the orientation.- **Asteroídeos. The system **ambulacral. The burial. The carnivorous *feeding.- **Ofiuroídeos. The *locomotion **braquial. The burial. The feeding.- **Equinoídeos. The *shell: regular and irregular hedgehogs. The feeding **raspadora: the *torch of **Aristótele. The *excavation. The feeding **sedimentívora: spines and podiums.- **Holoturoídeos. The corporal orientation: **bivio and *trivium. The different ways of life: buccal podiums. The feeding **suspensívora, **detritívora and **sedimentívora. The *tubules of **Cuvier.- Quotation of **Crinoídeos.- **Hemicordados. **Tunicados. **Carácteres Singular. Ways of life. Ecology.
Cefalocordados. Vertebrates	The **esqueleto *axial: **notocorda and vertebral column.- **Condrictios. *Swimming by waves of **contracción. The stability, direction and control of the *swimming. The predatory feeding.- **Osteíctios. The *swimming. Alimentary diets. The feeding *rapaz and **planctívora. Social behaviour. Cares **parentais.- Mammalian *Cetáceos. Modifications of the plan of organisation **mamaliano for the aquatic life. Adaptation to the variations of hydrostatic *pressure: **narcose and *decompression. The feeding **planctívora (Mistacocetos). The carnivorous *feeding (**Odontocetos). The **ecolocación. Communication and social behaviour.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	12.5	37.5	50
Mentored work	4	8	12
Presentation	2	6	8
Seminars	2	0	2
Essay questions exam	3	0	3

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	Kinds *presenciais stop the exhibition by part of the Professor of the contained of the *temario of theory.
Mentored work	Practices varied (*pizarra, problems, computer) in the that employ tools *manipulativas own of the subject.
Presentation	Presentation and debate of the contained and of the resulted of works developed pole student.
Seminars	*Titorías Customized. Resolution to the students of doubts envelope the theoretical content of the subject.

Personalized assistance

Methodologies	Description
Seminars	Resolution to the students of doubts envelope the theoretical content of the subject
Presentation	It helps @perante orientation of the @docente to the correct design of the exhibitions, the *dicción and the defence of the works *expositivos.

Assessment

	Description	Qualification	Evaluated Competences			
Mentored work	(*)Avaliarase tanto a asistencia como a actitude nas leccións maxistras.	15				CT1 CT2
Presentation	Proof of presentation of works designed pole professor, generally developmental of the characteristics of the *taxons *estudiados.	35	CB4 CB5			CT2 CT4 CT7
Essay questions exam	Evaluation written: it will evaluate by means of examination writing to acquisition of the theoretical concepts contents in the program of the subject.	50	CB1 CB2 CB3 CB4 CB5	CG1 CG6	CE2 CE14	CT1 CT2 CT4 CT7

Other comments on the Evaluation

In the second call, the evaluation will be done with a final test, considering the continuous evaluation along the course.

Sources of information

Basic Bibliography

Complementary Bibliography

- Barnes, R.D., **Zoología de los invertebrados.**, 1989,
 Barnes, R.S.K., Callow, P., Olive, P.J.W., Golding, D.w. & Spicer, J.J., **The invertebrates: a synthesis.**, 2001,
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 Castro, P. & M.E. Huber., **Biología marina.**, 2007,
 Cognetti, G., Sará, M. & G. Magazzú., **Biología marina.**, 2001,
 Díaz, J.A. & Santos, T., **Zoología: aproximación evolutiva a la diversidad y organización de los animales.**, 1998,
 Fuente, J.A. de la, **Artrópodos. I: características generales.**, 1982,
 Hickman, C.P., Roberts, L.S. & Larson, A., **Principios integrales de Zoología.**, 2009,
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 Mader, S.S., **Biología.**, 2008,
 Moutou, F., **Los mamíferos en su medio.**, 1993,
 Varios Autores., **Galicia. Natureza. Zooloxía. Tomo XXXVII: Zooloxía I; Tomo XXXVIII: Zooloxía II; Tomo XXXIX: Zooloxía III; Tomo XL: Zooloxía IV.**, 2002,
 Ruppert, E.E. & Barnes, R.D., **Zoología de los invertebrados.**, 1996,
 Young, J.Z., **La vida de los vertebrados.**, 1985,
 Hondt, J.L.d', **Les invertebrés marins méconnus**, 1999,
 Bayer, F.M. & H.B. Owre, **The free-living lower Invertebrates.**, 1968,
 Campbell, A.C., **Guía de campo de la flora y fauna de las costas de España y de Europa.**, 1983,
 Fretter, V. & A. Graham., **A functional anatomy of Invertebrates.**, 1976,
 Gardiner, M.S., **Biología de los Invertebrados**, 1978,
 Hayward, P.J. & J.S. Ryland., **Handbook of the Marine Fauna of North-West Europe.**, 1975,
 Hayward, P.J. & J.S. Ryland., **The Marine Fauna of the British Isles and North-West Europe, vol 1: Introduction and Protozoans to Arthropods**, 1990a,
 Hayward, P.J. & J.S. Ryland., **The Marine Fauna of the British Isles and North-West Europe, vol 2: Molluscs to Chordates.**, 1990b,
 Hayward, P.J., T. Nelson-Smith & C. Shields, **Guía de identificación de la flora y fauna de las costas de España y Europa.**, 1998,
 Kaestner, A., **Invertebrate Zoology, vol III.**, 1970,
 Kaestner, A., **Invertebrate Zoology, vol I.**, 1967,

Recommendations

Subjects that continue the syllabus

Sampling Techniques for Identification of Marine Organisms and Communities/V02M098V01201

Subjects that are recommended to be taken simultaneously

Marine Botany/V02M098V01102

The Marine Environment: Physical Oceanography/V02M098V01101

Other comments

It recommends update the knowledges of Zoology purchased in the degree or the degree.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of the uncertain and unpredictable evolution of the sanitary alert caused by the *COVID-19, the University of Vigo establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or partially face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a more agile and effective way when being known in advance (or with a wide *antelación) by the students and the *profesorado through the tool normalised and institutionalised of the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===

In the case to have to carry out the teaching of way no face-to-face:

1.- The classes of Marine Zoology would give of telematic form, by the system of videoconference or platform that was affordable the three universities (*Teams, *Skype, etc). Once #finish the class will send them to the students the pdf of the presentation of *power *point *via *dropbox, as it did in previous courses.

2.-In the case to have to carry out a no face-to-face teaching of the matter, the evaluation would do by means of a bibliographic academic work, so that the professor would send him the each student a subject related with the matter of Marine Zoology, indicating him the extension of the maximum text and the term of delivery of the work in pdf that it would be sent by telematic road.

IDENTIFYING DATA				
Marine Microbiology				
Subject	Marine Microbiology			
Code	V02M098V01104			
Study programme	(*)Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	García Estévez, José Manuel Herrero López, Concepción			
Lecturers	Barja Pérez, Juan Luis García Estévez, José Manuel Herrero López, Concepción			
E-mail	jestevez@uvigo.es herreroc@udc.es			
Web	http://masterbiologiamarina.uvigo.es/gl/			
General description	(*)Nesta materia preténdese que el alumno: - Coñeza a contribución da Microbioloxía a os coñecementos Oceanográficos. - O papel dos microorganismos mariños no cambio climático. - A importancia da simbiose de microorganismos fotosintéticos e quimioautótrofos para a vida dalgúns ecosistemas mariños - As aplicacións biotecnolóxicas de microorganismos mariños e as implicacións sanitarias para as persoas e organismos cultivados por elas			

Competencies

Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CE4	Conocimiento y búsqueda del potencial interés económico y biotecnológico de los organismos marinos
CE6	Conocimiento, identificación y evaluación de la calidad ambiental del medio marino y de la legislación vigente. Dirección de consultorías ambientales
CE8	Conocimiento y manejo de la metodología de investigación, de las técnicas muestreo e instrumentales y de análisis de datos aplicados al medio marino
CE10	Inspección y asesoramiento técnico en la evaluación, explotación y gestión de pesquerías, extracción de recursos e instalaciones de acuicultura
CE12	Control de calidad y seguridad de alimentos y de productos de transformación y biotecnológicos de origen marino
CE14	Elaboración, discusión, interpretación, asesoramiento y peritaje de informes científico-técnicos, éticos, legales y socioeconómicos relacionados con el ámbito marino y pesquero
CT3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad

Learning outcomes

Learning outcomes	Competences
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(*)Conocimiento de la diversidad de los organismos vivos en los ecosistemas marinos, su diversidad morfológica y sus estrategias adaptativas.	CB1 CB2 CB3 CB4 CB5 CG1 CE4 CT3
(*)Conocimiento y comprensión de la importancia de las interacciones de los microorganismos marinos y su hábitat	CB1 CB2 CB3 CB4 CB5 CG1 CE6 CT3
(*)Conocimiento de la metodología de investigación en microbiología marina	CB1 CB2 CB3 CB4 CB5 CG1 CE8 CT3
(*)Conocimiento de comunidades especiales	CB1 CB2 CB3 CB4 CB5 CG1 CE10 CT3
(*)Análisis y discusión de artículos científicos	CB1 CB2 CB3 CB4 CB5 CG1 CE10 CE12 CT3
New	CB1 CB3 CB4 CG1 CE6 CE8 CE10 CE12 CE14 CT3

Contents

Topic

(*) A microbioloxía nos estudos Oceanográficos

(*)Diversidade e función dos microorganismos mariños

(*)Métodos en Microbioloxía mariña

(*)Importancia dos microorganismos para o funcionamento dos ecosistemas peláxicos: o bucle microbiano

(*)Simbiose entre macro e microorganismos

(*)Microorganismos e cambio climático

(*)Aspectos biotecnolóxicos dos microorganismos mariños.

(*)Os microorganismos como patóxenos de animais mariños. Aspectos sanitarios da Microbioloxía Mariña

(*)Importancia económica e perspectivas futuras.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	14	28	42
Seminars	4	24	28
Problem and/or exercise solving	2	2	4

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
	Description
Lecturing	(*)Clases con contidos teóricos. Os contidos básicos son proporcionados aos alumnos vía rede.
Seminars	(*)Presentación oral e/ou escrita de traballos científicos, informes técnicos o proxectos

Personalized assistance	
Methodologies	Description
Lecturing	
Seminars	

Assessment		Qualification	Evaluated	Competences
	Description			
Lecturing	(*)Avaliase na proba mixta Asimesmo poderá terse en conta a asistencia, actitude, participación e traballo do alumno nas sesión na aula	0	CB1 CB2 CB3 CB4 CB5	CG1 CE4 CE6 CE8 CE10 CE12
Seminars	(*)Térase en conta o traballo entregado o exposto. No caso de non participar neste tipo de metodoloxía docente a avaliación corresponde engadirase a da proba mixta	20		
Problem and/or exercise solving	(*)Avaliación do proceso de aprendizaxe mediante exame escrito tipo test	80	CB1 CB2 CB3 CB4 CB5	CG1 CE4 CE6 CE8 CE10 CE12

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Kirchman DL 2008, **Microbial ecology of the oceans**, 2nd. edition,
 Kiorboe T 2008, **A mechanistic approach to plankton ecology**, 3rd edition,
 Madigan, M.T., Martinko, J.M., Bender, K.S., Buckley, D.H. & Stahl, D.A., **Brock. Biología de los microorganismos**, 14ª ed,
 Munn, C. 2011, **Marine Microbiology. Ecology and Applications**, 2th ed,
 Pérez-Nieto, T. 2001, **Conceptos básicos de microbiología marina**, 1ª,
 Willey, J.M., Sherwood, L.M. & Woolverton, C.J. 2014, **Prescott's Microbiology**, 9th ed,

Recommendations

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

* Teaching methodologies modified

* Non-attendance mechanisms for student attention (tutoring)

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Tests that are modified

[Previous test] => [New test]

* New tests

* Additional Information

IDENTIFYING DATA				
Marine Ecology				
Subject	Marine Ecology			
Code	V02M098V01105			
Study programme	(*)Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Fernández Suárez, Emilio Manuel			
Lecturers	Fernández Suárez, Emilio Manuel Jabalera Cabrerizo, Marco Martínez García, Sandra Riveiro Alarcón, María Isabel Teira Gonzalez, Eva Maria			
E-mail	esuarez@uvigo.es			
Web				
General description	The *asignatura Marine Ecology marks like aim boost the capacity of the students to comprise the processes of circulation of the matter and the flows of energy in the different marine ecosystems, as well as to comprise the bases of the diversity and the processes of organisation and structure of these ecosystems.			
Competencies				
Code				
CB1 (*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.				
CB2 (*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.				
CB3 (*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.				
CB4 (*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.				
CB5 (*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.				
CG1 Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos				
CG2 Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación				
CG5 Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos				
CG6 Desarrollo de la curiosidad científica, de la iniciativa y la creatividad				
CE1 Conocimiento físico-químico del medio oceánico y costero				
CE2 Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas				
CE3 Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros				
CT1 Desarrollo de las capacidades comprensivas, de análisis y síntesis				
CT2 Desarrollo de la capacidad de razonamiento crítico y autocrítico				
CT5 Desarrollo de las habilidades de comunicación y discusión de planteamientos y resultados				
Learning outcomes				
Learning outcomes				Competences

(*)Capacity to comprise the scientific methodology and the technologies applied to the investigation in the area of the Ecology

CB1
CB2
CB3
CB4
CB5
CG1
CG2
CG5
CG6
CE1
CE2
CE3
CT1
CT2

(*)Capacity to analyse and comprise the relation between the organisms and the environmental factors

CB1
CB2
CB3
CB4
CB5
CG1
CG2
CG5
CG6
CE1
CE2
CE3
CT1
CT2
CT5

(*)Capacity to comprise the processes of circulation of the matter and the flow of energy in the Ecosystem

CB1
CB2
CB3
CB4
CB5
CG1
CG2
CG5
CG6
CE1
CE2
CE3
CT1
CT2
CT5

(*)Capacity to comprise and analyse the basic processes of the relations between organisms (*intra-
*interespecíficas).

CB1
CB2
CB3
CB4
CB5
CG1
CG2
CG5
CG6
CE1
CE2
CE3
CT1
CT2
CT5

(*)Capacity to comprise the bases of the diversity and the processes of organisation and structure of the ecosystems	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG5 CG6 CE1 CE2 CE3 CT1 CT2 CT5
(*)Skill for the handle of the bibliography related with the distinct fields of the ecology	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG5 CE1 CE2 CE3 CT1 CT2 CT5

Contents

Topic	
Introduction to Marine Ecology	Presentation of the subject. Methodological approximations to the study of marine ecosystems. Scales of the physical processes of interest in Marine Ecology.
Soft substrate benthic Ecosystems	Shallow benthic communities on soft substrate. Reactions of oxidation of organic matter. Biogeochemical processes in anoxic environments. Carbon capture. Habitat fragmentation. Regression and resilience.
Hard substrate benthic ecosystems.	Benthic communities on hard substrate. Factors of control of community structure. Global change and community structure.
Planktonic Ecosystems: production	Primary production: limiting factors, hydrodynamic control and variability. New and regenerated production. Secondary production. Decomposition of organic matter. The microbial loop.
Planktonic ecosystems: trophic interactions	Grazing pressure by heterotrophic plankton. Oligotrophic vs high production systems. Transfer of primary production to micro/mesozooplankton
Nektonic ecosystems	Global nektonic production. Global data. Life strategies and migrations. Fish abundance and variability. Hydroclimatic processes: effects at the global change. Top-down effects: fishing and changes in community structure.
Applications of "Omic" technologies in Marine Ecology	From gene to genome in Marine Ecology. Genomics, transcriptomics, proteomics and metabolomics: Sampling and analysis. Application of "omic" technologies in pure cultures: use of model organisms. "Omic" technologies in natural communities. A case of study in marine microbiology: Rhodospirillum rubrum.
Isotopic ecology	Bases of isotopic ecology. Carbon isotopes: determination of diets, remineralization processes. Nitrogen nitrogen: determination trophic levels, eutrophication. Sulphur Isotopes: sources of matter.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	15	35.1	50.1
Presentation	1.8	7.2	9
Seminars	4	0	4
Problem and/or exercise solving	2	0	2
Case studies	0	2	2
Project	0	6	6

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
	Description
Lecturing	It will use the methodology of session *magistral to work the fundamental contents of the matter
Presentation	Oral presentation and/or written of scientific works, technical reports or projects
Seminars	Meetings of the group of work with the/the educational to clear doubts and organise the work.

Personalized assistance

Methodologies	Description
Lecturing	During the sessions *magistrales the students will receive personalised attention by part of the professor attending to all the questions that pose .
Presentation	Attention in the preparation and council for the presentation and defence
Seminars	Model of *corresponsabilidad in the educational exercise, *tutorías of *índole organisational or of academic interest.

Tests	Description
Case studies	*Tutorías Personalised for the resolution of cases

Assessment						
	Description	Qualification	Evaluated	Competences		
Problem and/or exercise solving	Evaluation of the process of learning by means of written or oral examinations in which it will evaluate the acquisition of the main theoretical concepts and the capacity of relation. They will be able to include proofs of diverse format: type test, proofs of essay, questions of reasoning, ask subject and short, resolution of problems, and/or practical cases	50	CB2 CB3 CB4	CG2 CG5	CE1 CE2 CE3	CT1 CT2
Case studies	Evaluation of the capacity to resolve practical suppositions on thematic own of the matter.	15	CB2 CB3 CB4	CG2 CG5	CE1 CE2 CE3	CT1 CT2
Project	Evaluation of the capacity to elaborate a proposal of scientific project from the explanations given in class and of the personal work of the *estudiantado.	35	CB1 CB2 CB3 CB4 CB5	CG1 CG2 CG5 CG6	CE1 CE2 CE3	CT1 CT2

Other comments on the Evaluation

In the evaluation of July will take into account the merits obtained in the *items that *evaluan effected during the course, no like this the proofs written finals.

Sources of information

Basic Bibliography

Mann, K.H., **Ecology of coastal waters with implications for management**, 2º, Blackwell, 2000

Complementary Bibliography

Recommendations

Contingency plan

Description

Given the characteristics of the Máster, that typically operates as mixed teaching, with part of the students face-to-face and part on-line part, are not necessary particular adaptations to the new situation of mixed teaching. In the case of teaching non face-to-face, all the students will follow the course on-line.

* educational Methodologies that keep

By the previously described reasons, the educational methodologies will be largely kept, with the exception of the on-line teaching for all the students in the non face-to-face mode.

Since to date an educational platform that allow the access of the students of all the universities is not available, we will continue using a space in dropbox in which all the materials used in the course will be allocated.

* Educational methodologies that modify

In the no face-to-face way, the theoretical teaching and will give through the Remote Campus of the University of Vigo, in the classrooms that assign for such end by part of the Faculty of Biology.

* Mechanism no face-to-face of attention to the students (*tutorías)

So much in the normal way, as in the mixed and no face-to-face, this course enable the *tutorías on-line through the virtual dispatch of the professors in the Remote Campus.

* Modifications (if they proceed) of the contents to give

do not contemplate modifications in the contents to give depending of the way of valid teaching.

* Additional bibliography to facilitate the car-learning

do not contemplate modifications in the bibliography depending of the way of valid teaching.

=== ADAPTATION OF THE EVALUATION ===

do not contemplate adaptations in the evaluation in function the way of valid teaching

IDENTIFYING DATA				
Fisioloxía de Organismos Mariños				
Subject	Fisioloxía de Organismos Mariños			
Code	V02M098V01106			
Study programme	Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	1	1c
Teaching language	Castelán			
Department				
Coordinator	Míguez Miramontes, Jesús Manuel			
Lecturers	Conde Sieira, Marta González Rodríguez, Luis Lopez Patiño, Marcos Antonio Míguez Miramontes, Jesús Manuel Soengas Fernández, José Luis			
E-mail	jmmiguez@uvigo.es			
Web				
General description	Estudo do funcionamento dos organismos mariños (animais e vexetais) e os mecanismos que posibilitan a súa relación co medio. Prestarase especial atención aqueles aspectos fisiolóxicos mais relacionadas coa integración da información provinte do medio mariño e a xeración de respostas específicas.			

