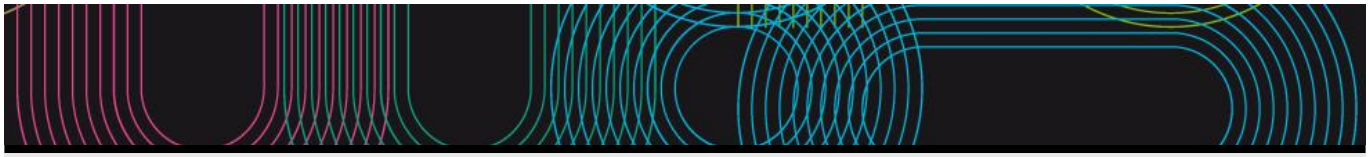

(*)Facultade de Ciencias do Mar

(*)Grao en Ciencias do Mar

Subjects			
Year 3rd			
Code	Name	Quadmester	Total Cr.
V10G060V01318	Prácticas externas	2nd	6
V10G060V01501	Fisioloxía de organismos mariños	1st	6
V10G060V01502	Oceanografía biolóxica I	1st	6
V10G060V01503	Oceanografía física I	1st	6
V10G060V01504	Oceanografía xeolóxica I	1st	6
V10G060V01505	Química aplicada ao medio mariño I	1st	6
V10G060V01601	Oceanografía biolóxica II	2nd	6
V10G060V01602	Oceanografía física II	2nd	6
V10G060V01603	Oceanografía xeolóxica II	2nd	6
V10G060V01604	Química aplicada ao medio mariño II	2nd	6

Year 4th			
Code	Name	Quadmester	Total Cr.
V10G060V01701	Contaminación mariña	1st	6
V10G060V01702	Dinámica oceánica	1st	6
V10G060V01703	Pesqueiras	1st	6
V10G060V01704	Xestión mariña e litoral	1st	6
V10G060V01801	Acuicultura	2nd	6

Year 3rd			
Code	Name	Quadmester	Total Cr.
V10G060V01901	Análise de concas	2nd	6
V10G060V01902	Bioloxía de peixes e mariscos	2nd	6
V10G060V01903	Economía e lexislación	2nd	6
V10G060V01904	Métodos en análise xeográfica	2nd	6
V10G060V01905	Modelización	2nd	6
V10G060V01906	Parasitoloxía e microbioloxía mariña	2nd	6
V10G060V01907	Recursos xenéticos mariños	2nd	6

V10G060V01908	Teledetección oceanográfica	2nd	6

Year 4th			
Code	Name	Quadmester	Total Cr.
V10G060V01909	Xeoloxía mariña aplicada	1st	6
V10G060V01991	Traballo de Fin de Grao	2nd	12

IDENTIFYING DATA				
Internships				
Subject	Internships			
Code	V10G060V01318			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Souza Troncoso, Jesús			
Lecturers	Souza Troncoso, Jesús			
E-mail	troncoso@uvigo.es			
Web				
General description	The external academic practices constitute an activity of formative nature realised by the university students and supervised by the Universities, whose aim is to allow to the same reinforce and complement the knowledges obtained ein his academic training, favouring the acquisition of capacities in view to prepare them for the exercise of professional activities (BOE 297, 10 December 2010).			

Competencies	
Code	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE27	To understand the operation details of enterprises linked to the marine environment, and to recognize their specific problems and solutions
CT8	Teamwork ability
CT12	Ability to adapt to new situations
CT15	Ability to apply knowledge in practice

Learning outcomes			
Learning outcomes	Competences		
New	CB2	CE14	CT8
		CE17	CT12
		CE27	CT15

Contents	
Topic	
The contents of the external academic practices have to otain the following objectives:	a) Contribute to the integral training of the students complementing his theoretical and practical learning. b) Facilitate the knowledge of the methodology of work adapted to the professional reality in that the students will have to operate, contrasting and applying the knowledges obtained. c) Stimulate the development of technical capacities, methodological, personal and participatory. d) Obtain a practical experience that facilitate the insertion in the market of work and improve his future employability. e) Favour the values of the innovation, the creativity and the ventures.

Planning			
	Class hours	Hours outside the classroom	Total hours
Practicum, External practices and clinical practices	150	0	150
*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 formative project in that it concretises the realisation of each external academic practice will have to fix the educational aims and the activities to develop. The aims will establish considering the basic capacities, generic and/or specific that it has to be obtained by the student.

Personalized assistance

Methodologies	Description
Practicum, External practices and clinical practices	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.

Assessment

	Description	Qualification	Evaluated Competencess		
Practicum, External practices and clinical practices	The advisor of the collaborator entity will realise and will send to the academic advisor of the university a final report, to the conclusion of the practices, that will collect the number of hours realised by the student and in which it will be able to value the different appearances referred so much to the generic competitions how to the specific, foreseen in the corresponding formative project. The student will elaborate and will do delivery to the academic tutor of the University a final memory (1-2 pages), to the conclusion of the practices with the seen well of the tutor of the company. The academic advisor will evaluate the practices developed, according to the reports of the student and of the advisor of the Company, filling the corresponding report of assessment with the final note.	100	CB2	CE14 CE17 CE27	CT8 CT12 CT15

Other comments on the Evaluation

All the procedure can find in the BOE number 297 (10/11/2010) and in the guideline of External Practices of the Marine Sciences Faculty.

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

Other comments

It is very important to follow the instructions of the Tutor of the Company, realise all the activities that are requested to the student.
Adopt an attitude of collaboration in all the tasks entrusted from the start of the practice.

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
Not apply

* Teaching methodologies modified
Not apply

* Non-attendance mechanisms for student attention (tutoring)
Not apply

* Modifications (if applicable) of the contents
Not apply

* Additional bibliography to facilitate self-learning
Not apply

* Other modifications
Not apply

=== ADAPTATION OF THE TESTS ===
* Tests already carried out
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
Not apply

* Pending tests that are maintained
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
Not apply

* Tests that are modified
[Previous test] => [New test]
Not apply

* New tests
Not apply

* Additional Information
If the company is closed an in consequence do not take our students, the students have the option to change for other optative subject.

IDENTIFYING DATA

Physiology of marine organisms

Subject	Physiology of marine organisms			
Code	V10G060V01501			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Lopez Patiño, Marcos Antonio			
Lecturers	Blanco Imperiali, Ayelén Melisa Conde Sieira, Marta Lopez Patiño, Marcos Antonio Pedrol Bonjoch, María Nuria Verde Rodríguez, Antía			
E-mail	mlopezpat@uvigo.es			
Web				
General description	Study of the operation of the marine organisms (animal and vegetal) and of the mechanisms that make possible his adaptation to the half. It will loan special attention the those physiological **appearances mothers related with the integration of the pertinent information of the half marine and the generation of specific answers.			

Competencies

Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE4	To know the basic techniques to sample the water column, organisms, sediments and sea bottom, as well as the surveying methods for dynamic and structural variables
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE12	To be able to operate the instrumental techniques applied to sea
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CT3	Written and oral communication in the official languages of the University
CT5	Information technology skills (search and data analysis)
CT6	Problem management and solving skills

Learning outcomes

Learning outcomes	Competences		
PLANT PHYSIOLOGY	CB1	CE1	
1. To identify and understand key physiological processes in the development of photosynthetic marine organisms.	CB2 CB3		
2. To know the relationships among the photosynthetic marine organisms and the marine environment by means of the study of changing physiological processes	CB1 CB2 CB3 CB5	CE6	
3. To handle equipments and techniques to study plant physiology.	CB2 CB3	CE4 CE5 CE12	CT5
4. To understand the scientific methodology and the technologies applied to plant physiology research.	CB1 CB3 CB5	CE1 CE4 CE5 CE12	CT5
5. To gain capacity of analysis and approaching to hypothesis in plant physiology.	CB2 CB3	CE5 CE6	CT3 CT6

6. To know the relationships among the photosynthetic marine organisms and the abiotic and biotic marine environments, by means of the study of their adaptations and the physiological processes of acclimation (functional types, osmoregulation, fotoprotection, biomass partitioning).	CB2 CB3 CB5	CE1	CT3
ANIMAL PHYSIOLOGY: 7. To know the mechanisms of acquisition and integration of the sensory information in marine animals	CB2 CB3 CB5	CE1	
8. To know the physiological bases of muscular activity and its implication in aquatic locomotion	CB3	CE1	
9. To know in marine animals the mechanisms trough which synthesis, release, transport and the action of hormones synthesised by endocrine glands and the nervous system of marine animals occurr.	CB2 CB3	CE1	
10. Knowing the corporal fluids and the functioning of cardiovascular systems.	CB3	CE12 CE17	CT6
11. To know the mechanisms of gas exchange between the animals and the water where they live.	CB3	CE1	CT6
12. To know the mechanisms for wastes elimination and of osmotic regulation in distinct groups of marine animals.	CB3	CE1	CT6
13. To know how animals obtain energy through food consumption, and how to use such energy as well.	CB3 CB5	CE1	CT3 CT5
15. To know the general and basic terminology in Animal Physiology.	CB3	CE1	
16. To know and to understand the generel functioning of different systems in animals addapted to different environmental conditions.	CB2 CB3	CE1	CT5 CT6
17. To understand the general functioning of the animal as a whole, emphasizing in the role played by the integratory and coordinatory systems.	CB2 CB3	CE1	CT5
18. To understand basic aphysiology-related aspects, such as aquaculture.	CB2 CB3 CB5	CE1 CE5	CT6