Competencias

Code	
CB1	Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
CG3	Aprendizaje de diversas técnicas y métodos analíticos tanto en el medio natural como en el laboratorio
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CG6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
CE2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
CE3	Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros
CE8	Conocimiento y manejo de la metodología de investigación, de las técnicas muestreo e instrumentales y de análisis de datos aplicados al medio marino
CE10	Inspección y asesoramiento técnico en la evaluación, explotación y gestión de pesquerías, extracción de recursos e instalaciones de acuicultura
CE13	Divulgación de conocimientos de la biología y el medio marinos: programas de formación y docencia; planificación y dirección de acuarios, museos, centros de interpretación ambiental, parques naturales y espacios naturales protegidos
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma
CT5	Desarrollo de las habilidades de comunicación y discusión de planteamientos y resultados
CT6	Desarrollo de las capacidades de reflexión sobre responsabilidades sociales y éticas

Resultados de aprendizaxe

Learning outcomes	Competences
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Coñecer a diversidade dos sistemas fisiolóxicos dos organismos animais e vexetais mariños.	CB1 CB3 CG1 CG2 CE2 CE3 CT1
Evaluar e interpretar o funcionamento dos sistemas fisiolóxicos nos organismos mariños, identificando as interaccións cos diversos ecosistemas mariños e costeiros e as estratexias de adaptación.	CB1 CB2 CG2 CG6 CE2 CE3 CE13 CT1 CT2
Coñecemento sobre a xestión dos recursos animais e vexetais mariños cara a planificación da súa conservación, explotación e sostenibilidade, así como do seu potencial interés económico e biotecnolóxico.	CB2 CB3 CG1 CG2 CE10 CT4
Coñecer e manexar a metodoloxía de investigación, as técnicas de mostraxe e a instrumentación que se usa para a análise de mostras de orixe animal e vexetal	CB1 CB2 CG3 CE8 CT1 CT2 CT3
Interpretar resultados experimentais aplicando coñecementos fisiolóxicos relativos aos animais e vexetais mariños	CB2 CB5 CG2 CE8 CE10 CT3 CT4
Obter información, manexala a nivel individual e colectivo, e elaborar informes científico-técnicos, éticos, legais e socio-económicos relacionados co ámbito marino.	CB3 CB4 CB5 CG5 CE10 CT2 CT3 CT5 CT6
Capacidade para divulgar ideas en contextos académicos e especializados, e para a presentación e discusión de traballos en público	CB4 CG6 CE13 CT5

Contidos

Topic

MODULO I. FISIOLOXIA DOS VEXETAIS MARIÑOS	Tema 1. Adaptacións ao medio mariño Tema 2. Mecanismos de captación de carbono inorgánico Tema 3. Respostas ao estrés: estrés oxidativo no medio mariño
MODULO II. FISIOLOXIA DOS ANIMAIS MARIÑOS	Tema 1. Fisioloxía sensorial nos animais mariños Tema 2. Sistemas neuroendócrinos e endócrinos en animais mariños. Respostas integradas en peixes: resposta de estrés; actividade reproductiva; ritmos biolóxicos. Tema 3. Circulación en animais acuáticos Tema 4. Respiración acuática Tema 5. Excreción, balance de agua e ións en animais mariños

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	30	45	75

Prácticas de laboratorio	6	9	15
Seminario	6	30	36
Traballo tutelado	2	0	2
Estudo de casos	1	9	10
Metodoloxías baseadas en investigación	2	8	10
Exame de preguntas de desenvolvemento	2	0	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Metodoloxía docente	
	Description
Lección maxistral	Sesión en aula na que se exporán por parte do profesor os contidos básicos do temario da materia. O alumno debe seguir a exposición e poderá intervir cando requira información adicional e/ou cando se produza debate, tanto se este é xerado polo profesor coma se prodúcese a iniciativa dos propios alumnos.
Prácticas de laboratorio	Sesións que se desenvolven no laboratorio e con contido eminentemente práctico. Ensaiananse diferentes protocolos experimentais e analíticas, para posteriormente debater razonadamente os mesmos desde o punto de vista da súa significación fisiolóxica.
Seminario	Sesións de aula nas que se desenvolverán temáticas específicas da materia en relación co temario proposto. Os alumnos deberán realizar traballos bibliográficos sobre temas propostos polo profesor e/ou polos propios alumnos e que serán obxecto de exposición e debate posterior en clase.
Traballo tutelado	Seguimento polo profesorado do traballo do alumnado correspondente aos seminarios e ao informe de prácticas
Estudo de casos	Traballo de aula con preguntas que o alumnado debe responder
Metodoloxías baseadas en investigación	A partir de situacións reais o alumnado debe buscar bibliografía para atopar solucións adaptativas dos organismos vexetais ao seu medio

Atención personalizada	
Methodologies	Description
Lección maxistral	O profesor recibirá comentarios e cuestións dos alumnos/as durante a realización das sesións maxistrais, podendo tamén atender aos alumnos nas horas de tutoría.
Seminario	Durante as sesións de seminario os alumnos poden interactuar co profesor dun xeito individualizado e tamén poder acudir as horas de tutoría en caso de dúbidas ou en búsqueda de información que precisen na preparación dos traballos
Prácticas de laboratorio	Ainda que nas prácticas os alumnos fan traballos en grupos pequenos, haberá a posibilidade de interactuar dun xeito individualizado co profesor sempre que sexa preciso
Traballo tutelado	El profesorado fai un seguimento do traballo de seminario e da elaboración do informe de prácticas
Metodoloxías baseadas en investigación	O profesorado atenderá as cuestións que xurdan durante a elaboración do traballo.

Avaliación		Qualification	Evaluated	Competences
	Description			
Prácticas de laboratorio	Realizaranse 2 prácticas de laboratorio de Fisioloxía animal. A avaliación desas prácticas incluírá: -50% da nota por asistencia a sesión prácticas. -50% da nota por informe de prácticas.	13.333	CB1 CB2 CG1 CG3 CE8 CE10 CT3 CT5 CG5	
Seminario	En conxunto, Fisioloxía animal e Fisioloxía vexetal. Un 66.6% da nota desta actividade corresponde a FA, e un 33.3% a FV. Realización en grupos (2-3 alumnos) dun traballo sobre un tema proposto polo profesor e breve exposición do mesmo nunha sesión de clase ao final do curso. Seminario de integración ao final da materia sobre adaptacións dos organismos ao medio mariño.	30	CB1 CB4 CB5 CG1 CG2 CG5 CE2 CE3 CT2 CT3 CT4 CT5 CG6	
Estudo de casos	Corríxense as preguntas e devólvese ao alumno o resultado da solución proposta.	3.333	CB1 CB2 CB4 CG2 CG5 CG6 CE8 CE13 CT4 CT6	
Metodoloxías baseadas en investigación	Avalíase o resultado final das entregas en función da solución atopada polo alumnado	20	CB1 CB2 CB4 CG2 CG5 CG6 CE3 CE13 CT3 CT5	

Exame de preguntas de desenvolvemento	Parte de Fisioloxía animal. Avaliación do proceso de aprendizaxe mediante exames escritos ou orais nos que se avaliará a adquisición dos principais conceptos teóricos e a capacidade de relación. Poderán incluír probas de formato diverso: tipo test, probas de ensaio, preguntas de razoamento, preguntas tema e curtas, resolución de problemas, e/ou casos prácticos	33.333	CB1	CG5	CE2 CE3	CT1
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Other comments on the Evaluation

Os alumnos deberán realizar todas as actividades propostas. En caso de non realizar algunha, a calificación da mesma será de cero, e como tal considerárase na nota final da materia. **CÁLCULO DA NOTA FINAL:** terase en conta a cualificación que o alumno obteña en cada módulo, aplicándose a seguinte ponderación en función do peso do módulo: $\text{Nota global final} = 0.66 \times (\text{nota de módulo Fisioloxía animal}) + 0.33 \times (\text{nota módulo Fisioloxía vexetal})$.

En calquera caso, para aprobar a materia será imprescindible obter unha calificación mínima de 4 (sobre 10) en cada un dos módulos por separado. Ademais, no módulo de FA é imprescindible obter un mínimo de 3.5 puntos sobre 10 no examen. En caso de non acadar esta puntuación, será esa nota a que figura na calificación global da materia.

SEGUNDA CONVOCATORIA: Os compoñentes da nota final manteranse para a convocatoria de xullo. Non obstante, nin as prácticas nin os seminarios serán recuperables na segunda oportunidade, polo que se utilizaría a nota obtida na primeira oportunidade para o cálculo final.

Bibliografía. Fontes de información

Basic Bibliography

Larkum, A.W.D., Douglas, S., Raven, J.A., **Photosynthesis in algae (Advances in Photosynthesis and Respiration)**, Ed. Kluwer Academic, 2003

Nobel, P.S., **Physicochemical and environmental plant physiology**, Ed. Elsevier, 2005

Hill, R.W., Wyse, G.A., Anderson, M., **Fisiología animal**, Ed. Panamericana, 2006

Evans, D.H., **The physiology of fishes**, Ed. CRC Press, 2006

Bernier, N.J., Van der Kraak, G., Farrel, A.P., Brauner, C.J., **Fish Neuroendocrinology**, Ed. Academic Press, 2009

Farrel A.P., **Encyclopedia of fish physiology: from genome to environment**, Volúmenes 1, 2 y 3, Ed. Academic Press, 2011

Complementary Bibliography

Ostrander, G.K., **The laboratory fish**, Ed. Academic Press, 2000

Taiz, L., Zeiger, E., **Plant physiology**, Sinauer Assoc., cop Sunderland, 2010

Buesseler, K.O., Boyd, P.W., **Will ocean fertilization work?**, Science 300 (5616), pp. 67-68, 2003

Gross, E.M., **Allelopathy of aquatic autotrophs**, Critical Reviews in Plant Sciences 22(3-4), pp 313, 2003

Reibesell, U., **Effects of CO2 enrichment on marine phytoplankton**, Journal of Oceanography, 60 (4), pp. 719-729, 2004

Sarthou, G., Timmerman, K.R., Blain, S., Treguer, P., **Growth physiology and fate of diatoms in the ocean: A review**, Journal of Sea Research, 53 (1-2 SPEC ISS), pp. 25, 2005

Raven, J.A., **An aquatic perspective on the concepts of ingested relating plant nutrition to plant growth**, Physiologia Plantarum, 113 (3), pp. 301-307, 2001

Bentley, P.J., **Comparative vertebrate endocrinology**, Ed. Cambridge Univ Press, 1998

Breidbach, O., Kutsch, W., **The nervous system of invertebrates: an evolutionary and comparative approach**, Ed. Birkhauser, 1995

Evans, D.H., **Osmotic and ionic regulation. Cells and animals**, Ed. CRC Press, 2009

Hazon, N., Flik, G., **Osmoregulation and drinking in vertebrates**, Ed. Bios Scientific, 2002

Liem, K.F., Bemis, W.E., Walker, W.F., Grande, L., **Functional anatomy of the vertebrates**, Ed. Hartcourt College Publ., 2001

Reinecke, M., **Fish endocrinology**, Ed. Science Publ., 2006

Withers, P.C., **Comparative animal physiology**, Ed. Saunders College Publ., 1992

Rocha, M.J., Arukwe, A., Kapoor, B.J., **Fish Reproduction**, Ed. CRC Press, 2008

Recomendacións

Other comments

Para favorecer o seguimento da materia é importante que o alumno cando se inscriba aporte a dirección de correo electrónico para recibir información persoalizada do profesor.

Recomendase que os alumnos usen as direccións de e-mail das súas universidades.

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===

De acordo coa situación xerada pola COVID, a Universidade establece un escenario de normalidade adaptada, é dicir, unha situación acorde co grao de presencialidade estimado como normal no momento previo á pandemia. Está previsto un único escenario alternativo, previsto para situacións temporais limitadas por restricións locais derivadas de gromos ou peches na localidade no que se localice o centro docente.

DOCENCIA MIXTA:**=== ADAPTACIÓN DAS METODOLOXÍAS DOCENTES**

Na modalidade mixta tanto as Metodoloxías como os Sistemas de avaliación serán os mesmos que na modalidade presencial dado que a totalidade dos estudantes estarán presentes nas aulas de clase dos tres campus. No caso que a situación mudara, se podría seguir a docencia de xeito normal co desenvolvemento simultáneo das leccións maxistrais mediante o Campus Remoto (ou sistema similar das outras universidades participantes no máster) e asistencia presencial nas aulas. Está previsto que as probas de examen se poidan levar a cabo de xeito presencial, aínda que si chegado o caso non se puideran facer así, usaríanse as ferramentas disponibles no Campus Remoto ou un sistema virtual similar.

=== ADAPTACIÓN DA AVALIACIÓN

Para a avaliación da materia en segunda oportunidade e modalidade mixta se manterá o mesmo sistema de avaliación previsto na guía docente, coas mesmas ponderacións das probas.

DOCENCIA NON PRESENCIAL:**=== ADAPTACIÓN DAS METODOLOXÍAS**

Manteñense as tres metodoloxías docentes mencionadas na guía: lección maxistral, prácticas de laboratorio e seminarios, aínda que se farán lixeiras adaptacións que se indican a continuación:

Para las leccións maxistrais utilizarase o Campus Remoto ou sistema virtual similar que mellor se adapta os estudantes das tres universidades que participan no máster.

As actividades que se desenvolven nas sesións de prácticas (Fisioloxía animal) sustitúense por actividades que simulan as prácticas de xeito virtual. Proporcionaranse guións para as prácticas adaptadas e datos de cursos académicos previos para que os estudantes poidan facer os correspondentes informes, os cales seguirán facéndose de xeito grupal.

Para o desenvolvemento das actividades de seminarios e especialmente si os estudantes tivesen dificultades de acceso á bibliografía, aportaranselles enlaces, revisións ou artigos das temáticas (tanto de Fisioloxía animal como de vexetal) que lles permitirán desenvolver os traballos previstos, os cales seguirán sendo grupais (2-3 estudantes). Para as presentación dos traballos utilizarase o Campus Remoto (ou sistema virtual similar).

* Mecanismo non presencial de atención ao alumnado (titorías):

As sesións de titorización desenvolveranse mediante os seguintes modos de comunicación co alumnado.

- Correo electrónico cos profesores implicados.

- Comunicación mediante ferramentas de comunicación virtual: aula campus remoto ou similar.

* Modificacións (se procede) dos contidos a impartir:

Os contidos desenvolveranse de forma íntegra dacordo á planificación docente.

* Bibliografía adicional para facilitar o auto-aprendizaxe:

Se aportarán documentos, artigos, revisións temáticas, etc. para facilitar a comprensión da materia e das actividades programadas nas prácticas e seminarios, tanto na parte de Fisioloxía animal como na de Vexetal.

=== ADAPTACIÓN DA AVALIACIÓN

Manteráanse as probas que están previstas na guía docente: Traballo na clase (Fisioloxía vexetal), Examen final (Fisioloxía animal), Asistencia a prácticas e informe (fisioloxía animal), Traballo grupal: Seminarios (Fisioloxía vexetal e animal), Non se producirán cambios nas porcentaxes das probas, de xeito que son de aplicación os establecidos na guía docente.

Para a avaliación da materia en segunda oportunidade e modalidade non presencial manteranse o mesmo sistema de avaliación previsto na guía docente, coas mesmas ponderacións das probas.

IDENTIFYING DATA				
Molecular Basis of Adaptation to the Marine Environment				
Subject	Molecular Basis of Adaptation to the Marine Environment			
Code	V02M098V01107			
Study programme	(*)Máster Universitario en Biología Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	San Juan Serrano, María Fuencisla			
Lecturers	García Martín, Óscar San Juan Serrano, María Fuencisla			
E-mail	fsanjuan@uvigo.es			
Web				
General description	Molecular mechanisms underlying the phenomenon of adaptation. Integration of the biochemistry compared.			

Competencies	
Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG2	Búsqueda, análise e integración de información a partir de diferentes fontes y capacidad para su interpretación y evaluación
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CG6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
CE2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
CE3	Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros
CE13	Divulgación de conocimientos de la biología y el medio marinos: programas de formación y docencia; planificación y dirección de acuarios, museos, centros de interpretación ambiental, parques naturales y espacios naturales protegidos
CE14	Elaboración, discusión, interpretación, asesoramiento y peritaje de informes científico-técnicos, éticos, legales y socioeconómicos relacionados con el ámbito marino y pesquero
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma
CT7	Desarrollo de habilidades para la divulgación de ideas en contextos tanto académicos como no especializados

Learning outcomes	
Learning outcomes	Competences
Knowledge of basic mechanisms and adaptive strategies at molecular level	CB1
	CB2
	CB3
	CG2
	CG6
	CE2
	CE3
	CE13
	CT1
	CT2
	CT4

Integration ability to understand the molecular basis of adaptive phenomena from the perspective of comparative biochemistry.	CB2 CB3 CG6 CE2 CT1 CT2
Ability to evaluate and interpret the effects of environmental changes from marine environment on organisms and their interactions.	CB2 CB3 CG2 CE2 CE3 CE14 CT1 CT2
Ability to obtain information, analyse it critically and apply it to the interpretation and sustainability of marine environments.	CB2 CB3 CB5 CG2 CG6 CE13 CE14 CT1 CT2 CT4
Ability to develop individual and / or team works, and to expose them and discuss them in public.	CB3 CB4 CB5 CG2 CG5 CG6 CE13 CT1 CT2 CT4 CT7

Contents

Topic	
Biochemical adaptation: basic mechanisms and strategies.	Biochemical adaptation. Basic mechanisms of the biochemical adaptation. The time of the biochemical adaptation.
Adaptive points of cellular metabolism.	Points of metabolic adaptation in glycolysis. Origin and phylogenetic distribution of the urea cycle. Adaptations of mitochondrial energy metabolism.
Adaptation of enzymes to metabolic functions.	Mechanisms of enzymatic regulation. The enzymes like protective elements.
Molecular and metabolic adaptation to the physical-chemical factors of the marine environment: Adaptation to the limited oxygen availability.	Anaerobic metabolism of marine invertebrates. Anaerobic metabolism of marine vertebrates. Adaptation to hypoxia.
Molecular and metabolic adaptation to the physical-chemical factors of the marine environment: Adaptation to salinity.	Osmoregulation in aquatic organisms. Response regulation to osmotic shock.
Molecular and metabolic adaptation to the physical-chemical factors of the marine environment: Adaptation to temperature.	Compensatory mechanisms from poikilotherm organisms to temperature changes. Acclimatization mechanisms to temperature. Adaptation to ice.
Molecular and metabolic adaptation to the physical-chemical factors of the marine environment: Adaptation to pressure.	Effects of the hydrostatic pressure on the biological systems. Mechanisms of perception and compensation to the changes of pressure.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	20	40	60
Seminars	4	10	14
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	In master sessions the teacher will give the fundamental concepts so that the student understands and can prepare the subject contents.
Seminars	In seminars, students will work aspects or bibliographic data related with subject, and will elaborate coments and oral and/or written presentations.

Personalized assistance

Methodologies	Description
Lecturing	The doubts resolution and necessary orientation in the personal work of the student will be attended through voluntary tutorships.
Seminars	The doubts resolution and necessary orientation in the personal work of the student will be attended through voluntary tutorships.

Assessment

Description	Qualification	Evaluated	Competences
LecturingThe acquired theoretical knowledge will be assessed through a final test exam.	70	CB1 CB2 CB3 CB5	CE2 CE3 CT1 CT2
SeminarsIn the work from seminars, the ability to relate the acquired knowledges and concepts, the correct use of specific terminology and the criticism and synthesis ability will be assessed.	30	CB1 CB2 CB3 CB4 CB5	CG2 CG5 CG6 CE13 CE14 CT1 CT2 CT4 CT7

Other comments on the Evaluation

The realization of seminars and / or bibliographic work is compulsory for passing the subject.

The final test exam is compulsory for passing the subject. The score in the themes given by each professor should be 3 in order to be take into account in the exam total score . The mean score of the exam will have to be of 3,5 (35% of the assessment of subject) for to sum the score of the seminars assessment.

Sources of information

Basic Bibliography

Complementary Bibliography

- Atkinson D.E., **Cellular Energy Metabolism and its Regulation**, 1977
- Di Prisco, G., **Life under extreme conditions**, 1991
- Ewart K.V., **Fish antifreeze proteins. Molecular aspects of fish and marine biology**, 2002
- Gilles E., **Animals and Environmental Fitness: Physiological and Biochemical Aspects of Adaptation and Ecology**, 1ª Ed, 1980
- Hochachka, P.W. and Somero G.N., **Strategies of Biochemical adaptation**, 1973
- Hochachka, P.W. and Mommsen T.P., **Metabolic Biochemistry**, 1995
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- Le Gal, Y., **Biochimie Marine**, 1988
- Lucas A., **Bioenergetics of Aquatic Animals**, 1997
- Mathews-Van Holde, **Bioquímica**, 4ª Ed., 2013
- Nelson D.L and Cox M.M., **Lehninger. Principios de Bioquímica**, 6ª Ed., 2014
- Salway J., **Metabolism at a glance**, 2004
- Somero G.N., Lockwood B.L., Tomanek L., **Biochemical Adaptation: Response to Environmental Challenges from Life's Origins to the Anthropocene**, 1ª Ed, 2017
- Urich, K., **Comparative Animal Biochemistry**, 1994

Recommendations

Subjects that continue the syllabus

Physiology of Marine Organisms/V02M098V01106

Subjects that are recommended to be taken simultaneously

Marine Ecology/V02M098V01105

Physiology of Marine Organisms/V02M098V01106

Marine Zoology/V02M098V01103

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of the uncertain and unpredictable evolution of the sanitary alert caused by the *COVID-19, the University of Vigo establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or partially face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a more agile and effective way when being known in advance (or with a wide *antelación) by the students and the *profesorado through the tool normalised and institutionalised of the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===

* educational Methodologies that keep : ALL

* educational Methodologies that modify : ANY

* no face-to-face Mechanism of attention to the students (*tutorías): THE PERSONALISED ASSISTANCE WILL TAKE PLACE IN THE VIRTUAL CLASSROOMS THAT THE PROFESSORS HAVE ENABLED IN HIS RESPECTIVE UNIVERSITIES.

* Modifications (if they proceed) of the contents to give: NOT PROCEED

* additional Bibliography to facilitate the car-learning

* Other modifications

=== ADAPTATION OF THE EVALUATION ===

* Test already made

Proof XX: [previous Weight 00%] [Weight Proposed 00%]

...

* Pending proofs that keep

Proof XX: [previous Weight 00%] [Weight Proposed 00%]

...

* Proofs that modify

[previous Proof] => [new Proof]

* New test

* additional Information

- THE CONTENT AND PRESENCIALIDAD OF LECTURING AND SEMINARS WILL BE MAINTAINED THE SAME THAT IN NORMAL CIRCUMSTANCES.

- THE EVALUATION TESTS AND THE WEIGHT OF EACH ONE IN THE NOTE OF THE SUBJECT WILL BE THE SAME THAT IN NORMAL CIRCUMSTANCES.

- IN CASE OF MIXED OR VIRTUAL TEACHING, IT WILL BE IN THE VIRTUAL CLASSROOM THAT THE PROFESSORS HAVE ENABLED IN HIS RESPECTIVE UNIVERSITIES.

IDENTIFYING DATA				
Techniques to Study Marine Organisms				
Subject	Techniques to Study Marine Organisms			
Code	V02M098V01108			
Study programme	(*)Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Pérez Fernández, Juan			
Lecturers	Galindo Dasilva, Juan González Sotelo, María del Carmen Pasantes Ludeña, Juan José Pérez Fernández, Juan Suarez Alonso, Maria del Pilar			
E-mail	jperezf@uvigo.es			
Web				
General description	It is a essentially practical subject, in which students will be familiar with histological, biochemical and genetic techniques. These techniques will be used in studying tissues, protein and gene expression, genetic markers, biomolecules purification and immunological techniques. Its main aim is that the student knows and evaluates the potentiality of a variety of techniques for the study of marine organisms.			
Competencies				
Code				
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.			
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.			
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.			
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.			
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.			
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos			
CG2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación			
CG3	Aprendizaje de diversas técnicas y métodos analíticos tanto en el medio natural como en el laboratorio			
CG4	Desarrollo de habilidades en el manejo y tratamiento de herramientas, matemáticas, estadísticas e informáticas			
CE2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas			
CE8	Conocimiento y manejo de la metodología de investigación, de las técnicas muestreo e instrumentales y de análisis de datos aplicados al medio marino			
CE11	Estudios de dinámica poblacional, mejora genética y selección de stocks en pesquerías, acuicultura y programas de repoblación			
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis			
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico			
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma			
Learning outcomes				
Learning outcomes			Competences	

Contents

Topic	
1.- Histological techniques	1a.- Processed of samples for microscopic study: applications of the microscopy. 2b.- Immunohistochemistry and application of the histochemical techniques using lectins.
2. Genetic techniques	2a.- Detection of the genetic variation. 2b.- Genetic markers and their applications 2c.- Molecular resources in the internet
3.- Biochemical techniques	3a.- Extraction, separation and quantification of biomolecules. 3b.- Spectrophotometric electrophoretic, chromatographic, fluorometric and of enzymatic determination.
4.- Identification of species	4.- Use of molecular tools for the identification of fisheries products.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	15	34.5	49.5
Presentation	2	8	10
Seminars	1.5	0	1.5
Problem solving	1.52	0	1.52
Lecturing	4	8.48	12.48

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Laboratory practical	The techniques proposed in the content section will be carried out. In advance, a script will be delivered to the students explaining the basis and objectives to develop each technique. During or at the end of the development of the protocol students will make problems and solve practical cases .
Presentation	A practical problem with a combination of techniques will be proposed to the students who will have to choose the techniques that are best suited to solve that problem and, explain the basis of their choice.
Seminars	There will take place two 2 group tutorials, in which the doubts and questions will be ask about different aspects of the subject. The teacher will guide in the elaboration of personal works.
Problem solving	There will be a problem solving test via internet
Lecturing	The theoretical aspects and the usefulness of the laboratory techniques will be treated in the master sessions.

Personalized assistance**Methodologies Description**

Seminars	In the group tutorials will raise doubts and questions of the subject. The student will be advised to carry out their work
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Assessment

Description	Qualification	Evaluated Competences
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Laboratory practical	Continuous evaluation by means of the follow-up of the student's work in the laboratory.	20	CB2	CG1 CG3	CE8	
Presentation	Continuous evaluation through the delivery and/or exhibition of works, results, reports, etc.	30	CB1 CB4	CG2		CT1 CT2 CT4
Seminars	Evaluation of the monitoring of the performance of the work in the different parts of the subject.	10				CT2 CT4
Problem solving	Evaluation of the learning process through written and oral exams, which may include test-type exams, diverse format test tests, reasoning questions, subject and short questions, problem solving and case studies	30	CB2 CB3	CG1 CG2 CG3	CE8 CE11	CT1
Lecturing	Continuous evaluation by means of the follow-up of the student's work.	10	CB1 CB3	CG1 CG3	CE8	CT4

Other comments on the Evaluation

Sources of information

Basic Bibliography

Montuenga Badía, L., Esteban Ruiz, F.J., Calvo González, A., **Técnicas en histología y biología celular + StudentConsult en español**, 2ª, Elsevier-Masson, 2014

Perera, J., Tormo, A., García, L., **Ingeniería genética. Preparación, análisis, manipulación y clonaje de DNA.**, 1ª, Síntesis DL., 2009

Complementary Bibliography

Bergmeyer, H.U., **Methods of Enzymatic Analysis**, 3ª, Academic Press., 1995

Recommendations

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

== ADAPTATION OF METHODOLOGIES ==

* Teaching methodologies that are maintained

All teaching methodologies are maintained except for laboratory practices

* Teaching methodologies that are modified

Laboratory practices would be done online through videos and explanations from the teacher using remote control.

* Non-attendance mechanism for student attention (tutorials)

Not applicable

* Modifications (if applicable) of the content to be taught

Not applicable the contents would be the same

=== ADAPTATION OF THE EVALUATION ===

* Tests already carried out

The evaluation of the learning process is mostly online with exams based on problem solving and summary of research articles. The weight would be the same.

* Pending tests that are maintained

All.

* Evidence that is modified

In the case of attending practical classes, the obligation to attend remains but in this case online.

All the methodologies will be taught telematically through the use of the utilities integrated in the Remote Campus of the University of Vigo if necessary.

IDENTIFYING DATA				
Experimental Design and Information Resources				
Subject	Experimental Design and Information Resources			
Code	V02M098V01109			
Study programme	(*)Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Roca Pardiñas, Javier			
Lecturers	Roca Pardiñas, Javier			
E-mail	roca@uvigo.es			
Web				
General description				

Competencies

Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG4	Desarrollo de habilidades en el manejo y tratamiento de herramientas, matemáticas, estadísticas e informáticas
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad

Learning outcomes

Learning outcomes	Competences
(*)	CB1 CB4
(*)	CG1 CG4
New	CT2 CT3

Contents

Topic	
(*)*Introducción *al *diseño Of experiments: (*) *aleatorización, Blockade, *factorización.	
(*)*Diseños *unifactoriales.	(*) *Análisis *y *Diagnosis Of @el model.
(*)*Manejo Of statistical software.	(*)
(*)Access *y use of wool *información científica *especializada:	(*)*Manejo Of catalogues, bases of data *y scientific searchers.Organization *y *tratamiento of wool scientific information.

Planning

	Class hours	Hours outside the classroom	Total hours
Practices through ICT	12	12	24
Lecturing	15	35	50
Problem and/or exercise solving	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
Practices through ICT	(*)Actividade na que se formulan problemas e exercicios relacionados coa materia. O alumno debe, co apoio do profesorado, desenvolver a análise e a resolución dos problemas e exercicios

Lecturing (*)O profesor exporá en clase e por videoconferencia a teoría básica da materia. Diversos exemplos ilustrarán a aplicación dos resultados teóricos.

Personalized assistance

Methodologies	Description
Lecturing	
Practices through ICT	

Assessment

	Description	Qualification	Evaluated Competences	
Practices through ICT	(*)Os alumnos entregarán ao longo da materia uno ou varios traballos relacionados coas prácticas que formarán parte do sistema de avaliación continua	40	CG1 CG4	CT2
Problem and/or exercise solving	(*)Avaliación do proceso de aprendizaxe mediante exames escritos ou orais que poderían incluír probas tipo test, probas de ensaio de formato diverso, preguntas de razoamento, preguntas tema e curtas, e resolución de problemas ou casos prácticos.	60	CG1 CG4	CT2

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Abraira Santos, V. y Pérez de Vargas, A., **Métodos Multivariantes en Bioestadística**, Centro de Estudios Ramón Areces.,
 Maindonald, J. H., **Data analysis and graphics using R: an example-based approach.**, Cambridge University Press.,
 Crawley, M.J., **The R book.**, John Wiley & Sons,
 Zuur, Alain F, **A Beginner's guide to R.**, New York . Springer.,

Recommendations

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

* Teaching methodologies modified

* Non-attendance mechanisms for student attention (tutoring)

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Pending tests that are maintained
Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Tests that are modified
[Previous test] => [New test]

* New tests

* Additional Information

IDENTIFYING DATA				
Sampling Techniques for Identification of Marine Organisms and Communities				
Subject	Sampling Techniques for Identification of Marine Organisms and Communities			
Code	V02M098V01201			
Study programme	(*)Máster Universitario en Biología Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Ramil Blanco, Francisco José			
Lecturers	Besteiro Rodríguez, Celia Díaz Agras, Guillermo Parapar Vegas, Julio Peña Freire, Viviana Ramil Blanco, Francisco José Souto Derungs, Javier			
E-mail	framil@uvigo.es			
Web				
General description	Methods of sampling for the obtaining of plankton, **bentos and **necton. Separation, fixation and conservation of the samples. Observation *in alive of the species **intermareais and **infralitorais more notable of the flora and marine fauna of Galicia. Main **carácteres **taxonómicos of the flora and marine fauna of Galicia. Identification of species. Recognition, statistical analysis and interpretation of communities.			

Competencies	
Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
CG3	Aprendizaje de diversas técnicas y métodos analíticos tanto en el medio natural como en el laboratorio
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CG6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
CE2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
CE3	Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros
CE8	Conocimiento y manejo de la metodología de investigación, de las técnicas muestreo e instrumentales y de análisis de datos aplicados al medio marino
CE14	Elaboración, discusión, interpretación, asesoramiento y peritaje de informes científico-técnicos, éticos, legales y socioeconómicos relacionados con el ámbito marino y pesquero
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma
CT5	Desarrollo de las habilidades de comunicación y discusión de planteamientos y resultados

Learning outcomes	
Learning outcomes	Competences

New	CB1 CB2 CG1 CE2 CE3 CE8 CT1 CT2
New	CB1 CB2 CG1 CE2 CE3 CE8 CT1 CT2
New	CB1 CB2 CG1 CE2 CE3 CE8 CT1 CT2
New	CB1 CB2 CG1 CE2 CE3 CE8 CT1 CT2
New	CB1 CB2 CG1 CE2 CE3 CE8 CT1 CT2
New	CB1 CB2 CG1 CE2 CE3 CE8 CT1 CT2
New	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG3 CG5 CG6 CE14 CT1 CT2 CT3 CT4 CT5

Contents	
Topic	

Flora and fauna **intermareal (**rochedos and sediment)	Explanation in situ of the *zonation and structure of the communities **intermareais of *sustrato rocky and **sedimentario. Harvest of material: review of the different methods, direct and indirect, employed for the *recolección of the fauna and flora of rock, sand and slime. Collected on foot in the zone **intermareal. Treatment, separation and preparation of the samples: it trace it back. Observation *in alive and study in the laboratory of the flora and fauna obtained, with special dedication to the seaweeds.
Fauna and flora **sublitoral (**rochedos and sediment)	Explanation in situ, on board of the ship **Polybius, of the methodology of **recolección with **escafandro autonomous: technicians and material. Collected by means of diving with **escafandro autonomous of fauna and flora **infralitoral of rock.- Explanation in situ, on board of the ship **Polybius, of the methodology of **recolección by means of indirect methods: *dragas of horizontal and vertical performance; *dragas qualitative and quantitative. Collected of sediment with the *draga of Rectangular horizontal performance of Naturalistic with the *draga of vertical performance go **Veen. Collected of **epifauna **sedimentaria by means of the *draga **Agassiz **trawl. **Peneirado, separation and preparation of the samples.- Demonstration in laboratory of the methodology of study of the **meiofauna. Separation and observation *in alive of fauna **intersticial.
Flora and fauna **planctónicas	Harvest of material by means of sleeves of plankton. Observation *in alive and study in the laboratory of the phytoplankton and **zooplancto obtained.
Treatment of the information	Recognition and interpretation of the communities. Organisation of the data obtained for his back preparation.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	3	7.002	10.002
Presentation	10	30	40
Studies excursion	31	62	93
Seminars	3	0	3
Report of practices, practicum and external practices 1		3	4

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	Introduction of basic concepts and personal advice
Presentation	Preliminary presentation of the data of field obtained in campaign.
Studies excursion	Mission of sampling in craft of the marine station
Seminars	Resolution of doubts and approach of the tasks to make by the student of autonomous way out of the face-to-face hours.

Personalized assistance

Methodologies	Description
Seminars	The student will have of the necessary orientation for the preparation of the work.
Lecturing	Particular attention to the personal lagoons of knowledge of the half and marine taxonomy.
Presentation	Attention to the form of presentation of the data for his understanding, storage and transmission.
Studies excursion	Technological orientation in situ on processes, measures of security, tools, etc.

Assessment

	Description	Qualification	Evaluated	Competences
Studies excursion	Continuous evaluation of the assistance, attitude, active participation and work of the student during the sessions in him classroom, he laboratory, the exits of field, the seminars and the *tutorías	20	CB1 CB2 CB3 CB4 CB5	CG3 CG6 CE8 CT3 CT4 CT5

Report of practices, practicum and external practices	Along the week of length of this matter, the student will go filling up a fascicle of practices, that will deliver him to the start, with all the educational activities made and that it will have to deliver at the end of the week, to be evaluated by the professors of the matter: 40%.	80 (40+40)	CB1 CB2 CB3 CB4 CB5	CG1 CG2 CG5	CE2 CE3 CE14	CT1 CT2
	Each student will have to elaborate a work of results with the data obtained and with his corresponding discussion. It will give special importance to the quality and presentation of this work: 40%.					

Other comments on the Evaluation

In the second opportunity, the evaluation of the students will make with the same methodology that at the earliest opportunity (20% - 40% - 40%).

Sources of information

Basic Bibliography

Complementary Bibliography

Botosaneanu, L., **Stygofauna Mundi.**, 1986,
Braune, W. & Guiry, M.D., **Seaweeds.**, 2011,
Bunker, Brodie, Maggs & Bunker., **Seasearch guide to seaweeds of Britain and Ireland.**, 2010,
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Dawes, C.J., **Marine Botany.**, 1997,
Eleftheriou, A. & McIntyre, A., **Methods for the study of marine benthos.**, 2005,
Campbell, A.C., **Guía de campo de la flora y fauna de las costas de España y de Europa.**, 1983,
Falciai, L. & Minervini, R., **Guía de los Crustáceos Decápodos de Europa.**, 1995,
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Hayward, P.J. & Ryland, J.S., **The marine fauna of the British Isles and North West Europe. 2 vols.**, 1990,
Higgins, R.P. & Thiel, H., **Introduction to the study of meiofauna.**, 1988,
Horner, R.A., **A taxonomic guide to some common marine phytoplankton.**, 2002,
Kermack, D.M. & Barnes, R.S.K., **Synopses of the British Fauna.**, 1970-2009,
Ramos, A., **Fauna Ibérica. Vols. 2, 4, 21, 25, 27, 29.**, 1992-2006,
Riedl, R., **Fauna y flora del mar Mediterráneo.**, 2000,
Rodríguez Iglesias, F., **Galicia. Natureza. Zooloxía. Vols. 36, 37, 38 e 39.**, 2002,
Tomas, C.R., **Identifying marine phytoplankton.**, 1997,
Varios autores, **Serie Inventarios. Vols. 1, 4, 6, 7, 10, 11, 14.**, 1985-1991,
Warner, G.F., **Diving and Marine Biology.**, 1984,

Recommendations

Subjects that it is recommended to have taken before

Marine Botany/V02M098V01102
The Marine Environment: Physical Oceanography/V02M098V01101
Marine Zoology/V02M098V01103

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

The teaching of the subject of Techniques for sampling organisms and communities in the Inter-University Master's Degree in Marine Biology is given at the La Graña Marine Station (Ferrol). The exceptional nature and peculiarity of this subject, which is totally practical, makes it impossible for it to be taught in a non-classroom setting (by telematic means) as the student would not be able to acquire the skills involved.

For this reason, in the case of moving to non-attendance teaching, the teaching of this subject would have to be postponed and/or relocated in the academic calendar until health conditions allow it.

IDENTIFYING DATA				
Cartography, GIS and Remote Sensing				
Subject	Cartography, GIS and Remote Sensing			
Code	V02M098V01202			
Study programme	(*)Máster Universitario en Biología Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Mandatory	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	García Estévez, José Manuel Blanco Chao, Ramón			
Lecturers	Blanco Chao, Ramón García Estévez, José Manuel			
E-mail	ramon.blanco@usc.es jestevez@uvigo.es			
Web				
General description	In this subject, the student will be trained in spatial interpretation and analysis through the use of basic cartography and remote images and their implementation and analysis through Geographic Information Systems			

Competencies

Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
CG4	Desarrollo de habilidades en el manejo y tratamiento de herramientas, matemáticas, estadísticas e informáticas
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CE1	Conocimiento físico-químico del medio oceánico y costero
CE3	Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros
CE5	Conocimiento de los principios de explotación y sostenibilidad del medio marino y planificación y supervisión de su gestión
CE6	Conocimiento, identificación y evaluación de la calidad ambiental del medio marino y de la legislación vigente. Dirección de consultorías ambientales
CE7	Catalogación, evaluación, conservación, restauración y gestión de áreas marinas y litorales protegidos. Elaboración, asesoramiento legal y ejecución de planes de ordenación del litoral
CE9	Conocimientos de instituciones, organismos y legislación relacionados con el medio marino y sus recursos empresariales y económicos
CE13	Divulgación de conocimientos de la biología y el medio marinos: programas de formación y docencia; planificación y dirección de acuarios, museos, centros de interpretación ambiental, parques naturales y espacios naturales protegidos
CE14	Elaboración, discusión, interpretación, asesoramiento y peritaje de informes científico-técnicos, éticos, legales y socioeconómicos relacionados con el ámbito marino y pesquero
CE15	Gestión de actividades de ocio y turismo en el medio marino y litoral
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma
CT5	Desarrollo de las habilidades de comunicación y discusión de planteamientos y resultados
CT6	Desarrollo de las capacidades de reflexión sobre responsabilidades sociales y éticas

CT7 Desarrollo de habilidades para la divulgación de ideas en contextos tanto académicos como no especializados

CT8 Desarrollo de la habilidad para hablar bien en público

Learning outcomes

Learning outcomes	Competences
(*)	CB2
	CB5
	CG4
	CE7
	CE14
	CE15
	CT3
	CT8
New	CB1
	CB2
	CB3
	CG2
	CG4
	CE1
	CE5
	CE6
	CE7
	CE9
	CT2
	CT3
	CT4
	CT6
New	CB1
	CB2
	CG4
	CE1
	CE14
	CT1
New	CB4
	CG5
	CE13
	CE14
	CE15
	CT5
	CT7
	CT8
New	CB1
	CB2
	CB3
	CB4
	CB5
	CG1
	CE1
	CE3
	CE5
	CE6
	CE7
	CT1
	CT2
	CT3
	CT4
	CT5
	CT6
	CT7
	CT8

Contents

Topic

Basic cartography	Surfaces of reference in cartography: *xeoide, *elipsoide and topographical surface *Elipsoides and *datums Systems projected Systems of coordinates: geographical coordinates and *xeocéntricas Systems of coordinates: the projection UTM, coordinates UTM *Datum vertical: nets *xeodésicas and of *Nivelación. Altitude *ortométrica and *elipsoidal *Topografía: topographical representation, geometrical distance, reduced and real. Pending, directions and *acimuts
Systems of Geographical Information	Concepts of SIX: Definition. Elements of #a SIX The data in #a SIX: geographical and *alfanuméricos Structures and models of storage: models *ráster and *vectorial Analysis in #a SIX: Queries and rankings by attributes and space. Overlap of variable Results of #a SIX: Results *cartográficos and *alfanuméricos
Teledetection	Introduction to the Teledetection. Types of sensors and platforms. Introduction to the processing of images.

Planning

	Class hours	Hours outside the classroom	Total hours
Practices through ICT	15	15	30
Mentored work	0	17	17
Lecturing	2	4	6
Report of practices, practicum and external practices	5	5	10
Systematic observation	5	5	10
Laboratory practice	2	0	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Practices through ICT	Use of programs *SIGs
Mentored work	Follow-up of works *SIGs
Lecturing	Theoretical foundations

Personalized assistance

Methodologies	Description
Lecturing	Attention to the doubts of the student in real time, on concepts.
Practices through ICT	Attention to the use of computer technologies.
Mentored work	Personal orientation in the preparation of works and memories.