Contents

Topic	
PLANT PHYSIOLOGY:	1. Plant Physiology in the ocean. 2. Cell and tissue basic characteristics photosynthetic marine organisms 3. Water relations in photosynthetic marine organisms. Osmoregulation and osmoprotection. 4. Mineral nutrition in marine environments. 5. Photosynthesis: definition and physiological, ecological and evolutionary relevance. 6. The photosynthetic organelles. 7. Light and photosynthetic pigments. 8. The photochemical phase of photosynthesis. 9. The biochemical phase of photosynthesis. 10. Mechanisms of carbon gain and concentration in photosynthetic marine organisms.
ANIMAL PHYSIOLOGY:	1. Physiological bases of excitability 2. The nervous system and the neural communication 3. Physiology of the systems effectors in marine animals: muscular activity and locomotion, cromatophora and bioluminescence 4. Sensory physiology in marine animals: mecanoreception, electroreception, magnetoreception, quimioreception, fotoreception and vision. 5. Physiology of the neuroendocrine and endocrine systems in marine animals 6. Circulatory fluids and operation of the cardiovascular systems in marine animals 7. Operation of the respiratory systems in marine animals 8. Physiology of excretion and osmorregulation in marine animals 9. Physiology of the digestive systems in marine animals

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	28	70	98
Laboratory practical	10	4	14
Mentored work	0	6	6
Discussion Forum	0	2	2
Seminars	5	15	20
Objective questions exam	0.7	0	0.7
Essay questions exam	1	0	1

Problem and/or exercise solving	0.3	0	0.3
Essay	0	6	6
Debate	0	2	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	2-4 weekly hours until complete the planning. To be developed in the corresponding classroom, with all the enrolled students. Theory sessions will be supported by power point presentations. The educational materials will be at the disposal of the students at TEMA platform.
Laboratory practical	The students will assist 3 sessions of practices in the laboratory: two sessions of 2.5 h each in Animal Physiology, one session of 4 h in Plant Physiology, and another session of 1 h in Plant Physiology. The attendance is compulsory.
Mentored work	PLANT PHYSIOLOGY: short Activities of cooperative learning in the classroom, in spontaneous or random groups. Immediate delivery. They are a complement for the evaluation, not compulsory. Each activity delivered can add up to 0.1 points to the final mark of PLANT PHYSIOLOGY, although they do not penalise if they are not delivered.
Discussion Forum	PLANT PHYSIOLOGY, through the platform TEMA: -virtual Forum of review: scientific Articles and websites of cytology and histology of photosynthetic marine organisms -virtual Forum of innovation and state of the art: scientific Articles and websites of physiological /ecophysiological subjects of photosynthetic marine organisms -virtual Exercises proposing questions for the final exam Each quality contribution to the forum can add up to 0.1 points to the final mark of PLANT PHYSIOLOGY, although they do not penalise if you do not participate.
Seminars	In the module of ANIMAL PHYSIOLOGY seminars will be devoted to the planning and exhibition of subjects elaborated by the distinct groups of students In the module of PLANT PHYSIOLOGY seminars will be devoted to the resolution of problems

Personalized assistance

Methodologies	**Description**
Seminars	Resolution of doubts and difficulties to the groups or personal if necessary. During the seminar and in tutorials, monday and friday from 11:00 to 12:00.
Lecturing	Resolution of doubts and difficulties to the the group or personal if necessary. During the session and in tutorials, monday and friday from 11:00 to 12:00. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Laboratory practical	Resolution of doubts and difficulties to the groups or personal if necessary. During the practices and in tutorials, monday and friday from 11:00 to 12:00.
Mentored work	Resolution of doubts and difficulties to the groups the groups or personal if necessary. In the classroom and in tutorials, monday and friday from 11:00 to 12:00.
Discussion Forum	Feedback through the platform TEMA
Tests	**Description**
Essay	Resolution of doubts and difficulties to the groups or personal if necessary. In tutorials, monday and friday from 11:00 to 12:00.
Debate	Feedback through the platform TEMA

Assessment

	Description	Qualification	Evaluated Competencess		
Lecturing	Attendance will be valued	0	CB1 CB2	CE1 CE4	CT3 CT5
	By means of a final exam comprising the two modules. The weighting per module is 50%. It demands a minimum of 4 each in each module to pass the examination. The final exam will consist on short answer tests, long answer tests, and resolution of exercises.		CB3 CB5	CE5 CE6	CT6