Assessment

	Description	Qualification	Evaluated	Competences
Report of practices, practicum and external practices	Work of the course *GIS	80	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG4 CG5 CE1 CE3 CE5 CE6 CE7 CE9 CE13 CE14 CE15	CT1 CT2 CT3 CT4 CT5 CT6 CT7 CT8
Systematic observation	Follow-up of the degree of *aprovechamiento of the work of the students	20	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG4 CG5 CE1 CE3 CE5 CE6 CE7 CE9 CE13 CE14 CE15	CT1 CT2 CT3 CT4 CT5 CT6 CT7 CT8

Other comments on the Evaluation

IDENTIFYING DATA				
Environment Management: Socio-economics, Environmental Education and Legislation				
Subject	Environment Management: Socio-economics, Environmental Education and Legislation			
Code	V02M098V01203			
Study programme	(*)Máster Universitario en Biología Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Mandatory	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	García Estévez, José Manuel Blanco Chao, Ramón			
Lecturers	Blanco Chao, Ramón García Estévez, José Manuel			
E-mail	ramon.blanco@usc.es jestevez@uvigo.es			
Web				
General description	(*)Esta materia trata de achegar aos alumnos/as aos espazos costeiros, onde se desenvolven tanto as actividades pesqueiras e marisqueiras, como ás industriais.			

Competencies	
Code	
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
CE3	Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros
CE5	Conocimiento de los principios de explotación y sostenibilidad del medio marino y planificación y supervisión de su gestión
CE6	Conocimiento, identificación y evaluación de la calidad ambiental del medio marino y de la legislación vigente. Dirección de consultorías ambientales
CE7	Catalogación, evaluación, conservación, restauración y gestión de áreas marinas y litorales protegidos. Elaboración, asesoramiento legal y ejecución de planes de ordenación del litoral
CE9	Conocimientos de instituciones, organismos y legislación relacionados con el medio marino y sus recursos empresariales y económicos
CE15	Gestión de actividades de ocio y turismo en el medio marino y litoral
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma
CT5	Desarrollo de las habilidades de comunicación y discusión de planteamientos y resultados
CT6	Desarrollo de las capacidades de reflexión sobre responsabilidades sociales y éticas
CT7	Desarrollo de habilidades para la divulgación de ideas en contextos tanto académicos como no especializados

Learning outcomes	
Learning outcomes	Competences

(*)1. Analizar os espazos costeiros. Coñecer a súa dinámica e as características da súa regulación e ordenación.	CB2 CB4
2. Aproximarse aos criterios ordenadores das Zonas de Dominio-Público Marítimo Terrestre, en especial o que sobre as mesmas establece a Ley de Costas, e dun xeito especial o Plan de Ordenación do Litoral de Galicia.	CG1 CG6 CE3
3. Coñecer en profundidade as dinámicas xeomorfolóxicas.	CE5
4. Comprender a organización dos espazos costeiros: desde os asentamentos humanos tradicionais até as intensas transformacións xeradas pola urbanización masiva do litoral.	CE6 CE7
5. Análisis das bases económicas das comunidades dependentes do mar: o declive das actividades pesqueiras, a pluriactividade e as competencias de usos na costa (turismo, urbanismo e actividades extractivas na plataforma continental)	CE9 CE15 CT1
6. Comprender como a educación ambiental e a sensibilización en materia de Ordenación do Territorio aportan solucións de xestión sustentable.	CT3 CT4 CT5 CT6 CT7

Contents

Topic

- 1.- The offshore zone, definition, terminology and - delimitation.
- 2.- Coastal xeodinamycs factors.
- 3.- The changes of the level of the sea.
- 4.- The Problematic of the Coastal: Problematic environmental. Processes of degradation.
- 5.- The Juridical Frame: the Coastal Law, Environmental Rule, Ordenation of the Coastal of Galicia
- 6.- Figures of protection in offshore systems.
- 7.- Strategies of environmental education.

Planning

	Class hours	Hours outside the classroom	Total hours
Presentation	5.5	16.5	22
Lecturing	15	35.1	50.1
Objective questions exam	2	0	2
Essay	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
Presentation	Of *the advances in wool preparation of *the *works of wool matter.
Lecturing	The classes will be essentially theoretical *supported in abundant graphic material.To reinforce the contents will contribute him to the students/the complementary bibliography

Personalized assistance

Methodologies	Description
Lecturing	*Conceptual support for *esclarecer *doubts
Presentation	Orientation in wool preparation of *exhibitions

Assessment

	Description	Qualification	Evaluated	Competences
Objective questions exam	The theoretical contents of the matter will be object of an examination type test so that the students put of self-evident his level of knowledge of all the explained	50	CB2 CB4 CG1 CG6	CE3 CE5 CE6 CE7 CE9 CE15 CT1 CT3 CT4 CT5 CT6 CT7
Essay	The students will have to deliver a work on a subject that will choose between a smart proposal by the professor	50	CB2 CB4 CG1 CG6	CE3 CE5 CE6 CE7 CE9 CE15 CT1 CT3 CT4 CT5 CT6 CT7

Other comments on the Evaluation

Sources of information

Basic Bibliography

Haslett, Simon K., **Coastal systems**, Routledge, 2000

García Sanabria, J.; García Onetti, J.; Barragán Muñoz, J.M., **as Comunidades Autónomas y la gestión integrada de las áreas litorales de España : materiales para un debate sobre gobernanza**, Universidad de Cadiz, 2011

Barragán Muñoz, Juan Manuel, **Las áreas litorales de España : del análisis geográfico a la gestión integrada**, Ariel, 2004

Masselink, Gerhard, **Introduction to coastal processes and geomorphology**, Arnold, 2003

Flor, G., **Geología Marina**, Univ. de Oviedo, 2005

Complementary Bibliography

Bird, E.C.F., **Coastal Geomorphology: An Introduction**, Wiley&Sons, 2008

Carter, R.W.G., **Coastal Environments. An introduction to the physical, ecological and cultural systems of coastlines.**, Academic Press, 1988

Davidson-Arnott. R., **An Introduction to Coastal Processes and Geomorphology**, Cambridge University Press., 2010

Haslett, S.K., **Coastal Systems**, Routledge, 2000

Recommendations

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== METHODOLOGY ADAPTATION ===

Lectures: Explanation of theoretical contents.

In the scenarios 2 and 3 contemplated in the "Guidelines for the development of safe classroom teaching (2020/21)" of the USC, the lectures will be given using the Microsoft Teams.

Interactive: Practical work, not a link to data sources related to the coastline. Analysis of cases of implementation of coastal management measures.

In the three scenarios contemplated in the "Guidelines for the development of safe classroom teaching (2020/21)" of the USC, interactive teaching will be carried out using the Microsoft Teams application.

Virtual USC

The course is in the environment of the Virtual USC

=== ADAPTATION OF THE EVALUATION ===

Learning assessment system

In the 3 scenarios contemplated in the "Guidelines for the development of safe classroom teaching (2020/21)" of the USC, the evaluation will be made by means of a paper at the end of the subject, and will represent 100% of the qualification.

IDENTIFYING DATA				
Conservation Biology				
Subject	Conservation Biology			
Code	V02M098V01204			
Study programme	(*)Máster Universitario en Biología Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	García Estévez, José Manuel Domínguez Conde, Jesús			
Lecturers	Domínguez Conde, Jesús Fernández Rodríguez, Nuria García Estévez, José Manuel Muño Boedo, Ramón			
E-mail	jesus.dominguez@usc.es jestevez@uvigo.es			
Web	http://masterbiologiamarina.uvigo.es/			
General description	(*)Form to the student in the basic principles of the Biology of the Conservation, providing him tools of knowledge that allow him the resolution of relative practical cases to the marine environment			

Competencies

Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoitado nun contexto de investigación.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CG6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
CG7	Entendimiento de la proyección social de la ciencia
CE2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
CE3	Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros
CE5	Conocimiento de los principios de explotación y sostenibilidad del medio marino y planificación y supervisión de su gestión
CE6	Conocimiento, identificación y evaluación de la calidad ambiental del medio marino y de la legislación vigente. Dirección de consultorías ambientales
CE7	Catalogación, evaluación, conservación, restauración y gestión de áreas marinas y litorales protegidos. Elaboración, asesoramiento legal y ejecución de planes de ordenación del litoral
CE13	Divulgación de conocimientos de la biología y el medio marinos: programas de formación y docencia; planificación y dirección de acuarios, museos, centros de interpretación ambiental, parques naturales y espacios naturales protegidos
CE15	Gestión de actividades de ocio y turismo en el medio marino y litoral
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad
CT6	Desarrollo de las capacidades de reflexión sobre responsabilidades sociales y éticas

Learning outcomes

Learning outcomes	Competences
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(*)Knowledge of the diversity of the alive organisms in the marine ecosystems, his genetic diversity and his adaptative strategies.	CB1 CG1 CG2 CG5 CG6 CG7 CE2 CE3 CE5 CE6 CE7 CE13 CE15 CT1 CT2 CT3 CT6
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Knowledge of the nature, causes and consequences of the loss of genes, populations, species and habitats	CB1 CG1 CG2 CE3 CE5 CE6 CE7 CT1 CT2 CT6
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Contents

Topic

1. Introduction to the Biology of the Conservation	1.1. What is and how arises the discipline. 1.2. *Biodiversidad Marine
2. Diversity in the half marine	2.1. History and current state of the knowledge 2.2. General patterns of geographic distribution 2.3. Means *pelágico and *bentónico 2.4. The means *estuarinos
3. Species loomed. Extinctions	3.1. Definitions 3.2. Temporary patterns of *biodiversidad 3.3. Human development and extinctions 3.4. Half aquatic: current state and estimate of taxes of extinction
4. Overexploitation of resources	4.1. Exploitation of natural resources *vs sustainability 4.2 Half marine: Evolution, current state and tendency of the *pesquerías world-wide 4.3. Ecological effects of the fishing: (to) direct Effects on species (*b) Effects on the ecosystems 4.4. Biological theory of the sustainable exploitation and models of management of the *pesquerías: Models of production *vs management *ecosistémica of the *pesquerías 4.5. The marine reservations like tool of management *pesquera: marine Reservations of interest *pesquero in Galicia: You *miñarzos
5. Species *invasoras	5.1. To what call species *invasoras. 5.2. Effects on the environment. 5.3. Roads of introduction of *invasoras in the half marine. 5.4. Spanish catalogue of Species *Invasoras.
6. Climatic change	6.1. Concept. 6.2. Changes observed in the last 100 years. 6.3. Climatic change in Galicia. 6.4. Changes in the half physicist and biotic.
7. The parasitism in the half marine	7.1. Parasitic system/*hospedador: biological Cycles and specificity 7.2. Biological cycles and transmission of the marine parasites 7.3. *Ecoparasitología
8. The *biodiversidad parasitic	8.1. Main parasitic groups presents in the half marine 8.2. Technicians of preparation, conservation and identification of marine parasites

9. Parasitism and conservation

- 9.1. Dynamics of parasitic populations-*hospedador: populational regulation of parasites and *hospedadores
 9.1.1. Massive mortalities
 9.1.2. Parasites and biological control
 9.2. Parasites like *biomarcadores

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	20	53	73
Seminars	1	0	1
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	The student receives the contents and essential concepts for a correct understanding of the matter
Seminars	The student resolves relative doubts to the contents of the masterclasses and to the bibliographic work entrusted

Personalized assistance

Methodologies Description

Lecturing	The professor will attend in the course of the session *magistral to the doubts and comments formulated by the students. Also it will answer to the questions formulated by email or in visits realised to the dispatch.
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Assessment

Description	Qualification	Evaluated Competences
Lecturing They will evaluate by means of ad hoc proof the knowledge of the contents transmitted in the sessions *magistrales	100 CB1	CE2 CE3 CE5 CE6 CE7 CE13 CE15

Other comments on the Evaluation

Sources of information

Basic Bibliography

- Ausden, M., **Habitat management for conservation: a handbook of techniques**, Oxford University Press, 2007
 Bush, A.O.; Fernández, J.C.; Esch, G. & Seed J.R., **Parasitism. The diversity and ecology of animal parasites**, Cambridge University Press, 2001
 Doody, J.P., **Coastal Conservation and Management - An Ecological Perspective**, Kluwer Academics Publishers, 2000
 Primack, R.B. & Ros, J., **Introducción a la biología de la conservación**, Ariel Ciencia, 2002
 Sinclair, M. & Valdimarsson, G., **Responsible fisheries in the marine ecosystem**, CABI Publishing, 2003

Complementary Bibliography

- Bower, S.M., **Synopsis of Infectious Diseases and Parasites of Commercially Exploited Shellfish**, 2001
 Grabda, S., **Marine Fish Parasitology. An outline**, . Weinhein; Basel (Switzerland): Cambrige, NY. VCH, 1991
 Jennings, S. & Kaiser, M., **The effects of fishing on marine ecosystems and communities**, Academic Press, 2008
 Roberts, L.S. & Janovy, J.S., **Foundations of Parasitology**, McGraw-Hill Science, 2005
 Sodhi, N.S. & Ehrlich, P.R., **Conservation Biology for All**, Oxford University Press, 2010

Recommendations

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of its uncertain and unpredictable evolution of the sanitary alert caused by the COVID-19, the University establishes joint extraordinary planning that will actuate in the moment in that the administrations and the @propio institution determine it attending to criteria of security, health and responsibility, and guaranteeing the *docencia in a @escenario no *presencial or no totally *presencial. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the *docencia of a way but *áxil and effective when being known beforehand (or with a wide advance) pole students and the teaching staff through the tool normalized and institutionalized of the teaching guides DOCNE*T.

@ESCENARIO NO PRESENCIAL

Will keep the *impartición of the kinds *maxistrais, employing the available platforms in each University (*Teams or similar). The attention to the students will do employing the available platforms in each University.

The theoretical contents to impart in a @escenario no *presencial will not differ of the reflected stop a @escenario *presencial. Equally, the bibliography detailed in the present guide considered sufficient stop the *impartición of the subject in a @escenario no *presencial.

Adaptation of the evaluation

To proof of evaluation in a @escenario no *presencial will be similar to exposed stop the situation *presencial

IDENTIFYING DATA**Genetic Diversity and its Application to Study of Marine Organisms**

Subject	Genetic Diversity and its Application to Study of Marine Organisms			
Code	V02M098V01205			
Study programme	(*)Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Pérez Diz, Ángel Eduardo			
Lecturers	Galindo Dasilva, Juan Martínez Lage, Andrés Naveira Fachal, Horacio Pérez Diz, Ángel Eduardo Quesada Rodríguez, Humberto Carlos			
E-mail	angel.p.diz@uvigo.es			
Web				
General description	The subject Genetic Diversity and his applications to the study of the marine organisms contributes a wide vision on concepts and genetic tools of application for the management, conservation and study of species and marine populations. The questions treated in this subject include the study of the molecular techniques for the analysis of the genetic variation, the distribution of the intraspecific variability and his quantification, the molecular footprint of the adaptation, the study of the genic expression, and the variation in quantitative characters. The lessons *magistrales will be complemented with practical sessions in which the students will be able to exercise the knowledges purchased in the theoretical classes. As I complement to the face-to-face training, will make activities no face-to-face in which the students will put in practice the concepts learnt in the matter through the resolution of practical cases and the realisation of works *tutorizados by a professor, facilitating like this the personalised work and the integration of different sources of information.			

Competencies

Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
CG3	Aprendizaje de diversas técnicas y métodos analíticos tanto en el medio natural como en el laboratorio
CG4	Desarrollo de habilidades en el manejo y tratamiento de herramientas, matemáticas, estadísticas e informáticas
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CG6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
CE2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
CE4	Conocimiento y búsqueda del potencial interés económico y biotecnológico de los organismos marinos
CE7	Catalogación, evaluación, conservación, restauración y gestión de áreas marinas y litorales protegidos. Elaboración, asesoramiento legal y ejecución de planes de ordenación del litoral
CE10	Inspección y asesoramiento técnico en la evaluación, explotación y gestión de pesquerías, extracción de recursos e instalaciones de acuicultura
CE11	Estudios de dinámica poblacional, mejora genética y selección de stocks en pesquerías, acuicultura y programas de repoblación
CE12	Control de calidad y seguridad de alimentos y de productos de transformación y biotecnológicos de origen marino

CE14Elaboración, discusión, interpretación, asesoramiento y peritaje de informes científico-técnicos, éticos, legales y socioeconómicos relacionados con el ámbito marino y pesquero

CT1 Desarrollo de las capacidades comprensivas, de análisis y síntesis

CT2 Desarrollo de la capacidad de razonamiento crítico y autocrítico

CT4 Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma

Learning outcomes

Learning outcomes	Competences
Development of the understanding capacities, of analysis and synthesis	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG4 CG5 CG6 CE2 CT1
Utilisation of criteria and scientific methods in the approach and resolution of problems applying the knowledges purchased	CB1 CB2 CB3 CG1 CG2 CG3 CE2 CE4 CE7 CE10 CE11 CE12 CE14 CT1 CT2
Development of the capacity of critical reasoning and *autocrítico	CB1 CB2 CB3 CG2 CG6 CE2 CE4 CE7 CE11 CE12 CT2
Research, analysis and integration of information from different sources and capacity for his interpretation and evaluation	CB1 CB2 CB3 CB5 CG1 CG2 CG4 CG6 CE2 CE4 CE7 CE10 CT1 CT4

Learning of diverse technical and analytical methods so much in him half natural as in him laboratory	CB1 CB2 CB3 CG3 CG4 CE4 CE10 CE11 CT1 CT2 CT4
Development of skills in him handle and treatment of tools, mathematical, statistical and computer	CB1 CB2 CB5 CG1 CG2 CG4 CG6 CE10 CE11 CE12 CT1 CT2 CT4
Development of the capacity to update he knowledge of autonomous form	CB3 CB5 CG2 CG6 CE12 CE14 CT4
Development of the skill of preparation, presentation and defence of works and technical reports	CB1 CB2 CB4 CB5 CG5 CG6 CE14 CT1 CT2 CT4
Development of the scientific curiosity, of the initiative and the creativity	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG6 CE11 CT1 CT2 CT4
Knowledge of the diversity of marine organisms and his adaptative strategies	CB1 CB2 CB3 CG1 CG2 CG3 CE2 CE11 CT1

Knowledge and understanding of the interactions of the marine organisms and the marine and coastal ecosystems	CB2 CB3 CG1 CG2 CG3 CG4 CE2 CE7 CE11 CT1
Cataloging, evaluation, conservation, restoration and management of marine and coastal areas protected. Preparation, legal advice and execution of plans of ordination of the seaboard	CB1 CB2 CB3 CB5 CG1 CG2 CG3 CG4 CG5 CE7 CE11 CT1 CT2 CT4
Knowledge of the principles of exploitation and sustainability of the half marine and planning and supervision of his management	CB1 CB2 CB5 CG1 CG2 CG3 CG4 CE4 CE7 CE10 CE11 CE12 CT2
Divulging of knowledges of the biology and the half marine: programs of training and teaching; planning and direction of aquariums, museums, centres of environmental interpretation, natural parks and natural spaces protected	CB1 CB2 CB3 CB4 CG1 CG2 CG5 CE7 CT1 CT2 CT4
Preparation, discussion, interpretation, advice and *peritaje of scientific reports-technical, ethical, legal and socioeconomic related with him marine field and *pesquero	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG5 CE14 CT1 CT2 CT4

Knowledge and research of the potential economic interest and *biotecnológico of the marine organisms	CB1 CB2 CB3 CB5 CG1 CG2 CG3 CG4 CE4 CT1 CT2 CT4
Knowledge and handle of the methodology of investigation, of the technicians of sampling and instrumental and of analysis of data applied to the half marine	CB1 CB2 CB3 CB5 CG1 CG2 CG3 CG4 CE10 CT1 CT2 CT4
Studies of populational dynamics, genetic improvement and selection of stocks in *pesquerías, aquaculture and programs of *repoblación	CB1 CB2 CB3 CB5 CG1 CG2 CG3 CG4 CE11 CT1 CT2 CT4
Inspection and technical advice in the evaluation, exploitation and management of *pesquerías, extraction of resources and installations of aquaculture	CB1 CB2 CB3 CB5 CG1 CG2 CG3 CG5 CE10 CT1 CT2

Contents

Topic	
SUBJECT 1: GENETIC VARIATION IN MARINE ORGANISMS	Molecular techniques for the scrutiny of the populational genetic variation. Databases. Identification of species (Barcoding), individuals and sexes.
SUBJECT 2: DISTRIBUTION OF THE GENETIC VARIABILITY INSIDE SPECIES	Estimators of the genetic diversity. Populational subdivision and migration. Phylogeography.
SUBJECT 3: GENETIC VARIATION IN NATURAL POPULATIONS: EFFECTS OF THE POPULATIONAL SIZE	Genetic drift in natural populations. Effective population size. Demographic effects. Inbreeding due to genetic drift. Strategies to handle populations in captivity.
SUBJECT 4: NATURAL SELECTION, ADAPTATION And GENETIC DIVERSITY	Natural selection and adaptation. Neutral theory of the molecular evolution. The molecular footprint of the natural selection. Inference of selection from intra- and interspecific molecular variation.
SUBJECT 5: ADAPTATIVE And NEUTRAL VARIATION IN THE GENIC EXPRESSION	Techniques to quantify gene expression. Proteomics. Variation of gene expression within and between populations. Neutral and adaptative variation in gene expression. Phenotypic plasticity.
SUBJECT 6: VARIATION IN QUANTITATIVE CHARACTERS	The continuous variation. Components of variance. Heritability. Estimation of the heritability. The action of the natural selection on the quantitative traits. Methods for the cartography of QTLs

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	28	56	84
Mentored work	0	30	30
Practices through ICT	12	24	36

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	The teacher explains the theoretical content of each topic. Extensive diagrams of the subject and a specific bibliography will be provided so that the student can delve into the different topics. The student assimilates and writes down concepts. It raises doubts and questions.
Mentored work	Students will prepare a written report on a topic proposed and tutored by a teacher
Practices through ICT	Students will be trained in the use of the most relevant online programs and tools related to each topic. The teacher guides and solves doubts.

Personalized assistance

Methodologies Description

Mentored work	The process of learning of the student that complements the masterclasses and the practices, will be carried out by means of the preparation of a memory written on a topic related with the subject, proposed and supervised by a professor. The professors will reserve a time to attend and resolve the doubts of the students. In this activity professors have the function to orient and guide the process of learning of the students and will help them to make successfully the corresponding autonomous work. The professors indicate during the beginning of the term the place, day and hours for this personalised attention.
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Assessment

	Description	Qualification	Evaluated	Competences
Lecturing	They will evaluate the answers to a final examination writing in which they will pose relative questions to the theoretical concepts given along the subject.	50	CB1 CB2 CB3 CB4 CB5	CG1 CG3 CG4 CG6 CE2 CE4 CE7 CE10 CE11 CE12 CE14
Mentored work	It will evaluate the quality of the memory written presented by the students in base to the subject posed by his tutor.	20	CB1 CB2 CB3 CB4 CB5	CG1 CG2 CG5 CG6 CE2 CE4 CE7 CE10 CE11
Practices through ICT	The answers to a practical exercise in which questions related to the practical concepts taught throughout the course will be evaluated.	30	CB1 CB2 CB3 CB4 CB5	CG1 CG2 CE2 CE11

Other comments on the Evaluation

It will be necessary to obtain a minimum score of 4,0 points in the final exam to pass the subject. Delaying in the presentation of working tasks will be penalised up to 20% of the corresponding score assigned to the concerned task (if this is presented inside the penalised extended term, otherwise a zero will be obtained). It will not be admitted the delivery of works a week later of the term of delivery (penalised extended term). Any attempt of plagiarism in the activities will make to get a qualification of zero in the activity affected, without possibility to recover it in the second chance-call (July). The students that do not attend to the final exam will count as no presented. To pass the subject will be necessary to obtain 5 points of 10 in the weighted global evaluation. For the second chance-call (final exam in July), the student will conserve the scores of the activities made previously.

Date for examination (final exam, 1st and 2nd chance) can be obtained from:

<http://masterbiologiamarina.uvigo.es/gl/docencia/exames>

Sources of information

Basic Bibliography

Complementary Bibliography

John C. Avise, **Molecular Markers, Natural History, and Evolution**, Springer, Second Edition,

Philip W. Hedrick, **Genetics of Populations, Fourth Edition, Jones & Bartlett**, Fourth Edition,
 Anne Charmantier, Dany Garant, Loeske E.B. Kruuk, **Quantitative Genetics in the wild, OUP Oxford**, Primera Edición,
 Arthur Lesk, **Introduction to Bioinformatics, OUP Oxford**, Fourth Edition,
 Johanna R. Freeland, Heather Kirk, Stephen D. Petersen, **Molecular Ecology, Wiley-Blackwell**, Second Edition,

Recommendations

Subjects that continue the syllabus

Techniques to Study Marine Organisms/V02M098V01108

Subjects that it is recommended to have taken before

Molecular Basis of Adaptation to the Marine Environment/V02M098V01107

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies that are modified

Blended case: Both the theoretical and practical classes will be followed in a mixed way in the classroom by a small group of students who will rotate, and telematically for the rest, as long as the maximum capacity allowed in the teaching classroom is exceeded .

Non-face-to-face case: Both the theoretical and practical classes will be taught electronically following the schedule established in the academic calendar, leaving all the material available on FAITIC and/or by email.

* Non-face-to-face mechanism for student meetings (tutorials)

All the tutorial meetings will be carried out in group or individually using the remote campus following the hours indicated by the center or agreeing dates and times previously with the students by email.

=== ADAPTATION OF THE EVALUATION ===

- Blended modality: they are not modified.

- Non-face-to-face mode: The tests will be carried out virtually using the existing mechanisms (remote campus and FAITIC).

IDENTIFYING DATA				
Marine Pollution and Ecotoxicology				
Subject	Marine Pollution and Ecotoxicology			
Code	V02M098V01206			
Study programme	(*)Máster Universitario en Biología Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	García Estévez, José Manuel Barreiro Lozano, Rodolfo			
Lecturers	Barreiro Lozano, Rodolfo García Estévez, José Manuel Sánchez Marín, Paula			
E-mail	jestevez@uvigo.es rodolfo.barreiro@udc.es			
Web	http://https://plus.google.com/+RodolfoBarreiroSP/posts			
General description	This course explore techniques for detecting, quantifying and predicting the effects of pollutants in the marine environment. These techniques are essential for protecting and managing the environment against the risks of pollution.			

Competencies

Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG4	Desarrollo de habilidades en el manejo y tratamiento de herramientas, matemáticas, estadísticas e informáticas
CG6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
CE6	Conocimiento, identificación y evaluación de la calidad ambiental del medio marino y de la legislación vigente. Dirección de consultorías ambientales
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico

Learning outcomes

Learning outcomes	Competences
Distinguishes and identifies the approaches of retrospective prospective ecotoxicology.	CB1 CB2 CG1 CE6
Describes the typical effects of the pollution on individuals, populations and communities	CB1 CB2 CG1 CE6
Assesses the advantages and limitations of each level of organisation to detect the impact of pollutants	CB1 CB2 CG1 CE6 CT1 CT2
Understands the fundamentals of ecotoxicology assays, bioaccumulation-dpuration studies and biomarkers	CB1 CB2 CG4 CT1 CT2
Understands the relevance of the information provided by ecotoxicology assays	CT1 CT2
Understands the fundamentals and limitations of the predictions derived from models of the distribution and effects of pollutants	CT1 CT2

Contents

Topic

Introduction and bioaccumulation (Retrospective ecotoxicology I)	Main environmental problems. Ecotoxicology. The concept of bioavailability. Factors of pollutant bioavailability. Use of bioaccumulators. Requirements of a good bioaccumulator
Toxicokinetics	Kinetics of pollutant accumulation. Concepts of Bioconcentration Factor (BCF), Bioaccumulation Factor (BAF).
Biomagnification along the food chain	Concept of biomagnification. Estimating trophic transfer and Biomagnification Transfer. Examples of biomagnification and trophic dilution
Physiological effects	Main physiological detrimental effects used in ecotoxicology and biomonitoring.
Biomarkers (Retrospective Ecotoxicology II).	Classification, specificity and relation with adverse effects. Requirements of a biomarker. Examples of biomarker.
Toxicity assays (Prospective Ecotoxicology *I).	Concentration-response relationship. Types of assay: acute and chronic toxicity. Data analyses. Toxicity curves. LC50, NOEC, LOEC and MATC.
Prediction in ecotoxicology (Prospective Ecotoxicology II)	Species sensitivity distribution. Environmental risk assessment.
Changes in community composition (Retrospective Ecotoxicology III).	Bioindicator species. Relative abundance. Biotic indexes. Diversity indexes. Comparison with communities of reference.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	16	40	56
Problem solving	4	12.5	16.5
Autonomous problem solving	1.5	0	1.5
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	Master session
Problem solving	Computer sessions with specialized software.
Autonomous problem solving	Personal guidance to students through one-to-one meeting and/or using TICs.

Personalized assistance

Methodologies	Description
Autonomous problem solving	Personal guidance to students through one-to-one meeting and/or using TICs.

Assessment

	Description	Qualification	Evaluated Competences			
Objective questions exam	A test	100	CB1 CB2	CG1 CG4 CG6	CE6	CT1 CT2

Other comments on the Evaluation**Sources of information****Basic Bibliography****Complementary Bibliography**

Newman, M. C., and M. A. Unger, **Fundamentals of Ecotoxicology**, 2,
Walker, C. H., S. P. Hopkin, R. M. Sibly, and D. B. Peakall., **Principles of Ecotoxicology**, 3,
Clark. R.B., **Marine Pollution**, 5,

Recommendations

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of the uncertain and unpredictable evolution of the sanitary alert caused by the *COVID-19, the University of Vigo establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or partially face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a more agile and effective way when being known in advance (or with a wide *antelación) by the students and the *profesorado through the tool normalised and institutionalised of the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===

Teaching methodologies that do not change:

-All (the subject is already taught using tele-teaching tools as it is part of an interuniversity master where a portion of the students are physically located at other universities.

* Educational methodologies that will change

-None. The only change will be the channel used to teach the classes as the videoconference system used under regular circumstances will be replaced by the platform Teams.

* Mechanism for face-to-face attention to the students

-Email and videocalls in Teams.

* Modifications (if they proceed) of the contents to give

-does not proceed.

* Additional bibliography to facilitate the car-learning

-does not proceed.

* Other modifications

-does not proceed.

=== ADAPTATION OF THE EVALUATION ===

* Test already made

Proof XX: [previous Weight 00%] [Weight Proposed 00%]

-does not proceed.

* Pending proofs that keep

Proof XX: [previous Weight 00%] [Weight Proposed 00%]

-- Multioption test (previous weight 100%)(proposed weight 100%): The test will be identical to the one used under regular circumstances. The only difference will be that the students will take the test from their home (instead of in a classroom) using a platform for on-line evaluation.

* Proofs that modify

[previous Proof] => [new Proof]

-does not proceed.

* New proofs

-does not proceed.

* Additional information

-does not proceed.

IDENTIFYING DATA				
Biology of Exploited and Potentially Exploitable Species				
Subject	Biology of Exploited and Potentially Exploitable Species			
Code	V02M098V01207			
Study programme	(*)Máster Universitario en Biología Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	García Estévez, José Manuel Cremades Ugarte, Javier			
Lecturers	Cremades Ugarte, Javier Fernández Rodríguez, Luis García Estévez, José Manuel Rubal García, Marcos Veiga Sánchez, María Purificación			
E-mail	jestevez@uvigo.es javier.cremades@udc.es			
Web				
General description	(*)Ciclo vital e dinámica de poboacións das especies actualmente explotadas no litoral galego, e de especies potencialmente *explotables. Hábitat, abundancia, distribución e propiedades *nutritivas			

Competencies

Code	
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG2	Búsqueda, análise e integración de información a partir de diferentes fontes e capacidade para su interpretación y evaluación
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CE2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
CE3	Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros
CE4	Conocimiento y búsqueda del potencial interés económico y biotecnológico de los organismos marinos
CE5	Conocimiento de los principios de explotación y sostenibilidad del medio marino y planificación y supervisión de su gestión
CE9	Conocimientos de instituciones, organismos y legislación relacionados con el medio marino y sus recursos empresariales y económicos
CE10	Inspección y asesoramiento técnico en la evaluación, explotación y gestión de pesquerías, extracción de recursos e instalaciones de acuicultura
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma
CT7	Desarrollo de habilidades para la divulgación de ideas en contextos tanto académicos como no especializados
CT8	Desarrollo de la habilidad para hablar bien en público

Learning outcomes

Learning outcomes	Competences
(*)	CE5
(*)	CG2
	CE2
	CE3
	CE4
(*)	CE2
	CE3
(*)	CE2
	CE3
	CE5
(*)	CE4

New	CE5 CE9 CE10 CT4
New	CB4 CB5 CG2 CG5 CT1 CT2 CT4 CT7 CT8

Contents

Topic	
(*)Concept of species *explotable and potentially *explotable.	(*)Main species exploded in the coasts of Galicia. Figures of production, economic assessment and markets of destination.
(*)Species associated to *sustratos rocky *I.	(*)Main species of *macroalgas *bentónicas *intermareales and *submareales exploded at present in Galicia. Examples type: *alginófitos, *carragenófitos, *agarófitos and alimentary seaweeds. Cycle of life, habitat, adaptations, abundance and geographic distribution. Other species exploded and potentially *explotables.
(*)Species associated *sustratos rocky *II.	(*)Main species of marine invertebrates *bentónicos exploded at present in Galicia. Cycle of life, habitat, adaptations, abundance and geographic distribution. Examples type: seed of mussel, hedgehog and *percebe. Other species exploded or potentially *explotables.
(*)Species associated to *sustratos soft.	(*)Main species of marine invertebrates exploded at present in Galicia. Cycle of life, habitat, adaptations, abundance and geographic distribution. Examples type: *berberechos, clams, razors and other bivalve molluscs. Other species exploded or potentially *explotables.
(*)Species *pelágicas (*costeras and oceanic).	(*)Habitat and adaptations. Generalities and species guides. Examples type: anchovy and sardine; beautiful and fish sword. Potentiality of species *explotables (*descartes).
(*)Species *demersales and of bottom (fishes and crustaceans).	(*)Habitat and adaptations. Generalities and species guides. Examples type: hake, anglers, commercial crustaceans. Potentiality of species *explotables (*descartes).
(*)Marine species potentially *explotables in Galicia and new resources for the *alimentación human.	(*)Nutritious value of *macroalgas and marine invertebrates. Derivative effects of the consumption of marine products in the human beings and his repercussion in physiological parameters.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	24	58.8	82.8
Presentation	4	16	20
Seminars	4	0	4
Mentored work	12	30	42
Essay questions exam	2	0	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	Presentation by the teacher of the contents on the subject matter of study, theoretical bases and / or guidelines of a work or exercise that the student has to develop.
Presentation	Presentation by the students to the teacher and / or a group of students of a subject matter or content of the results of a job, exercise, project ... It can be done individually or in groups.
Seminars	(*)Personalización do apoio e seguimento do alumno.
Mentored work	(*) Para desenvolver a capacidade de buscar e estruturar unha información traballando de forma autónoma e de expor publicamente os resultados obtidos.

Personalized assistance

Methodologies	Description
Presentation	

Assessment						
	Description	Qualification	Evaluated	Competences		
Presentation	The work done and delivered as well as the clarity and synthesis capacity in its public exposure will be evaluated	20	CB4 CB5	CG2 CG5		CT2 CT4 CT7 CT8
Mentored work	Both the attendance and attitude in the lectures will be evaluated.	10				CT1 CT2
Essay questions exam	The written exam will consist of a series of development questions of medium length and covering all parts of the subject	70	CB5	CG2	CE2 CE4 CE5 CE9 CE10	CT1 CT4

Other comments on the Evaluation

Sources of information

Basic Bibliography

- Bocanegra, A., Bastida, S., Benedí, J., Ródenas, S. & F.J. Sánchez-Muníz, **Characteristics and nutritional and cardiovascular-health properties of seaweeds**, 2009
- Chambers, R.C. & E.A. Trippel, **Early life history and recruitment in fish populations**, Chapman & Hall, London, 1997
- Critchley, A.T. & Ohno, M. & Largo, D.B. (Eds.), **World Seaweed Resources**, ETI. University of Amsterdam. (CD-ROM, 2006
- Dawes, C.J., **Marine Botany**, John Wiley & Sons, Inc., New York, 1997
- Doumenc, D. A. & Van Praet, **Ordre des Actiniales. Ordre des Phychodactiniales. Ordre des Corallimorphaires**, In Grassé, P.P. (Ed.), *Traite de Zoologie*. Vol. III, Masson, Paris, 1987
- Figueras, A. J., **Biología y cultivo del mejillón (Mytilus galloprovincialis) en Galicia**, Biblioteca de Ciencias, Consejo Superior de Investigaciones Científicas, M, 2007
- Gerking, S.D., **Feeding ecology of fish**, Academic Press, San Diego, 1994
- Graham, L.E., J.M. Graham & L.W. Wilcox, **Algae**, Second edition, Pearson, 2009
- Guiry, M.D. & Blunden, G., **Seaweeds Resources in Europe: Uses and Potential**, John Wiley & Sons, West Sussex, 1991
- Helfman, G.S., B.B. Collette & D.F. Facey, **The diversity of fishes**, Blackwell Science, USA, 1997
- Little, C. & J.A. Kitching, **The Biology of Rocky Shores**, Oxford University Press, 1996
- Lobban, C.S. & P.J. Harrison, **Seaweed ecology and physiology**, Cambridge Univ. Press, Cambridge, 1994
- Lüning, K., **Seaweeds their environment, biogeography and ecophysiology**, John Wiley & Sons, Inc. Toronto, 1990
- Molares, J., **Estudio del ciclo biológico del percebe (Pollicipes cornucopia Leach) de las costas de Galicia**, 1993
- Nielsen, S. Suzanne, **Análisis de los alimentos**, Editorial Acirbia, S.A., 2003
- Sirkoski, Z.E., **Seafood: Resources, Nutritional Composition and Preservation**, CRC Press, Inc., 1990
- Weatherley, A.H. & H.S. Hill, **The biology of fish growth**, Academic Press, London, 1987

Complementary Bibliography

- Barnes, M., **Pedunculate cirripedes of the genus Pollicipes**, 1996
- Bell, M., F. Redant & I. Tuck, **Lobsters: biology, management, aquaculture and fisheries**, Bruce Phillips (ed.). Blackwell Publishing, 2006
- Cruz, T., **Biología e ecología do percebe, Pollicipes pollicipes (Gmelin, 1790) no litoral sudoeste português**, Universidad de Évora, 2000
- Lustres Pérez, V., **El erizo de mar: Paracentrotus lividus (Lamarck, 1816) en las costas de Galicia**, Universidad de Santiago de Compostela, 2006
- Manuel, R. L., **British Anthozoa (Coelenterata: Octocorallia & Hexacorallia)**, Synopses of the British Fauna (New Series), 18 (R, 1988
- Sakaguchi, M. (Ed.), **Developments in food science. More efficient utilization of fish and fisheries products**, Elsevier, 2004
- Xunta de Galicia, **Plan de ordenación de los recursos pesqueros y marisqueros de Galicia (III). Las algas en Galicia alimentación y otros usos**, Santiago de Compostela, 1993

Recommendations

Subjects that continue the syllabus

Evaluation and Exploitation of Coastal Resources/V02M098V01208

Subjects that it is recommended to have taken before

Marine Botany/V02M098V01102

Marine Zoology/V02M098V01103

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

* Teaching methodologies modified

* Non-attendance mechanisms for student attention (tutoring)

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Tests that are modified

[Previous test] => [New test]

* New tests

* Additional Information

IDENTIFYING DATA				
Evaluation and Exploitation of Coastal Resources				
Subject	Evaluation and Exploitation of Coastal Resources			
Code	V02M098V01208			
Study programme	(*)Máster Universitario en Biología Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Presa Martínez, Pablo			
Lecturers	Cerviño López, Santiago Pérez Rodríguez, Montserrat Presa Martínez, Pablo			
E-mail	presa@uvigo.es			
Web	http://http://masterbiologiamarina.uvigo.es/			
General description	Subject oriented to the knowledge of the current systems of evaluation of the alive marine resources in the seaboard and his use in the management of the same of integrated form: conservation, exploitation and sustainability.			

Competencies	
Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
CG3	Aprendizaje de diversas técnicas y métodos analíticos tanto en el medio natural como en el laboratorio
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CE5	Conocimiento de los principios de explotación y sostenibilidad del medio marino y planificación y supervisión de su gestión
CE8	Conocimiento y manejo de la metodología de investigación, de las técnicas muestreo e instrumentales y de análisis de datos aplicados al medio marino
CE10	Inspección y asesoramiento técnico en la evaluación, explotación y gestión de pesquerías, extracción de recursos e instalaciones de acuicultura
CE11	Estudios de dinámica poblacional, mejora genética y selección de stocks en pesquerías, acuicultura y programas de repoblación
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma
CT5	Desarrollo de las habilidades de comunicación y discusión de planteamientos y resultados

Learning outcomes	
Learning outcomes	Competences
1 That the student handles the parameters and obtains data on which the evaluation of the living marine resources is based .	CB1 CG1 CE5 CT1

2 That the student knows how to identify models, processes and technologies that allow to optimise the evaluation of the living marine resources.	CB2 CG2 CE8 CT4
3 That the student knows the foundations of the management of fisheries and handles the criteria employed in plans of exploitation and recovery.	CB3 CG3 CE10 CT1
4 That the student understands and handles the underlying genetic parameters in the management of living marine resources	CB2 CG2 CE11 CT4
5 That the student knows how to handle the genetic background of adapted fish stocks and enhancement stocks: foundation, maintenance and follow-up.	CB4 CG3 CE10 CT3
6 That the student knows how to elaborate an integral plan of management of fisheries by means of the suitable genetic tools for his evaluation and exploitation.	CB5 CG5 CE11 CT2 CT5

Contents

Topic	
SUBJECT I. Antecedents and concepts: systems of evaluation and exploitation of the living marine resources.	Aims, concepts, technicians of identification of stocks, cycle of life, models of adjust recruitment-stock, selectivity of the arts, growth, mortality.
SUBJECT II. Tools of evaluation of living marine resources I.	Assessment of a stock: sources of information; international organisms that take part in the regulation and management of living resources. Statistical network and programs to follow-up for the evaluation of resources.
SUBJECT III. Tools of evaluation of the living marine resources II.	Concept of overharvest and its types. Sustainability and management of fisheries: technical foundations. Management based on the limits of captures and control of the effort. Plans of recovery. Precautionary approach and ecosystemic approach.
SUBJECT IV. Tools of evaluation of the living marine resources III.	Evaluation of fishery resources: indirect methods. Models of production. Structural models; analysis of cohorts; method of the virtual population.
SUBJECT V. Tools of management of living marine resources IV.	System of advice of the EU fisheries. Censuses and samples. Statistical fisheries, captures, effort, CPUE. Strategies of sampling. Direct methods of evaluation of independent resources of fishing data. Types of campaigns and aims. Species-specific prospection tools.
SUBJECT VI. Genetic bases of the management of living marine resources.	Continuous variation of characters of interest and biométrie methods for the evaluation of characters.
SUBJECT VII. I handle genetic of fishing stocks.	Selection of founders stocks; effective population genetic size; maintenance of stocks for enhancement of fisheries; genetic selection induced by fishing and domestication.
SUBJECT VIII. Molecular tools for the genetic evaluation of fisheries.	Types of molecular markers: evolution and properties. Application of markers to the management of fisheries.
SUBJECT IX. Genetic evaluation of demersal fisheries.	Genetic evaluation of demersal fisheries: relationship SSB - recruitment with genetic diversity. Criteria of genetic management of fisheries oriented to the goal: exploitation, conservation or sustainability.
SUBJECT X. Genetic evaluation of coast fisheries.	The genetic structure frame of management. Integral management of fisheries. Genetic basis within a management plan for cultured or wild stocks.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	9	18	27
Practices through ICT	6	12	18
Problem solving	5	10	15
Problem and/or exercise solving	0	5	5
Essay questions exam	2	0	2
Laboratory practice	0	4	4
Debate	4	0	4

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
	Description
Lecturing	The face-to-face credits that correspond with the conceptual classes, will take place by means of videoconference. The concepts will be introduced through telematic means (graphic and auditory).
Practices through ICT	Practices of simulation of processes for evaluation of fisheries, using field data. They will take place in the classroom, using all the available digital tools and with real time tutorship by videoconference.
Problem solving	The problems and case studies that sustain the conceptual background of the subject, consist on a daily homework during the length of the teaching period. They are introduced at the end of the class, executed as offclass duties, sent for correction to the teacher and corrected publicly in the classroom.