Laboratory practical	In the module of Plant Physiology (5% of the qualification) the evaluation will be by attendance and questions in the final exam. In the module of Animal Physiology (5% of the qualification) the evaluation will be by attendance	10	CB1 CB2 CB3 CB5	CE1 CE4 CE5 CE12 CE17	CT5 CT6
Mentored work	Voluntary for Plant Physiology	0			
Discussion Forum	Voluntary for Plant Physiology	0			
Seminars	It is compulsory the attendance to the seminars In the module of Plant Physiology (10% qualification) the assessment will be by attendance and performance, and the problems will be matter of examination. In the module of Animal Physiology (10% qualification) the students in groups of 2-3 will elaborate a memory and will present in public a work of a listing of subjects proposed.	10	CB1 CB2 CB3	CE1 CE6	CT5 CT6
Objective questions exam	Mandatory	25			
Essay questions exam	Mandatory	35			
Problem and/or exercise solving	Mandatory	10			
Essay	Mandatory for Animal Physiology	10			

Other comments on the Evaluation

To pass the matter demands that the global qualification of each one of the modules (examination, seminars and practical) separately marks no less than 4 points (up to 10).

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

Date, time and place of exams will be published in the official web of Marine Sciences Faculty:

http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Sources of information

Basic Bibliography

Hill, R.W. et al, **Fisiología animal.**,

Moyes, C. y Schulte, P., **Principios de fisiología animal.**,

Withers, P.C., **Comparative Animal Physiology.**,

Complementary Bibliography

Randall,D. et al., **Fisiología animal.**,

Willmer, P., Stone, G., Johnston, I., **Environmental physiology of animals,**,

Azcón-Bieto J, Talón M, **Fundamentos de Fisiología Vegetal**, 2ª ed. Madrid: McGraw-Hill Interamericana,

Taiz L, Zeiger E, **Fisiología vegetal**, Publicacions de la Universitat Jaume I,

Lobban CS, Harrison PJ, **Seaweed Ecology and Physiology**, Cambridge University Press, New York,

Kirk JTO, **Light and photosynthesis in aquatic ecosystems**, 3rd ed. Cambridge, UK: Cambridge University Press,

Larkum AWD, Robert JO, Duarte CM, **Seagrasses: biology, ecology, and conservation**, Dordrecht (The Netherlands): Springer,

Taiz L et al., **Plant Physiology and Development, Sixth Edition**, Sinauer Associates, Inc.,

Recommendations

Subjects that continue the syllabus

Aquaculture/V10G060V01801

Other comments

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams,

evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

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. By means of online lessons through telematic teaching-learning on Campus Virtual (https://campusremotouvigo.gal/).

* Teaching methodologies modified

None. If required, lab sessions would be replaced with video and tutorial sessions, and a commented report should be mandatory.

* Non-attendance mechanisms for student attention (tutoring)

By mean of e-mail and virtual offices at Campus Virtual.

* Modifications (if applicable) of the contents:

None

* Additional bibliography to facilitate self-learning:

None

* Other modifications

=== ADAPTATION OF THE TESTS ===

Exams and computer-based tests will be conducted through the platform TEMA.

IDENTIFYING DATA				
Biological oceanography I				
Subject	Biological oceanography I			
Code	V10G060V01502			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Lastra Valdor, Mariano			
Lecturers	Aranguren Gassis, María Costas Selas, Cecilia Delgadillo Nuño, Erick Jabalera Cabrerizo, Marco Lastra Valdor, Mariano			
E-mail	mlastra@uvigo.es			
Web				
General description	This subject deepens in the study of diverse coastal ecosystems, located in the transition continent-ocean as they are the beaches, rocky coast, estuaries, coastal lagoons, dunes, reefs, etc. The fundamental aim is to comprise the characteristics of these ecosystems and know the fauna and flora that inhabit them.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CT2	Organization and planning skills
CT8	Teamwork ability
CT16	Research skills

Learning outcomes			
Learning outcomes	Competences		
Through theoretical contents, practical, exits of field and the work of investigation, at the end of the course the student will have to have purchased the necessary knowledges that allow him interpret the operation of the coastal ecosystems (estuaries, beaches, coastal lagoons, etc), and his interaction with the antrophic activities in the open ocean.	CB1 CB2 CB3 CB4 CB5	CE1 CE5 CE6 CE13 CE14 CE15 CE16 CE17 CE18	CT2 CT8 CT16