Personalized assistance

Methodologies	Description
Lecturing	Attention in real time to the doubts of understanding and mathematical developments that arise in the face-to-face sessions.
Practices through ICT	The execution of the digital processes are tutorized in real time.
Problem solving	Orientation towards a non-ambiguous interpretation of problems and practical settings.

Assessment

	Description	Qualification	Evaluated Competences			
Problem and/or exercise solving	Each conceptual session is associated with its continuous evaluation by means of the asynchronous execution of the daily duties, its delivery to the teacher with feedback and the group correction in the next class. They are essential to apprehend the matter.	30	CB1 CB2 CB3	CG1 CG2	CE5 CE8	CT2 CT3 CT5
Essay questions exam	Final test of conceptual and operative competence, constituted by: definitions, test of multiple answers, description of processes and resolution of a practical case.	50	CB3 CB4	CG5	CE5 CE10	CT1 CT2 CT4
Laboratory practice	It values the correct understanding and execution of the processes requested, the digital solvency and the implication in the autonomous learning and community during the practices.	10	CB4 CB5	CG3 CG5	CE11	CT2 CT3 CT5
Debate	The face-to-face debate in situ involves the reasoning and scientific positioning in front of situations of management of living marine resources, of technical, scientist, social or economic nature. It values the constructive participation of the student in the daily debate.	10	CB4	CG5	CE11	CT5

Other comments on the Evaluation

In the second dating for the written exercise as 30/06/2022, it will be conserved the mark of the items from the continuous evaluation and the resultant mark will include the new exám score. It will be disposable tutorship activities in the virtual classroom, as to reinforce the processes of evaluation, i. e. review of exercises and exams.

Sources of information

Basic Bibliography

AR Beaumont, K Hoare, (Eds.), **Biotechnology and Genetics in Fisheries and Aquaculture (2nd ed)**, 978-1-405-18857-9, 2nd, Wiley-Blackwell, 2010
TJ Pandian, CA Strussmann, MP Marian, **Fish Genetics And Aquaculture Biotechnology**, 9781578083725, 1st, CRC Press, 2005
JD Ferraris, S Palumbi, **Molecular Zoology: Advances, Strategies and Protocols**, 9780471144618, 1st, John Wiley & Sons, 1996
J Avise, **Molecular Markers: Natural History and Evolution**, 9780412037818, 2nd, Sinauer Associates, 2004
S Jennings, MJ Kaiser, JD Reynolds, **Marine Fisheries Ecology**, 9780632050987, 1st, Wiley-Blackwell, 2001

Complementary Bibliography

TJ Pitcher, PJB Hart, D Pauly, **Reinventing Fisheries Management**, 9780792357773, 2nd, Chapman & Hall, 2001
M. Haddon, **Modelling and Quantitative Methods in Fisheries**, 2nd, Chapman and Hall/CRC, 2001

Recommendations

Other comments

Orientations for the study and CV optimisation:

1. Consult the bibliography recommended by the professor in the distinct thematic units.
2. Assist to customised tutorships as face-to-face or virtual, open (answer differed) or enclosed (agreement of schedules for the on-line tutorship).
3. Participate actively in real and virtual classes.
4. Execute the daily duties during the class time.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of the uncertain and unpredictable evolution of the sanitary alert caused by the COVID-19, the University of Vigo establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine, as attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or partially face-to-face. These already scheduled measures guarantee, in the moment that were prescriptive, the development of the teaching of a more agile and effective way when being known in advance (or with a wide anticipation) by the students and the profesorship through the tools normalised and institutionalised in the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===

*Educational Methodologies keep :

All are kept, but as virtual teaching.

* Educational Methodologies modified:

The masterclass will can be substituted by videoclasses at educational platforms.

* Non face-to-face mechanisms of attention to the students:

Virtual classrooms and offices, as well as external platforms such as Skype or Team.

* Modifications (if they proceed) of the contents:

Not modified but converted into digital matter in the event of an entirely virtual course.

* Additional bibliography to facilitate the car-learning

Simple tutorials exist to handle the educational web of the subject.

* Other modifications

Course available at MOOVI with all the material employed in the teaching of this subject.

=== ADAPTATION OF THE EVALUATION ===

* Test already made

Tests Resolution of Problems: [previous Weight 30%] [Weight Proposed 30%]

Daily activity, it belongs to the continuous evaluation, so much in physical face-to-face, as face-to-face-virtual, as no face-to-face virtual.

* Pending proofs kept:

Participation and debate: [previous Weight 10%] [Weight Proposed 10%]

keeps as it is totally viable on-line at any stage, whenever the group have of access to the network.

Practices of simulation using TIC: they keep face-to-face or online.

* Proofs modified:

[face-to-face final Test physicist 50%] = [face-to-face final Test virtual 50%]

If it can not be developed as face-to-face, it will given through platforms specific for evaluation, p. ej. Moodle.

* New tests:

On-line tests if it were necessary to compensate the fault of evaluation in situ.

* Additional information:

Incorporating the digital video instead of the masterclass, with pill contents of 5 minutes and diversification of the virtual activities.

IDENTIFYING DATA				
Pesquería e Explotación de derivados da Pesca				
Subject	Pesquería e Explotación de derivados da Pesca			
Code	V02M098V01209			
Study programme	Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	1	2c
Teaching language	Castelán			
Department	Bioloxía funcional e ciencias da saúde Dpto. Externo			
Coordinator	Iglesias Blanco, Raúl			
Lecturers	Aubourg Martínez, Santiago Pedro Castro Pampillón, José Antonio Iglesias Blanco, Raúl			
E-mail	rib@uvigo.es			
Web				
General description	Nesta materia abordarase o estudo das principais pesqueiras mundiais e nacionais, os fundamentos da bioloxía pesqueira e a xestión de pesqueiras, e os principais aspectos relacionados co tratamento postcaptura, transformación e control de aptitude dos produtos da pesca, incluíndo a importancia económico-sanitaria dos parasitos para o sector pesqueiro.			

Competencias

Code	
CB1	Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
CG3	Aprendizaje de diversas técnicas y métodos analíticos tanto en el medio natural como en el laboratorio
CG4	Desarrollo de habilidades en el manejo y tratamiento de herramientas, matemáticas, estadísticas e informáticas
CG7	Entendimiento de la proyección social de la ciencia
CE7	Catalogación, evaluación, conservación, restauración y gestión de áreas marinas y litorales protegidos. Elaboración, asesoramiento legal y ejecución de planes de ordenación del litoral
CE10	Inspección y asesoramiento técnico en la evaluación, explotación y gestión de pesquerías, extracción de recursos e instalaciones de acuicultura
CE11	Estudios de dinámica poblacional, mejora genética y selección de stocks en pesquerías, acuicultura y programas de repoblación
CE12	Control de calidad y seguridad de alimentos y de productos de transformación y biotecnológicos de origen marino
CE14	Elaboración, discusión, interpretación, asesoramiento y peritaje de informes científico-técnicos, éticos, legales y socioeconómicos relacionados con el ámbito marino y pesquero
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma

Resultados de aprendizaxe

Learning outcomes	Competences
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Poder realizar e/ou dirixir consultorías ambientais relacionadas coa xestión das pesqueiras.	CB2 CB3 CB4 CB5 CG1 CG2 CG7 CE10 CT1 CT2 CT3 CT4
Ser capaz de catalogar, avaliar, conservar, restaurar e xestionar as áreas mariñas e litorais protexidas, no que refire aos seus recursos pesqueiros, así como saber elaborar, asesorar legalmente e executar os plans de ordenación do litoral, no que se refire devanditos recursos	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG7 CE7 CE10 CE11 CE14 CT1 CT2 CT3 CT4
Ser capaz de inspeccionar e asesorar tecnicamente na avaliación, explotación e xestión de pesqueiras, así como na extracción de recursos e instalacións de acuicultura	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG3 CG7 CE7 CE10 CT1 CT2 CT3 CT4
Demostrar que pode realizar estudos de dinámica poboacional e/ou selección de *stocks en pesqueiras, acuicultura e/ou programas de repoboación	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG3 CG4 CG7 CE10 CE11 CE14 CT1 CT2 CT3 CT4

Ser capaz de analizar a calidade e seguridade de alimentos e de produtos de transformación e biotecnolóxicos de orixe mariña

CB1
CB2
CB3
CB4
CB5
CG1
CG2
CG3
CG7
CE12
CE14
CT1
CT2
CT3
CT4

Demostrar que pode elaborar, discutir, interpretar, asesorar e *peritar informes científico-técnicos, éticos, legais e socioeconómicos relacionados co ámbito mariño e pesqueiro

CB1
CB2
CB3
CB4
CB5
CG1
CG2
CG7
CE14
CT1
CT2
CT3
CT4

Contidos

Topic

Pesquerías mundiais e españolas

Bioloxía pesqueira

Xestión de pesquerías

Características da composición das especies mariñas

Mecanismos de alteración dos produtos mariños

Ferramentas para a determinación da perda de calidade

Novas tecnoloxías para a retención da calidade

(*)Aprovechamiento de recursos marinos

Parásitos nos produtos pesqueiros

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	20	10	30
Traballo tutelado	1	15	16
Estudo de casos	3	26	29

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Metodoloxía docente

	Description
Lección maxistral	As clases maxistrais impartiranse en sesións duns 50 min de duración mediante videoconferencia e o uso de presentacións Power Point. Tentarase fomentar a participación activa dos alumnos a través da formulación de cuestións ou situacións relacionadas cos contidos da materia
Traballo tutelado	Os alumnos deberán preparar, en pequenos grupos, e de forma non presencial, un traballo relacionado coas temáticas e competencias específicas da materia, que finalmente deberán entregar por escrito

Atención personalizada

Methodologies	Description
Lección maxistral	Os profesores atenderán as preguntas que poidan xurdir durante as clases presenciais, ou durante o traballo non presencial relacionado coa preparación dos contidos impartidos. Neste último caso as dúbidas resolveranse a través das correspondentes titorías (presenciais ou virtuais).

Traballo tutelado Orientarase aos alumnos sobre a preparación dos traballos, resolvendo aquelas dúbidas importantes que poidan xurdir e que se consideren determinantes para progresar na realización desta actividade.

Avaliación							
Description		Qualification	Evaluated Competences				
Traballo tutelado	Avaliarase a capacidade dos alumnos para buscar e filtrar información contrastada sobre un tema, e para estruturar, argumentar, e discutir debidamente dita información, de forma escrita.	30	CB1	CG2	CE7	CT1	
			CB3	CG7	CE10	CT2	
			CB4		CE11	CT3	
			CB5			CT4	
Estudo de casos	Avaliarase a capacidade dos estudantes para dar resposta, de forma crítica e razoada, aos casos plantexados polos profesores. Estes casos tentarán simular situacións similares ás que se poden dar no mundo laboral relacionado coa xestión de pesquerías e o control da aptitude dos produtos pesqueiros. Para a súa resolución os alumnos deberán integrar todo o aprendido previamente durante as leccións maxistras e, en ocasións, poderán necesitar buscar información adicional. Os casos resoltos serán expostos e/ou discutidos durante as sesións presenciais destinadas a esta actividade.	70	CB2	CG1	CE7	CT1	
			CB3	CG2	CE10	CT2	
			CB5	CG3	CE11	CT4	
				CG4	CE12		CE14

Other comments on the Evaluation

Para superar a materia será necesario sacar un 5.0, unha vez ponderadas as notas das dúas actividades avaliadas (estudo de casos e traballo tutelado). En caso, de non superar a materia na primeira oportunidade, os alumnos deberán enfrontarse a unha proba final integradora, que poderá incluír preguntas de diferente deseño destinadas a avaliar os contidos e competencias adquiridas durante as clases.

Bibliografía. Fontes de información

Basic Bibliography

Bozariis, I.S., **Seafood Processing: Technology, Quality and Safety**, Wiley-Blackwell, 2014

Alasalvar, C., Shahidi, F., Miyashita, K., Wanasundara, U., **Handbook of Seafood Quality, Safety and Health Applications**, Blackwell Publishing Ltd, 2011

Borresen, T., **Improving seafood products for the consumer**, CRC Press, 2008

Complementary Bibliography

FAO, **Definición y clasificación de las diversas categorías de artes de pesca**, FAO Documento Técnico de Pesca nº 222, 1990

FAO, **FAO Technical Guidelines for Responsible Fisheries - Fisheries Management** [], <http://www.fao.org/3/w4230e/w4230e00.htm>, 1997

FAO, **El estado mundial de la pesca y la acuicultura 2018. Cumplir los objetivos de desarrollo sostenible**, CC BY-NC-SA 3.0 IGO, FAO, 2018

ICES, **Introduction to advice**, <http://www.ices.dk/sites/pub/Publication%20Reports>, 2019

SPARRE, P. and VENEMA, S.C., **Introduction to tropical fish stock assessment. Part 1. Manual**, FAO Fisheries Technical Paper. № 306. Re, 1997

Tewari, G. & Jeneja, V., **Advances in thermal and non-thermal food preservation**, Blackwell Publishing, 2007

Cabado, A. G. & Vieites, J.M., **Quality parameters in canned seafoods**, Nova Science Publishers, 2008

Sikorski, Z., **Tecnología de los productos del mar**, Ed. Acribia, 1990

Bremner, H.A., **Safety and quality issues in fish processing**, CRC Press, 2002

Lal, R. et al., **Food security and environmental quality in the developing world**, Lewis Publishers, 2003

U.S. Department Of Health And Human Services, **Fish and Fishery Products Hazards and Controls Guidance**, U.S. Department of Health and Human Services Food, 2011

Agencia Española de Consumo, Seguridad Alimentaria y Nutrición (AECOSAN), <http://www.aecosan.msssi.gob.es/AECOSAN/web/home/a>,

European Food Safety Authority (EFSA), <http://www.efsa.europa.eu/>,

Recomendacións

Subjects that are recommended to be taken simultaneously

Bioloxía de Especies Explotadas e Potencialmente Explotables/V02M098V01207

Avaliación e Explotación de Recursos no Litoral/V02M098V01208

Other comments

Recoméndase traballar na materia de forma continua e participar activamente durante as sesións presenciais

Description

Aínda que o contido da guía está inicialmente deseñado desde a perspectiva dun escenario de NORMALIDADE ADAPTADA (MODALIDADE PRESENCIAL), podería ser necesario, dependendo do que ditén as autoridades e o Reitorado en canto ao aforo permitido nas aulas, recorrer ao uso das aulas INTEGRAL para a docencia teórica (DOCENCIA MIXTA), mantendo en todo caso a planificación da docencia e as metodoloxías docentes e de avaliación (incluídos as súas respectivas porcentaxes) que figuran na guía.

ESCENARIO ALTERNATIVO

No caso de que a situación sanitaria provoque o peche temporal do Centro ou a corentena da clase pola aparición dun brote de COVID-19, impartiranse os contidos de forma NON PRESENCIAL. Para iso empregarase o Campus Remoto habilitado pola Universidade para este tipo de situacións e a plataforma de teledocencia Moovi.

Dado que as aulas virtuais do Campus Remoto ou sistemas similares permiten non só impartir as leccións maxistras por parte do profesorado senón tamén realizar exposicións por parte do alumnado (estudo de casos), neste escenario manteranse tamén a planificación da docencia e as metodoloxías docentes e de avaliación (incluídos as súas respectivas porcentaxes e comentarios adicionais) recollidas na Guía Docente orixinal (modalidade presencial).

Atención ao alumnado

Durante o tempo que dure a docencia non presencial as sesións de tutoría realizaranse exclusivamente por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, etc) con cita previa.

IDENTIFYING DATA				
Estatística Espacial e Modelización				
Subject	Estatística Espacial e Modelización			
Code	V02M098V01210			
Study programme	Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	1	2c
Teaching language	Castelán			
Department				
Coordinator	Roca Pardiñas, Javier			
Lecturers	Roca Pardiñas, Javier			
E-mail	roca@uvigo.es			
Web				
General description				

Competencias

Code	
CB1	Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB4	Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG4	Desarrollo de habilidades en el manejo y tratamiento de herramientas, matemáticas, estadísticas e informática
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad

Resultados de aprendizaxe

Learning outcomes	Competences
Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, a miúdo nun contexto de investigación.	CB1 CB4
Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun modo claro e sen ambigüidades.	
Utilización de criterios e métodos científicos na formulación e resolución de problemas aplicando os coñecementos adquiridos.	CG1 CG4
Desenvolvemento de habilidades no manexo e tratamento de ferramentas, matemáticas, estatísticas e informática.	
Desenvolvemento da capacidade de razoamento crítico e autocrítico	CT2 CT3
Desenvolvemento das capacidades de traballo en equipo, enriquecidas pola *pluridisciplinariedad	

Contidos

Topic	
Introdución ao software *R	Introdución ao software *R: Presentación e instalación; Estruturas de datos: *Vectores, matrices, listas e marcos de datos; Importación/exportación de datos; Procedementos gráficos.
Modelo de Regresión	Introdución aos modelos de regresión lineal: estimación, predición e *inferencia. Diagnóstico do modelo: observacións atípicas e/ou influentes, *homocedasticidade e normalidade; outros modelos de regresión: regresión *polinómica, modelos *linealizables, modelos non lineais e regresión non *paramétrica; *aplicacións en bioloxía mariña.
Estatística Espacial	Conceptos básicos de estatística espacial. Tipos de procesos; introdución á *geoestadística: estacionalidade e *isotropía; Modelado da dependencia espacial: *variografía; predición *kriging; aplicacións en Bioloxía Mariña..

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	15	35	50
Prácticas con apoio das TIC	10	13	23
Resolución de problemas e/ou exercicios	2	0	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Metodoloxía docente

	Description
Lección maxistral	O profesor exporá en clase e por videoconferencia a teoría básica da materia. Diversos exemplos ilustrarán a aplicación dos resultados teóricos.
Prácticas con apoio das TIC	Actividade na que se formulan problemas e exercicios relacionados coa materia. O alumno debe, co apoio do profesorado, desenvolver a análise e a resolución dos problemas e exercicios

Atención personalizada

Methodologies	Description
Lección maxistral	O profesor exporá en clase por videoconferencia os fundamentos de carácter *metodolóxico da materia. Utilizaranse diversos exemplos baseados en datos reais relacionados coa Bioloxía Mariña para ilustrar a aplicación da metodoloxía anterior.
Prácticas con apoio das TIC	Na aula de informática os alumnos aprenderán a resolver de forma autónoma e crítica problemas reais usando a metodoloxía vista nas sesións maxistras. Utilizarase o *software estatístico *R, gratuito e de libre distribución e que pode ser instalado directamente desde * https://www.r-project.org/ .

Avaliación

	Description	Qualification	Evaluated Competences	
Prácticas con apoio das TIC	Los alumnos entregarán al largo de la materia uno o varios trabajos relacionados con las prácticas que formarán parte del sistema de evaluación continua	40	CG1 CG4	CT2
Resolución de problemas e/ou exercicios	La evaluación del alumnado se realizará a través de entregas y/o presentaciones de trabajos, que podrán ser individuales o en grupo.	60	CG1 CG4	CT2

Other comments on the Evaluation

Para los casos de realización fraudulenta de ejercicios o pruebas (plagios o uso indebido de las tecnologías) será de aplicación el recogido en la normativa de evaluación del rendimiento académico de los estudiantes y de revisión de calificaciones.

Bibliografía. Fontes de información

Basic Bibliography

Complementary Bibliography

Everitt, B. and Hothorn, T., **An introduction to applied multivariate analysis with R**, Springer.,
Maindonald, J. H., **Data analysis and graphics using R: an example-based approach.**, Cambridge University Press,
Wood S.N., **Generalized Additive Models: An Introduction with R.**, Chapman and Hall/CRC,

Recomendacións

Plan de Continxencias

Description

No caso de que sexa necesario a importación de docencia en modalidade non presencial, a actividade docente impartirase mediante Campus Remoto ou outro plataforma semellante.