Contents

Topic	
1. Introduction to the marine habitat	1.1. Types of coastal habitats 1.2. Adecuacy of the coastal ecosystems to the typology of habitats of interest 1.3. Conservation of the coastal ecosystems 1.4 Destruction of the coastal habitats
2. Estuaries	2.1. Introduction 2.2. Salinity and substrate 2.3. Vegetation and macrofauna 2.4. The communities of Petersen 2.5. The alimentary chain
3. Rocks	3.1. General appearances 3.2 Adaptations to the physical stress: temperature, waves, burial, .. 3.3. Coasts warmed up, exposed and moderately exposed. 3.4. Subtidal rocks 3.5. Control factors 3.6. The food chain
4. Beaches	4.1. Introduction 4.2. Types of Beaches 4.3. Zonation 4.4. Flora and fauna
5. Coastal lagoons	5.1. General characteristics 5.2. Lagoon organisms 5.3. Ecology of the coastal lagoons 5.4. Primary and secondary production
6. Dune systems	6.1. General characteristics 6.2. Characteristics of ecological importance 6.3. Dune vegetation 6.4. Fauna 6.5. Food chains
7. Mangroves	7.1. Distribution and physical conditions 7.2. Zonation 7.3. Ecological importance
8. Coral reefs	8.1. The paper of the zooxanthellae 8.2. Factors that limit the growth of the reefs 8.3. Geographic distribution and types of coral reefs 8.4. Productivity of the reef 8.5. Biological interactions and mutualism
9. Vertical structure in open ocean and coastal waters: biology of the superficial ocean.	9.1 Zonation of the oceanic region 9.2. Phytoplankton and zooplancton 9.3. Food webs

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	7	7	14
Laboratory practical	15	0	15
Studies excursion	0	10	10
Lecturing	25	37.5	62.5
Mentored work	0	34.5	34.5
Objective questions exam	1	10	11
Essay	1	2	3

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

Methodologies

	Description
Seminars	They will divide the groups in subgroups of 4-5 people. Each subgroup will prepare a work to choose between the subjects offered by the professor at the beginning of the course. Each student will have to involve clearly in all or some of the facets of the work. The works will be directed during the destined hours to the seminars. The oral exhibition will have a length of 20 minutes for the oral presentation and 5 minutes for the round of questions of the professor and of the rest of students. The presentation will come accompanied by an archive in computer support (powerpoint) that will send to the professor in dates fixed previously to the presentation.

Laboratory practical	With the samples taken during the exit to the sea, the students will learn to realise separation, identification and headcounts of pertaining organisms to distinct groups of the bentos. With the table of data obtained will work the statistical section from univariate analysis, bivariate and multivariate.
Studies excursion	They will realise in the subject two field trips: 1) Exit to the estuary of Vigo in the fuselage Mytilus, for the collected of benthic samples with dragas quantitative (Van-Veen). 2) Exit to Aguiño (Ribeira, A Coruña)
Lecturing	They will present and they will argue theoretical contents that they will be evaluated in a final examination.
Mentored work	The works of investigation will be driving in group through the seminars. The students that belong to the same group will have to assist to same group of seminar.

Personalized assistance

Methodologies	Description
Lecturing	Theoretical classes on the subjects of the subject. It content will be moved to the platform TEMA once that each subject have finalised. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. Schedule of tutorials: September 2017: Tuesday and Thursday of 17:00 to 18:00 h. From October 2017: Tuesday and Thursday of 13:00 to 14:00 h.
Laboratory practical	2 groups of laboratory of 20 students roughly.
Seminars	3 groups of seminars, of roughly 15 students, and that will serve to give support to the works of investigation developed by the students.

Assessment

	Description	Qualification	Evaluated Competencess		
Seminars	The groups will be divided into subgroups of 4-5 people. Each group will prepare a work to choose from among those proposed by the teacher at the beginning of the course. The works * will be tutored during the hours allocated to the seminars (small groups 2.5 * h). The presentation of the works will take place in December and will last 20 minutes for the oral presentation and 5 minutes for the round of questions from the teacher and the rest of the students. The presentation will be accompanied by a file on computer support (* powerpoint) that will be sent to the teacher on dates set before the presentation.	25	CB1 CB2 CB3 CB4 CB5	CE1 CE5 CE6 CE13 CE14 CE15 CE16 CE17 CE18	CT2 CT8 CT16
Laboratory practical	Participation in practices, rigor in sampling and laboratory work, aptitude for teamwork and the ability to prepare and interpret results will be evaluated.	10	CB3 CB5	CE1 CE15 CE16 CE17	
Lecturing	Written exam. Questions will be asked that show the level of understanding acquired by the students throughout the subject, both in the theoretical classes, as well as in the practical ones, seminars and field trips.	65	CB1 CB2 CB3 CB4 CB5	CE1 CE5 CE6 CE13 CE14 CE15 CE16 CE17 CE18	CT2 CT8 CT16

Other comments on the Evaluation

To surpass the subject is necessary to approve each one of the three proofs (test, seminars and practicals).