En calquera caso todo o material docente da materia será posto a disposición dos alumnos empregando algunha plataforma de intercambio de información (DropBox, plataforma de teledocencia Fatic, etc.)

De igual xeito, o exame final será feito de maneira non presencial, e non será necesario facer ningún cambio na planificación docente desta materia.

Ademais as titorías poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, ...) baixo a modalidade de concertación previa.

IDENTIFYING DATA				
Invasive Species and Fouling				
Subject	Invasive Species and Fouling			
Code	V02M098V01211			
Study programme	(*)Máster Universitario en Biología Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	García Estévez, José Manuel Ruiz de la Rosa, José Miguel			
Lecturers	Cremades Ugarte, Javier García Estévez, José Manuel Ruiz de la Rosa, José Miguel Veiga Sánchez, María Purificación			
E-mail	jmruiz@udc.es jestevez@uvigo.es			
Web				
General description	(*)Exponse as principais rutas da introdución de especies foráneas, as características tanto dos invasores como dos sistemas receptores, e as consecuencias ecolóxicas, xenéticas e evolutivas dos devanditos eventos. Préstase especial atención á problemática do fouling, presentando os organismos que o compoñen, a súa sucesión, os seus efectos negativos e os seus posibles tratamentos preventivos			

Competencies

Code	
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CE2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
CE3	Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma

Learning outcomes

Learning outcomes	Competences
(*)*Conocer Characteristic wools of wools invading species *y *su *riesgo for *los @receptor ecosystems.*Reconocer Wools *principales invading species *halladas in wools coasts *gallegas.*Conocer Wool importance of *fouling how *vector of species *alóctonas *y *su problematic social *y economic.*Conocer *los *principales *tratamientos *antifouling *y *sus *desventajas.	CE2 CE3
(*)*Reconocer Wools *principales invading species *halladas in wools coasts *gallegas	CE2 CE3
(*)*Conocer Wool importance of *fouling how *vector of species *alóctonas *y *su problematic social *y economic	CE2 CE3
(*)*Conocer *los *principales *tratamientos *antifouling *y *sus *desventajas	CE2 CE3
New	CG5 CT4

Contents

Topic	
(*)1. Invading species2. *Biodiversidad *alóctona *marina *gallega3. *Fouling	(*)1.1. Characteristics1.2. Routes of *introducción1.3. @Receptor systems1.4. Consequences2.1. Studio of cases: *principales species2.2. Roads of *introducción2.3. Dynamics of *colonización2.4. Problematic3.1. Definition *y problematic3.2. *Principales Organisms3.3. *Sucesión3.4. *Tratamientos *antifouling

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	18	45	63
Mentored work	0.1	0	0.1
Seminars	2	8	10
Objective questions exam	2	0	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
	Description
Lecturing	The masterclasses summarise the state of the matter
Mentored work	It will register the assistance of the students to the distinct classes
Seminars	To develop the capacity to work autonomously, the students will review scientific works to present them in an oral and/or written way

Personalized assistance	
Methodologies	Description
Lecturing	Resolution of doubts on the fly
Seminars	Discussion of the group work presented
Mentored work	Register of the assistance to class
Tests	Description
Objective questions exam	Pertinent explanations

Assessment			
	Description	Qualification	Evaluated Competences
Lecturing	Examination of objective questions	70	CE2 CE3
Mentored work	Assistance to class	10	
Seminars	Preparation and presentation of works in group	20	CG5 CT4

Other comments on the Evaluation

In the first announcement (22/04/20, 10-12 *h) the three methodologies will be considered. In the second announcement (07/07/20, 10-12 *h) the evaluation will result from the written exam, being able to be the 20-60% of the final note the qualifications obtained in activities evaluated positively previously.

Sources of information	
Basic Bibliography	
Complementary Bibliography	

Recommendations

Other comments
It is recommended to work on the matter in a continuous form

Contingency plan

Description
=== EXCEPTIONAL PLANNING === Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool. === ADAPTATION OF THE METHODOLOGIES === * Teaching methodologies maintained * Teaching methodologies modified * Non-attendance mechanisms for student attention (tutoring) * Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Tests that are modified

[Previous test] => [New test]

* New tests

* Additional Information

IDENTIFYING DATA				
Biology of the Development of Marine Organisms				
Subject	Biology of the Development of Marine Organisms			
Code	V02M098V01212			
Study programme	(*)Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Miguel Villegas, Encarnación de Rodríguez Díaz, Miguel Angel			
Lecturers	Álvarez Otero, Rosa María Miguel Villegas, Encarnación de Rodríguez Díaz, Miguel Angel			
E-mail	miguelangel.rodriguez.diaz@usc.es villegas@uvigo.es			
Web				
General description	(*)Nesta materia expónse os principios biolóxicos que rexen o desenvolvemento dos organismos mariños. O curso profundiza: 1) na bioloxía da reprodución e a bioloxía das larvas e embrións das especies animais mariñas. 2) nos mecanismos celulares xerais que subxacen aos procesos de diferenciación e desenvolvemento. A docencia desta materia inclúe clases maxistras e resolución de exercicios e outras actividades propostas polo profesorado. Nas clases maxistras explicaranse os conceptos que se enuncian no temario da materia. Os exercicios e actividades permitirán resolver, debater e argumentar sobre cuestións de interese xeral e actual no campo da bioloxía do desenvolvemento.			

Competencies	
Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoitado nun contexto de investigación.
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
CG3	Aprendizaje de diversas técnicas y métodos analíticos tanto en el medio natural como en el laboratorio
CG4	Desarrollo de habilidades en el manejo y tratamiento de herramientas, matemáticas, estadísticas e informáticas
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CE2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
CE3	Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros
CE8	Conocimiento y manejo de la metodología de investigación, de las técnicas muestreo e instrumentales y de análisis de datos aplicados al medio marino
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma
CT5	Desarrollo de las habilidades de comunicación y discusión de planteamientos y resultados

Learning outcomes	
Learning outcomes	Competences

That the student:	CB1
- To understand the interactions of the marine organisms and the marine ecosystems and coast systems	CB2
- To look for the potential economic interest and biotechnology of the marine organisms	CB3
- To purchase knowledge, identify and evaluate the environmental quality of the marine environment and of the valid legislation. It can carry out the direction of environmental consulting	CB4
- to know and be able to handle the methodology of investigation, sampling techniques , instrumental and of analysis of data applied to the marine environment.	CB5
- To evaluate the quality and safety of food and of products of transformation and biotechnology of marine origin	CG1
-To schedule and direct aquariums, museums, centers of environmental interpretation, natural parks and natural spaces protected	CG2
- To elaborate, argue, interpret, advise and evaluate scientific-technical reports, ethical, legal and socioeconomic related with the marine environment and fishing	CG3
	CG4
	CG5
	CE2
	CE3
	CE8
	CT1
	CT2
	CT4
	CT5

Contents

Topic	
Gametogénesis and Fecundation	Spermatogenesis. Structure of the spermatozooids. Hormonal control. Oogenesis. Structure of the ovule. Fertilization: Contact and recognition of gametes. Acrosomic reaction. Polyispermia. Activation of egg metabolism.
Early development.Organogenesis	Segmentation. Segmentation patterns Gastrulation: Types. Embryonic leaves. Derived ectodermal, neurulation, neural crests and epidermis. Derived mesodermal. Derived endodermic.
Main processes and development concepts	Phases of the ontogenetic development. Patterns of development in marine organisms model. Determination, differentiation, growth, morphogenesis and establishment of the body pattern. Alterations of the pattern: mutations of genes related with development. Modifications of the body plan in the development postembryonic: heterochrony and *allometry. Techniques of study.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	15	34.95	49.95
Presentation	2	8	10
Seminars	1	0	1
Seminars	4	8	12

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	The professors explain the contents of the subject object of study, theoretical bases and/or guidelines , exercise or project that will develop the student.
Presentation	The professors will use presentations to explain each of the blocks of the subject
Seminars	During the development of the master lessons if the professors wants to be able ask questions to the students that could help to a better understanding of the the subject
Seminars	Activities of different nature that the students will carry out of individual way or in group, destined to a deeper knowledge of the subject.

Personalized assistance

Methodologies	Description
Lecturing	Master lessons imparted by the professor
Seminars	The professors will realize a continuous assessment of the academic performance of the student, in base to the his intervention in the distinct activities offered.
Presentation	The students will be able to do the questions that they wish in relation to the presentations used by the professor in the master lessons.
Seminars	During the development of the master lessons if the professors wants to be able ask questions to the students that could help to a better understanding of the the subject. And by another part, if the students have any in regard to subject, will be able to contact with the professors through email or physically.

Assessment					
Description	Qualification	Evaluated Competences			
Lecturing Master lessons by videoconference among the three universities where the profesor use presentations to explain different subjects	0				
Seminars Activities of different nature	30	CB1	CG1	CE2	CT1
		CB2	CG2	CE3	CT2
		CB3	CG3		CT4
		CB4	CG4		CT5
		CB5	CG5		

Other comments on the Evaluation

The dates of the final exam are the following: First opportunity: 26 of April (10:00-12:00 h.) Second opportunity: 7 of July (12:00-14:00 h.) The evaluation system of the subject will include a qualification obtained in the official exam of the subject and a qualification derived from the activities carried out during the course. In the final grade of the subject the result of the final exam will have a weight of 7 points and the activities carried out during the course will have a weight of 3 points. The score derived from the activities will only be taken into account for the final grade when the student obtains a score equal or superior to 5 points in the official exam of the subject. The qualification system will be expressed by numerical final grade from 0 to 10 points according to the current legislation (Royal Decree 1125/2003 of September 5, BOE September 18)

Sources of information

Basic Bibliography

Complementary Bibliography

BROWDER, L.W. et al., **Development Biology.**, 1991,

GILBERT, S. F., **Developmental Biology**, 2013,

WOLPERT, L. ET AL. ., **Principles of Development**, última ed,

GILBERT, S.F., **Biología del desarrollo.**, 7ª ed o posterior,

WOLPERT, L. ET AL., **Principios del desarrollo.**, última edición,

NORRIS D.O. et al, **Hormones and Reproduction of Vertebrates - Vol 1: Fishes**, 2010,

Recommendations

Contingency plan

Description

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

In the event that the subject has to be developed in the mixed modality (with distancing, partial restrictions on physical attendance), the expository teaching (master classes and seminars), will be carried out totally or partially in a virtual way, since either with synchronous or asynchronous mechanisms. In this scenario, the teaching activities will be taught through the virtual platform or through the way provided by the coordinating university of the degree, through which the students will have access to the teaching content.

The evaluation criteria in this scenario will be the same that are included in the assessment, the tests will be carried out virtually through the platform provided by the university, with visual and audio monitoring of the students. These tests will include the necessary adaptations (limitation of the response time, anti-plagiarism controls ...) to ensure the fairness and proper conduct of the tests. If technical or personal impediments arise that hinder the reliable control of these tests, alternatives of an oral nature with recording will be offered, in order to leave a documentary record of them. The recording may be extended, if necessary, to the exam review sessions.

In the event that the subject has to be developed in a non-face-to-face way (closure of the facilities, impossibility of teaching with physical presence), all the teaching will take place virtually, either with synchronous or asynchronous mechanisms. In this scenario, the teaching activities will be taught through the virtual platform provided by the coordinating university of the degree, through which the students will have access to the teaching content.

The evaluation criteria will be the same that are included in the assessment, the tests will be conducted virtually through the platform provided by the university, with visual and audio monitoring of the students. These tests will include the necessary adaptations (limitation of the response time, anti-plagiarism controls ...) to ensure the fairness and proper conduct of the tests. If technical or personal impediments arise that hinder the reliable control of these tests, alternatives of an oral nature

with recording will be offered, in order to leave a documentary record of them. The recording may be extended, if necessary, to the exam review sessions.

IDENTIFYING DATA				
Toxicity and Detoxification Mechanisms of Xenobiotic Compounds				
Subject	Toxicity and Detoxification Mechanisms of Xenobiotic Compounds			
Code	V02M098V01213			
Study programme	(*)Máster Universitario en Biología Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	San Juan Serrano, María Fuencisla			
Lecturers	García Martínez, Paz			
	San Juan Serrano, María Fuencisla			
E-mail	fsanjuan@uvigo.es			
Web				
General description	Absorption, distribution, metabolism, toxic effects and excretion of pollutants compounds in marine organisms.			

Competencies	
Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG2	Búsqueda, análise e integración de información a partir de diferentes fontes y capacidad para su interpretación y evaluación
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CG6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
CG7	Entendimiento de la proyección social de la ciencia
CE5	Conocimiento de los principios de explotación y sostenibilidad del medio marino y planificación y supervisión de su gestión
CE6	Conocimiento, identificación y evaluación de la calidad ambiental del medio marino y de la legislación vigente. Dirección de consultorías ambientales
CE7	Catalogación, evaluación, conservación, restauración y gestión de áreas marinas y litorales protegidos. Elaboración, asesoramiento legal y ejecución de planes de ordenación del litoral
CE12	Control de calidad y seguridad de alimentos y de productos de transformación y biotecnológicos de origen marino
CE13	Divulgación de conocimientos de la biología y el medio marinos: programas de formación y docencia; planificación y dirección de acuarios, museos, centros de interpretación ambiental, parques naturales y espacios naturales protegidos
CE14	Elaboración, discusión, interpretación, asesoramiento y peritaje de informes científico-técnicos, éticos, legales y socioeconómicos relacionados con el ámbito marino y pesquero
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma
CT6	Desarrollo de las capacidades de reflexión sobre responsabilidades sociales y éticas
CT7	Desarrollo de habilidades para la divulgación de ideas en contextos tanto académicos como no especializados

Learning outcomes	
Learning outcomes	Competences

Knowledge and understanding of the cellular and molecular mechanisms of toxicity and response of organisms to environmental pollution.	CB1 CB2 CB3 CG2 CG6 CE5 CE6 CE13 CT1 CT2 CT4
Ability to integrate knowledge from different disciplines to understand and explain phenomena of environmental toxicology.	CB2 CB3 CG7 CE5 CE6 CT1 CT2 CT6
Ability to evaluate and interpret data about environmental pollution from a toxicological perspective	CB2 CB3 CG2 CE6 CE7 CE12 CE14 CT1 CT2 CT6
Ability to obtain information, analyze it critically and apply it to assess of quality, exploitation and sustainability of marine environment.	CB2 CB3 CB5 CG2 CG6 CG7 CE6 CE7 CE12 CE14 CT1 CT2 CT4 CT6
Ability to develop individual and / or team works, and to expose them and discuss them in public.	CB3 CB4 CB5 CG2 CG5 CG6 CE13 CT1 CT2 CT3 CT4 CT6 CT7

Contents

Topic	
Xenobiotics and Toxicity	Definition of xenobiotic. Factors Affecting Toxicity. Phases of toxic action.
Exposure, Absorption and Distribution of Xenobiotics	Factors affecting the absorption and distribution of xenobiotics in the body. Elimination / Excretion.
Mechanisms of toxicity	Genotoxicity. Neurotoxicity. Hormonal disruptors. Metabolic disorders. Destabilization of cell membranes.
Metabolism of xenobiotics	Oxidation reactions: dependent and independent cytochrome P450 monooxygenases. Reactions of reduction and hydrolysis. Conjugation Reactions.

Sequestration processes	Non-metabolizable xenobiotics. Mechanisms of sequestration. Immobilization and transport of metals in cells: metallothioneins. Toxic metal elimination.
Oxidative stress and antioxidant defense	Production of oxy-radicals and oxidative stress. Biological effects of reactive oxygen species. Antioxidant Cellular Defenses.
Biomonitoring and biomarkers	Specificity of biomarkers. Relationship between biomarkers and adverse effects of pollution. Global and specific biomarkers. Role of biomarkers in environmental assessment

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	18	34	52
Presentation	2	20	22
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	In master sessions the teacher will give the fundamental concepts so that the student understands and can prepare the subject contents.
Presentation	Personal or team work and oral and/or written exhibition of a bibliographic work on some specific topic related with the subject.

Personalized assistance

Methodologies	Description
Lecturing	Resolution of doubts during the subject study and the bibliographic work elaboration, individually and / or in group.
Presentation	Resolution of doubts during the subject study and the bibliographic work elaboration, individually and / or in group.

Assessment

	Description	Qualification	Evaluated	Competences
Lecturing	The acquired theoretical knowledge will be assessed through a final test exam.	40	CB1 CB2 CB3 CB5	CG2 CE6 CE7 CE12 CT1 CT2 CT6
Presentation	In the presentation and exhibition of bibliographic work will be assessed the ability to search information in databases, to handle scientific literature, to identify and synthesize the fundamental ideas, to relate and apply the concepts acquired, to use the appropriate terminology in toxicology, and to transmit information.	60	CB1 CB2 CB3 CB4 CB5	CG2 CG5 CG6 CG7 CE5 CE6 CE7 CE13 CE14 CT1 CT2 CT3 CT4 CT6 CT7
	As transversal skills, the initiative, capacity for autonomous learning, teamwork, organizational ability, critical capacity and handling of informatic tools, will be assessed.			

Other comments on the Evaluation

The realization of the bibliographic work is compulsory for passing the subject.
The final test exam is compulsory for passing the subject and should be 5 (over 10) in order to take into account the bibliographic work score.

Sources of information

Basic Bibliography

Complementary Bibliography

Boelsterli U.A., **Mechanistic toxicology. The molecular basis of how chemicals disrupt biological targets**, 2007
Gibson G.G. and Skett P., **Introduction to drug metabolism**, 2001
Lewis D.F.V., **Guide to Cytochromes P450. Structure and function**, 2001
Malins D.C., Ostrander G., **Aquatic Toxicology: Molecular, Biochemical and Cellular Perspectives**, 1994
Taylor E.W., **Toxicology of Aquatic Pollution. Physiological, Molecular and Cellular Approaches**, 2009
Timbrell J., **Principles of Biochemical Toxicology**, 2008
Walker C.H., Hopkin S.P., Sibly R.M., Peakall D.B., **Principles of Ecotoxicology**, 2012

Frank C. Lu and Sam Kacew, **Lu's Basic Toxicology: Fundamentals, Targeted Organs, and Risk Assessment**, 6ª Ed., 2013

Grune T., **Oxidants and Antioxidants Defense Systems**, 2005

Farooqui T., Farooqui A.A., **Oxidative Stress in Vertebrates and Invertebrates. Molecular aspects of cell signaling**, 2012

Recommendations

Subjects that it is recommended to have taken before

Marine Pollution and Ecotoxicology/V02M098V01206

Physiology of Marine Organisms/V02M098V01106

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained: ALL

* Teaching methodologies modified: ANY

* Non-attendance mechanisms for student attention (tutoring): THE PERSONALISED ASSISTANCE WILL TAKE PLACE IN THE VIRTUAL CLASSROOMS THAT THE PROFESSORS HAVE ENABLED IN HIS RESPECTIVE UNIVERSITIES.

* Modifications (if applicable) of the contents: NOT PROCEED

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Tests that are modified

[Previous test] => [New test]

* New tests

* Additional Information

- THE CONTENT AND PRESENCIALIDAD OF LECTURING AND SEMINARS WILL BE MAINTAINED THE SAME THAT IN NORMAL CIRCUMSTANCES.

- THE EVALUATION TESTS AND THE WEIGHT OF EACH ONE IN THE NOTE OF THE SUBJECT WILL BE THE SAME THAT IN NORMAL CIRCUMSTANCES.

- IN CASE OF MIXED OR VIRTUAL TEACHING, IT WILL BE IN THE VIRTUAL CLASSROOM THAT THE PROFESSORS HAVE ENABLED IN HIS RESPECTIVE UNIVERSITIES.

IDENTIFYING DATA				
Marine Genomics				
Subject	Marine Genomics			
Code	V02M098V01214			
Study programme	(*)Máster Universitario en Biología Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	Spanish English			
Department				
Coordinator	Presa Martínez, Pablo			
Lecturers	Canchaya Sanchez, Carlos Alberto Presa Martínez, Pablo			
E-mail	pressa@uvigo.es			
Web	http://http://bioloxia.uvigo.es/es/estudios/master-en-biologia-marina/			
General description	The last decade has witnesses an important development of methodologies for genomic sequencing, which have lead to an exponential knowledge increase of genomes. Those new technologies are also intensively applied to marine biota. This subject aims to approach the student to those technological advances in order to acquire the necessary knowledge to confront the scientific and industrial oportunities of applied marine genomics in the 21st century.			