In the second announcement only will realise an examination written corresponding to the matter given in the test, but will take into account the assistance to seminars and practical during the course.

Date, time and place of exams will be published in the official web of Marine Sciences Faculty: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole

academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

Sources of information

Basic Bibliography

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Keninish Michael J., **Coastal Lagoons: Critical habitats of Environmental Change**, First Edition, CRC Press Taylor and Francis Group, 2010

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Barreiro F., Gómez M., López J., Lastra M. & la Huz R., **Coupling between macroalgal inputs and nutrients outcrop in exposed sandy beaches**, Hydrobiologia, 700: 73-84, 2013

Vila-Concejo A. & Kench P.S., **Storms in Coral Reefs: Processes and Impacts**, Coastal Storms, pp.127-149, 2017

Ansell, A.D, Gibson, R.N., Barnes, M.,, **Oceanography and Marine Biology, An annual review**, Aberdeen University Press, 1995

Shing Yip Lee et al., **Ecological role and services of tropical mangrove ecosystems: a reassessment**, Global Ecology and Biogeography 23 , 726□743, 2014

Recommendations

Subjects that continue the syllabus

Biological oceanography II/V10G060V01601

Subjects that are recommended to be taken simultaneously

Ocean Dynamics/V10G060V01702

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===
Teaching methodologies that are maintained
In the event of a health emergency, the contents of the theoretical teaching, practical teaching and seminars will be maintained.

* Teaching methodologies that are modified:
In the event of a health emergency, theoretical teaching and seminars will be taught through a remote campus, maintaining the content and teaching objectives.
Field trips will be replaced by audiovisual content that will allow the acquisition of the planned content, and attempts will be made to carry them out in person / as soon as possible.
If the presence in the laboratories is impossible, the practices will be taught virtually through a remote campus analyzing case studies identical to those provided for in-person teaching.

Group work, which is usually based on data extracted from field or laboratory work, will become strictly bibliographic in the event of a health emergency.

* Non-face-to-face service mechanism for students (tutorials)
The tutorials will be carried out through remote campus sessions agreed through email. Or simply through email.

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

There will be no changes in the teaching content.

* Additional bibliography to facilitate self-learning

It will be attached, if necessary, depending on the conditions of the moment.

* Other modifications

There is not

=== ADAPTATION OF THE EVALUATION ===

Theoretical Exam: [Previous weight 65%] [Proposed Weight 70%]

Public exhibition of group work: 15%

Written report of group work: 15%

* Evidence that is modified
Laboratory practice evaluation will be part of the theoretical exam

* New tests
There is not

* Additional Information

IDENTIFYING DATA				
Physical oceanography I				
Subject	Physical oceanography I			
Code	V10G060V01503			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Roson Porto, Gabriel			
Lecturers	Roson Porto, Gabriel			
E-mail	groson@uvigo.es			
Web				
General description	Knowledge of the main physical processes in the ocean as well as their relevant climatological causes.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE18	To transmit writing, verbal and graphical information for audiences of various types
CE25	To participate in and advise on research on wave climate
CT1	Analysis and synthesis ability

Learning outcomes			
Learning outcomes	Competences		
Basic knowledge of the climatological processes and the meteorological phenomena, with special attention to his influence on the oceanic processes.	CB1	CE1 CE2 CE6 CE14 CE16 CE18	CT1
Descriptive knowledge of the main physical processes in the ocean	CB2 CB3	CE1 CE2 CE5 CE6 CE18	CT1
Descriptive knowledge of the oceanic circulatory systems.		CE1 CE14 CE25	