Competencies	
Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG3	Aprendizaje de diversas técnicas y métodos analíticos tanto en el medio natural como en el laboratorio
CG6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
CE2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
CE4	Conocimiento y búsqueda del potencial interés económico y biotecnológico de los organismos marinos
CE8	Conocimiento y manejo de la metodología de investigación, de las técnicas muestreo e instrumentales y de análisis de datos aplicados al medio marino
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma

Learning outcomes	
Learning outcomes	Competences
That the student knew the structure of the genomes in its distinct levels of organisation and the variation in the structural elements that generate molecular diversity.	CB1 CT1 CT4
That the student knew the new technics of genome sequencing of high performance for the study of the genomes of marine organisms and thier applications.	CB1 CB5 CG3 CG6 CE8 CT1 CT4
That the student identified the strategies for sequencing genomes of reference and the mechanisms to achieve it: assembling, annotation and mapping.	CB1 CB5 CG3 CG6 CE8 CT1 CT2 CT4
That the student knew the applications of genomics in the study of marine biodiversity, evolution and management of fisheries and aquaculture.	CG6 CE2 CE4 CT1

Contents

Topic

The organisation of marine genomes	The nuclear and mitochondrial genome. Chromosomes, genes and repetitive components of a genome. Karyotypes and size of marine genomes. Nucleotide variants and structural variants in a genome. Genomic databases.
Applications of the NGS techniques to the analysis of marine genomes	New generation of high performant sequencing techniques. Modalities of genome sequencing and transcriptome sequencing. Strategies of sequencing for the identification of variants in a genome. Applications of genomic sequencing to the study of marine organisms.
Sequencing of genomes of reference	Strategies for sequencing a genome of reference. Scaffolding and assessment of quality of an assemblage (value of the parameter N50). Construction of genomic maps with data NGS. Annotation of a genome of reference. Calculation of the size of a genome by means of the k-mers abundance. Projects and databases of marine genomes of reference.
Applications of genomics to the study of the marine life	Biodiversity and biogeography. Change induced and adaptative evolution. Marine genomics and aquaculture.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	17	30	47
Problem solving	2	10	12
Presentation	2	9	11
Problem and/or exercise solving	2	2	4
Debate	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	The professor introduces the basic technical concepts to approach the genomic methodologies. He presents the materials and the specific bibliography for matter enrichment and discusses on applied cases in science and industry.
Problem solving	Each conceptual development implements exercises of qualification by resolution of technical problems associated to the genomic methodologies. Daily exercises constitute the continuous evaluation of the subject.

Personalized assistance

Methodologies	Description
Lecturing	Attention in real time to the doubts of understanding.
Problem solving	Physical and virtual assistance on the explanation and execution of digital processes by means of group and individual tutorship.
Tests	Description
Presentation	Personalised attention for the selection and methodological approach to deep in an applied genomic study.

Assessment

	Description	Qualification	Evaluated Competences			
Presentation	Selection, strategy of analysis, methodology of presentation and dissertation, of a practical case study.	50	CB1	CG3	CE2 CE4	CT1 CT2 CT4
Problem and/or exercise solving	The daily duties help to apprehend the methodologies treated in the subject. Students execute autonomous work, corrected digitally with feedback from the teacher and group reviewing in the classroom.	40	CB5	CG6	CE8	CT1 CT4
Debate	Positioning and argumentation of the student on the methodologies, applications and social repercussions of marine genomics. It demands participatory assistance, reflection and argumentation.	10				CT1 CT2 CT4

Other comments on the Evaluation

The first evaluation session of the course 2021/22 corresponds to the exhibition and defence of the practical case on 29 April 2022 (10-12*h) and the second announcement is due on 5 July 2022 (12-14*h). Qualifications obtained in the exercises and participations evaluated along the course, will be carried over the second opportunity, which represents 50% of the final

mark.

Sources of information

Basic Bibliography

Arthur M. Lesk, **Introduction to Genomics**, Tercera Edición, Oxford University Press, 2017

T. A. Brown, **Genomes 4**, Cuarta Edición, Garland Science, 2017

Complementary Bibliography

Recommendations

Other comments

The complementary bibliography will be proposed by the professor along the course, and will consist in an up to date list of articles, texts, links, and scientific blogs, that will serve as material of enlargement and work. The physical face-to-face classes will be simultaneously given in the classrooms of videoconference of the Máster in Marine Biology by the Faculties of Biology of UVI (classroom A6) of USC (classroom Sir David Attenborough) and the Faculty of Sciences of UDC (classroom of videoconference MBM). It is advisable the participatory assistance to all the classes of the course and the fulfillment of the commitments towards the group of work regarding schedules, deliveries and processes.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED And ADAPTATION OF THE METHODOLOGIES ===

In case of partial or total return to confinement as consequence of the covid-19 disease, it is foreseen the teaching activity throughout the platforms and telematic systems of the Universities. In the event of some kind of incompatibility of schedules or technical problems to access the on-line classes through those platforms, UVI offers an alternative use of vídeoclases from local platforms called Campus Remoto, to which the students will be able to access through a link that will be provided by the professor. It is not foreseen any change in the system of evaluation, which will be emforced through the own platforms of the university or alternatively through common platforms such as Skype, Zoom or Team.

IDENTIFYING DATA				
Internships				
Subject	Internships			
Code	V02M098V01301			
Study programme	(*)Máster Universitario en Biología Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	18	Mandatory	2nd	1st
Teaching language	Spanish Galician			
Department				
Coordinator	García Estévez, José Manuel			
Lecturers	García Estévez, José Manuel			
E-mail	jestevez@uvigo.es			
Web	http://masterbiologiamarina.uvigo.es/index.php?option=com_content&view=article&id=80&Itemid=532			
General description	This matter gathers the majority of the competitions posed in the title since in her apply the knowledges purchased in the first year in some labour surroundings. It contemplates all the formative and professional activities and/or researchers that program and develop with one accord between the universities and the companies or institutions with which have established a specific agreement for the realisation of the External Practices.			

Competencies	
Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
CG3	Aprendizaje de diversas técnicas y métodos analíticos tanto en el medio natural como en el laboratorio
CG4	Desarrollo de habilidades en el manejo y tratamiento de herramientas, matemáticas, estadísticas e informáticas
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CG6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
CG7	Entendimiento de la proyección social de la ciencia
CT1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
CT2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
CT3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad
CT4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma
CT5	Desarrollo de las habilidades de comunicación y discusión de planteamientos y resultados
CT6	Desarrollo de las capacidades de reflexión sobre responsabilidades sociales y éticas
CT7	Desarrollo de habilidades para la divulgación de ideas en contextos tanto académicos como no especializados
CT8	Desarrollo de la habilidad para hablar bien en público

Learning outcomes	
Learning outcomes	Competences
That the student acquires physico-chemical knowledge of oceans and coasts, of the diversity of marine organisms and its adaptative strategies and those interactions with the marine and coastal ecosystems.	CB1 CG1 CT1
That the student was able to pursue the potential economic and biotecnológica interest of marine organisms, to know the principles of their exploitation and sustainability and the planning and supervision of its management.	CB2 CT3 CT5

That the student identifies and evaluates the environmental quality of the sea upon current legislation. Be able to carry out the direction of environmental consultings and evaluate the quality and security of foods and secondary products of marine origin	CB3 CG2 CT3 CT6
That the student was able to catalog, evaluate, conserve, restore and manage the marine protected areas, as well as know how to elaborating, assessing and executing coastal management plans.	CB3 CG1 CG4 CT4 CT5
That the student knows how to handle the methodology of investigation, the technics of sampling the instrumental usage and the analysis of data applied to the marine environment.	CB3 CG3 CT1 CT4
That the student can inspect and advise technically in the evaluation, exploitation and management of fisheries, as well as in the extraction of resources and installations of aquaculture	CB4 CG2 CG5 CT2 CT7
That the student can perform studies of populational dynamics, genetic improvement and selection of stocks in fisheries, aquaculture and programs of restocking and can schedule and direct aquariums, museums, centres of environmental interpretation, natural parks and natural spaces protected	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG3 CG4 CG5 CG6 CG7 CT1 CT2 CT3 CT4 CT5 CT6 CT7 CT8
That the student was able to elaborate, argue, interpret, and evaluate scientific reports-technical, ethical, legal and socioeconomic related with marine fields and fisheries and manage coastal activities of leisure and tourism.	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG3 CG4 CG5 CG6 CG7 CT1 CT2 CT3 CT4 CT5 CT6 CT7 CT8

Contents

Topic

Topics will be those offered in the laboratory, department, area or plant of the institution receptor of the student. The contents on Marine Biology will be handled in the centre receptor, previous agreement between the student, the internal tutor and the external tutor. The thematic offered to carry out the external practices will be varied, to cover the distinct formation expectancies of the student i.e. marine biotechnology, management of fisheries, coastal pollution and bioremediación, evaluation of resources, etc.

In line with the precise work in which the student will work at the receptor centre he/she will handle elements, processes and affine concepts to the education apprehended in the title, in terms of amplitude and multidisciplinary. The background obtained in the first year of the title, allows to adapt to any discipline demanded in the company, centre or institution of received of students in external practices. The extension of subjects during the practic period has the support of internal and external tutors, to ensure the suitable training of the trainee.

Planning

	Class hours	Hours outside the classroom	Total hours
Practicum, External practices and clinical practices	404	45.0056	449.006
Report of practices, practicum and external practices	0.9944	0	0.9944

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Practicum, External practices and clinical practices	The practical will be of forced *tutela by an External Tutor of the centres and institutions with specific agreement with the *MBM (see in Criterion 5, general Explanation of the Plan of Studies) and by an Internal Tutor, necessarily Doctor and educational of the *Máster of Marine Biology. Each one of the centres receptors will be able to receive to several students in function of his annual demand. The student will integrate in the labour dynamics of an institute or department of investigation or in a company or centre of services. The student has to develop autonomous and cooperative works, to scale computational or experimental and on scientific appearances, technicians, economic or politicians applied to the study and exploitation of the half marine .

Personalized assistance

Methodologies	Description
Practicum, External practices and clinical practices	The practical will be of forced *tutela by an External Tutor of the centres and institutions with specific agreement with the *MBM (see in Criterion 5 of the Memory of the Title the general Explanation of the Plan of Studies) and supervised by an Internal Tutor, necessarily Doctor and educational of the *Máster. They explain besides with the personalised attention of the central services of attention to the student, of the universities and of the faculties of *matrícula, in addition to the coordinators of matter and of degree, local and autonomic. It will ensure the achievement of the external practices for the achievement of the title, *redestinando if it was necessary, to the student to a centre of destination in which develop fully his capacities and expectations.
Tests	Description
Report of practices, practicum and external practices	The student will have at all times advice and scientific follow-up-technical of his tutors, for the preparation of the report of the external practices.

Assessment

	Description	Qualification	Evaluated Competences		
Practicum, External practices and clinical practices	Assessment by the Jury of the Report of the tutor or tutors of the external practices.	70	CB1	CG1	CT1
			CB2	CG2	CT2
			CB3	CG3	CT3
			CB4	CG4	CT4
			CB5	CG5	CT5
				CG6	CT6
				CG7	CT7
					CT8

Report of practices, practicum and external practices	Assessment by the Jury of the quality of the memory of practices, its brief presentation and its defence. The report will be brief although it is advised that it collects all the formative aspects that the student wish to reflect, e.g. his experience in the host centre. The report must contain the place of destination, the dates and length of the practices and the name and signature of the external tutors. Also it must contain a reflection on the degree of achievement of the goals and competences pursued, the technics handled and the professional or academic improvement perceived by the student. The student can accompany graphic information and the report can be summarized, lectured and defended at the interuniversity court wich will publish the annual rules in December each year.	30	CB1 CB2 CB3 CB4 CB5	CG1 CG2 CG3 CG4 CG5 CG6 CG7	CT1 CT2 CT3 CT4 CT5 CT6 CT7 CT8
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Other comments on the Evaluation

Do not describe the specific competitions evaluated as they are specific of the thematic tackled in the centre centre receptor, stranger a priori, of the work assigned to the student and of the economic nature of the company or institution *conveniada to realise the practices.

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

Other comments

The external practices are the more visible professional aspect of the Master and place the student in very fist-line professional situation. Thus, it is of great relevance the selection of the destination centre upon the capacities of the student, his potentialities and his preferences. The Master offers more than 20 agreed companies which will receive students from the Master as well as all the academic Departments from SUG and centres associated to Galician universities and several Spanish universities. Along the second semester each student, tutorized by his internal tutor of the PAT will outline his preferences with regard to the centres of destination offered or will promote agreements with new ones better fitting his expectancies.

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

The external curricular practices must be developed in conditions of safety, self-protection and physical distance and in accordance with the regulations in force and the stipulated in the corresponding Educational Cooperation Agreement. During the periods of mixed or non-attendance teaching, they may be developed totally or partially under the telematic modality and always the formative program allows it.

IDENTIFYING DATA**Final Year Dissertation**

Subject	Final Year Dissertation			
Code	V02M098V01302			
Study programme	(*)Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Type	Year	Quadmester
	12	Mandatory	2nd	1st
Teaching language	Spanish Galician			
Department				
Coordinator	García Estévez, José Manuel			
Lecturers	García Estévez, José Manuel			
E-mail	jestevez@uvigo.es			
Web	http://http://masterbiologiamarina.uvigo.es/			
General description	The Work of End of *Máster is a fundamental activity in the training of the students of the title, since it includes all the process of approach, development and defence of a professional project. This involves the staged of all the competitions pursued by the student his evaluation by diverse the groups of interest (educational, court, tutors, and entrepreneurs).			

Competencies

Code	
CB1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
CB2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
CB3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
CB4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
CB5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
CG1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
CG2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
CG3	Aprendizaje de diversas técnicas y métodos analíticos tanto en el medio natural como en el laboratorio
CG4	Desarrollo de habilidades en el manejo y tratamiento de herramientas, matemáticas, estadísticas e informáticas
CG5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
CG6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
CG7	Entendimiento de la proyección social de la ciencia
CE1	Conocimiento físico-químico del medio oceánico y costero
CE2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
CE3	Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros
CE4	Conocimiento y búsqueda del potencial interés económico y biotecnológico de los organismos marinos
CE5	Conocimiento de los principios de explotación y sostenibilidad del medio marino y planificación y supervisión de su gestión
CE6	Conocimiento, identificación y evaluación de la calidad ambiental del medio marino y de la legislación vigente. Dirección de consultorías ambientales
CE7	Catalogación, evaluación, conservación, restauración y gestión de áreas marinas y litorales protegidos. Elaboración, asesoramiento legal y ejecución de planes de ordenación del litoral
CE8	Conocimiento y manejo de la metodología de investigación, de las técnicas muestreo e instrumentales y de análisis de datos aplicados al medio marino
CE9	Conocimientos de instituciones, organismos y legislación relacionados con el medio marino y sus recursos empresariales y económicos
CE10	Inspección y asesoramiento técnico en la evaluación, explotación y gestión de pesquerías, extracción de recursos e instalaciones de acuicultura
CE11	Estudios de dinámica poblacional, mejora genética y selección de stocks en pesquerías, acuicultura y programas de repoblación
CE12	Control de calidad y seguridad de alimentos y de productos de transformación y biotecnológicos de origen marino
CE13	Divulgación de conocimientos de la biología y el medio marinos: programas de formación y docencia; planificación y dirección de acuarios, museos, centros de interpretación ambiental, parques naturales y espacios naturales protegidos

CE14Elaboración, discusión, interpretación, asesoramiento y peritaje de informes científico-técnicos, éticos, legales y socioeconómicos relacionados con el ámbito marino y pesquero

CE15Gestión de actividades de ocio y turismo en el medio marino y litoral

CT1 Desarrollo de las capacidades comprensivas, de análisis y síntesis

CT2 Desarrollo de la capacidad de razonamiento crítico y autocrítico

CT3 Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad

CT4 Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma

CT5 Desarrollo de las habilidades de comunicación y discusión de planteamientos y resultados

CT6 Desarrollo de las capacidades de reflexión sobre responsabilidades sociales y éticas

CT7 Desarrollo de habilidades para la divulgación de ideas en contextos tanto académicos como no especializados

CT8 Desarrollo de la habilidad para hablar bien en público

Learning outcomes

Learning outcomes	Competences
Capacity of synthesis and skills in the communication and critical discussion of ideas. Quality of the works or scientific reports. Acquisition of knowledges and methodologies advanced in a field of application or of biological investigation. Autonomy in the preparation of new hypothesis, in the interpretation of results. Reflection on the limits of the technical employees, of the possible artefacts and of the need of standardisation of the technicians.	CB1 CB2 CB3 CB4 CB5 CG1 CG2 CG3 CG4 CG5 CG6 CG7 CE1 CE2 CE3 CE4 CE5 CE6 CE7 CE8 CE9 CE10 CE11 CE12 CE13 CE14 CE15 CT1 CT2 CT3 CT4 CT5 CT6 CT7 CT8

Contents

Topic	
The Work of End of Máster is a fundamental activity in the training of the students, since it includes all the processes of approach, development and defence to a professional project. Its content include the planning of tasks to resolve a work or project, the realisation of said tasks and finally the concretion of the results in an explanatory memory of the problem posed, the procedure followed for his study or preparation, the interpretation of the results or of the design implemented and finally the results shown in the final report.	All the contents that contemplate the educations of the title, related with the management and exploitation of the marine environment and its resources.

Planning

	Class hours	Hours outside the classroom	Total hours
Project based learning	149.5	149.5	299
Presentation	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
Project based learning	The methodology of the work of End of Master will change in function of the project posed i.e. more professional or more academic-scientific. Although conceptually they are similar, the methodology and the form to structure the information, can vary significantly between students, centres and interest and the supervisors. The methodology will be preferably the one of the Scientific Method, without prejudice that it can consist in a technical work, but yet will be methodologically rigorous in design, execution and presentation. The tasks to realise by the student will vary in function of the project realised and will reflect in the memory of the Work of End of Máster, that has to collect evidence of justification, methodology, results, discussion and comparison with other projects with similar results.

Personalized assistance

Methodologies	Description
Project based learning	Each student will have at least an Internal Tutor of the Máster to direct the Report off Máster's End, that will have academic responsibilities (selection of centres, academic orientation, treatment of data, etc.) and which can be co-directed by a External Tutor, upon agreement subscribed before the initiation of the works, whenever the work is realised out of the university centres. The ultimate orientation of the formal presentation of the memory of the Master will be responsibility of the internal tutor that necessarily will be Doctor, without prejudice of an equivalent maximum implication of the external tutor, if applicable. The student will be able to resort to the orientation of his tutor of the PAT and of the educational staff of the title, to resolve specific elements of the development of his TFM, p.ej. Preparation of mathematical models.

Assessment

	Description	Qualification	Evaluated Competences			
Project based learning	The interuniversity academic court will consider the qualification awarded to the student by the Tutor-s of the TFM, according to the available reports, the evaluation sheet of the student and the degree of professional training or scientific excellence reached by the student according to the evaluation by peers developed by his supervisors.	30	CB1	CG1	CE1	CT1
			CB2	CG2	CE2	CT2
			CB3	CG3	CE3	CT3
			CB4	CG4	CE4	CT4
			CB5	CG5	CE5	CT5
				CG6	CE6	CT6
				CG7	CE7	CT7
					CE8	CT8
					CE9	
					CE10	
					CE11	
					CE12	
					CE13	
					CE14	
					CE15	
Presentation	The interuniversity academic court will value the quality of the contents of the memory *TFM and his organisation and written presentation, the clarity in the exhibition and the capacity of defence upon questions raised by the interuniversitary court.	70	CB1	CG1	CE1	CT1
			CB2	CG2	CE2	CT2
			CB3	CG3	CE3	CT3
			CB4	CG4	CE4	CT4
			CB5	CG5	CE5	CT5
				CG6	CE6	CT6
				CG7	CE7	CT7
					CE8	CT8
					CE9	
					CE10	
					CE11	
					CE12	
					CE13	
					CE14	
					CE15	

Other comments on the Evaluation

The Work End of *Máster will be necessarily the last matter *cursada in this degree, not being able to defend before the

*superación of the rest of matters, and will give place to the application of the title by the student. They will be able to present and defend simultaneously the *PE and the *TFM, in the announcements of February or of July, both equivalent to effects qualifiers, or will be able to effect the presentation and defence of the *PE in the announcement of February and the *TFM in the one of July, but no to the reverse.

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

Other comments

The TFM is the conclusion of the formative activities and rofesionalizantion awarded by the master, and his concretion and evaluation is a right and a duty of each student. Its preparation can be generated after data or processes developed originally by the student in the centre of destination of the external practices, in companies or insititutions, although they are not synonymous at all, as the PE include the learning of a series of competences very distinct to the ones pursued and evaluated in the TFM. If by reasons of confidentiality there were not possible to ellaborate a TFM report from results obtained during the external practices, the title will ensure the preparation of the memory TFM in a thematic affine to the máster, for example, in a Research Department from the SUG universities involved.

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

Elaboration:

In the case of non-presence, the student has the possibility of changing the proposed TFM, adapting it to a situation of non-presence.

Depending on the date on which this non-presence is determined, those works that had an experimental basis and whose practical development had not yet been carried out or was not yet sufficient to complete the proposed objectives should make use of this possibility. In these cases, it is recommended that the work be oriented towards a more bibliographic field or a type of theoretical project with possible applicability in the field of marine biology.

In the case of works that, although having an experimental approach, are already completed or very advanced, it is recommended to maintain the initial project, completing it, if necessary, with a more bibliographic content.

The rules and instructions already established in the teaching guide for the preparation of the report and the presentation of the TFM before a panel are maintained.

Tutorials:

During the suspension of activities, tutoring is even more necessary and precise, and tutors can use virtual classrooms, e-mail and any other means that may help them to contact each other from a distance.

Presentation and evaluation:

If the presentation and defence of the TFM is in non-attendance mode, the process will be carried out using video conferencing through the virtual classrooms with the appropriate measures to ensure the reliability and objectivity of the test. In any case, the evaluation percentages already established in the teaching guide of the subject will be maintained.