Contents
Topic

I. BASIC CLIMATOLOGY	I.1. Description of the atmosphere: composition, temperature and density with height. I.2. Electromagnetic radiation. Black body emission. Characteristics of solar and terrestrial radiation. I.3. Radiative budget. Albedo and absorption. The greenhouse effect. Energetic latitudinal disequilibrium of the Earth. General movements of air masses, planetary convective cells. I.2. Fundaments of Meteorology: atmospheric pressure; vertical and horizontal structure. Surface maps: isobaric systems. Accelerations in isobaric systems; geostrophic equilibrium; horizontal and vertical circulation.
II. HYDROGRPHY AND WATER MASSES	II.1. TEMPERATURE II.1.1. Surface distribution. II.1.2. Temperature of the water column. Differences among three regions: Mixing layer, seasonal thermocline, main thermocline, deep waters. II.1.3. Upwelling. Ekman spiral. Ekman Transport. Types of upwelling. Downwelling. II.2. SALINITY II.2.1. Conservative and no conservative components. Absolute and practical salinity. II.2.2. Surface distribution and it relationship with balance precipitation + runoff - evaporation. Estuaries and estuarine circulation. Coupling estuarine circulation with upwelling and downwelling. II.3. MASAS DE AGUA Y DIAGRAMAS TS II.3.1. Water masses and water types. Abyssal circulation. Types of density variation in relation with water masses formation. The core method. Identification of water masses circulation. II.3.2. Equation of state of Seawater. Isopycnals. Density vertical profiles of by latitudes: The pycnocline. Density gradient and water masses stability. II.3.3. TS diagrams. Mixing of water types; caballing. Stability of water masses using TS diagrams.
III. DYNAMICS OF OCEAN CURRENTS	III.1. Surface currents and wind systems. The westward intensification. Eulerian and lagrangian currents. III.2. The subtropical and subpolar gyres. Equatorial currents. The Antarctic Circumpolar Current. III.3. Dynamic topography and geostrophic currents. Barotropic and baroclinic regimes. Helland-Hansen equation. III.4. Origin of the dynamic topography: cyclonic and anticyclonic winds. Convergences and divergences of the surface currents. Relationship with upwelling and downwelling. Ekman Pumping.
IV. REGIONAL OCEANOGRAPHY	IV.1. THE ANTARCTIC OCEAN. IV.2. THE ATLANTIC OCEAN. IV.3. THE MEDITERRANEAN SEA. IV.4. THE PACIFIC OCEAN. IV.5. THE INDIAN OCEAN.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	36	0	36
Seminars	16	8	24
Autonomous problem solving	0	46	46
Objective questions exam	1	3	4
Problem and/or exercise solving	0	20	20
Essay questions exam	4	16	20
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Theoretical lessons
Seminars	Research work (obligatory attendance)
Autonomous problem solving	Exam

Personalized assistance	
Methodologies	**Description**

Lecturing	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. Monday-Tuesday-Wednesday 10-12 h.
Seminars	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. Monday-Tuesday-Wednesday 10-12 h.
Autonomous problem solving	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. Monday-Tuesday-Wednesday 10-12 h.

Tests	**Description**
Objective questions exam	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. Monday-Tuesday-Wednesday 10-12 h.
Problem and/or exercise solving	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. Monday-Tuesday-Wednesday 10-12 h.
Essay questions exam	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. Monday-Tuesday-Wednesday 10-12 h.

Assessment

	Description	Qualification		Evaluated Competencess	
Lecturing	Exams	0	CB1 CB2 CB3	CE1 CE2 CE5 CE6 CE14 CE16 CE18 CE25	CT1
Seminars	Seminars	0	CB1 CB3	CE1 CE5 CE16	CT1
Autonomous problem solving	Exam and seminars	0		CE5 CE25	CT1
Objective questions exam	Exam in a not specified date	20	CB1		
Problem and/or exercise solving	Deliverables of seminar exercises	30	CB1 CB2	CE2 CE14 CE25	
Essay questions exam	Oficial Exam	50	CB1 CB2 CB3	CE1 CE2 CE5 CE6 CE14	CT1

Other comments on the Evaluation

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

Assesment of classroom lectures:

One no official exam (no free up of contents) during the course in a no previously specified date. (weight 20%)

Official Exam (weight 50%)

Assesment of Seminars:

individual memories of seminars (weight 30%).

Delivery of seminar report must be up to 7 days after the seminar. See delivery calendar at http://facultadeccdomar.webs.uvigo.es/index.php/es/alumnado-actual/calendario-escolar.

After that deadline, delivery is not accepted (in this case mark will be 0).

Repeat students are also required to delivery seminar reports .

Students are required to pass (mark >=5) both official exam and seminar reports in order to pass the whole matter.

Both non official exam and seminar reports will be kept for the second opportunity.

Date, time and place of exams will be published in the official web of Marine Sciences Faculty:

http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Sources of information

Basic Bibliography

SENDIÑA, I Y . PÉREZ MUÑUZURI, V, **Fundamentos de meteorología,**, Universidad de Santiago de Compostela, Servizo de Publicacións e Intercambio Científico,

R.A. Varela y G. Rosón., **Métodos en Oceanografía Física**, Editorial Anthias Biblioteca INNOVA,

Complementary Bibliography

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TOMCZCAK, M. y J. STUART GODFREY, **Regional Oceanography: an introduction**, Pergamon. 422 p., http://www.es.flinders.edu.au/~mattom/regoc/pdfver,

ANGELA COULING and the Open University course Team., **Ocean circulation**, Pergamon press, 238 p.,

R. STEWART, **Introduction to Physical Oceanography**, Texas A&M University., http://www.uv.es/hegigui/Kasper/por%20Robert%20H%2,

Recommendations

Subjects that continue the syllabus

Physical oceanography II/V10G060V01602

Other comments

IMPORTANT MARKS:

The delivery of the individual seminar report for teacher assessment has a deadline of 7 days after the day when seminar took place. After that deadline no reports will be collected. In this circumstance, mark will be 0.

The delivery of any report by the student for teacher assessment implies student goes to PRESENTED mode automatically, regardless of the student sit for final exam.

The final mark of this matter will be an average of three marks (between 0 and 10): the no official exam (en), the official exam (eo) and the average mark of the seminars, both in first and second opportunity, accordingly with:

n = 0,2*en + 0,5*eo + 0,3*se

The official exam as well as average mark of the seminars must be passed separately. If not (i.e. if se<5 or eo<5) the following formulae replaces the former one:

n = 0,2*en + 0,2*eo + 0,1*se

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 methodologies would be maintained.
* Teaching methodologies modified
In the case of on line teaching, two resources will be set up, the remote campus https://campusremoto.tv.uvigo.es/ and the on line teaching platform https://faitic.uvigo.es/, as well as other resorts that will help students to access to the contents of the matter.
* Non-attendance mechanisms for student attention (tutoring)
Personal attention will be arranged through the virtual office 2308 (Gabriel Rosón). Password: SeguroqueaprueboOF1 , as well as via email, only through the institutional student domain @alumnos.uvigo.es. Emails send via non institutional domain will not answered.
Tutoring schedule will be increased from monday to friday from 10 to 18 h.
* Modifications (if applicable) of the contents
Not applicable
* Additional bibliography to facilitate self-learning
In order to make learning easier, all additional bibliography will be uploaded in the online plattform faitic if neccesary.
* Other modifications Not applicable
=== ADAPTATION OF THE TESTS ===
* Tests already carried out
Test XX: [Previous Weight 00%] [Proposed Weight 00%] Not applicable
* Pending tests that are maintained
Test XX: [Previous Weight 00%] [Proposed Weight 00%] Not applicable
* New tests Not applicable
* Additional Information
In this unusual situation, students are required to face this matter with a responsible and honest behaviour.

IDENTIFYING DATA				
Geological oceanography I				
Subject	Geological oceanography I			
Code	V10G060V01504			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Bernabéu Tello, Ana María			
Lecturers	Alejo Flores, Irene Bernabéu Tello, Ana María Marino , Gianluca			
E-mail	bernabeu@uvigo.es			
Web	http://193.146.32.240/tema1112/claroline/course/index.php			
General description	Geological oceanography (also called marine geology) is one of the broadest fields in the Earth Sciences and contains many subdisciplines, including geophysics, and plate tectonics, petrology and geochemistry, sedimentation processes, and micropaleontology and stratigraphy. Geological Oceanography I will focus on the study of basic earth proceses affecting sedimentation in litoral areas, since sediments are the main geological feature of these region. The subject will cover the fundamental techniques to study the topography, structure, sedimentation, and associated geological processes of these areas to discover how they were formed and how ongoing processes (coastal dynamics, climate change, human impact...) may change them in the future. The subject will deal with the peculiarity of combining terrestrial and marine data to study litoral and coastal processes.			

Competencies	
Code	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CT6	Problem management and solving skills
CT16	Research skills

Learning outcomes	Competences		
2. Capacity to manage the basic techniques of observation, meassurement and description of marine geological materials in these environments	CB2 CB5	CE1 CE2 CE5 CE13 CE17	CT6 CT16
3. Capacity to manage the basic techniques of sampling and surveying	CB2	CE1 CE5 CE13 CE17	CT16
4. Capacity to manage the basic techniques of sediment caracterización and analyses	CB2 CB5	CE1 CE2 CE5 CE6	CT6 CT16
5. Geological mapping and representation skills	CB2 CB5	CE1 CE5 CE6 CE16	CT16

6. Report elaboration and presentation skills	CB2 CB5	CE1 CE6 CE16	CT16

Contents	
Topic	
T0. Presentation	0.1 Aims 0.2 Activities 0.3 Program 0.4 System of qualification
T1. Introduction	1.1 History and development of Marine Geology 1.2 Importance of Marine Geology
T2. General protocol for geological research on the coast and nearshore	2.1 Nature of Research and project design 2.2 General protocol for design and execution of a project 2.3 Planning and definition of methodological strategies 2.4 Data evaluation, interpretation and publication
T3. Coastal Morphodynamics	3.1 Basic concepts 3.2 Morphodynamics of coastal systems 3.3 Transport assessment
T4 Methods of sampling and subsampling	4.1 Grabbers 4.2 Corers 4.3 Fluids and gases 4.4 Samples curation
T5. Seismo-acoustic methods	5.1 Basic Principles 5.2 Echosounders 5.3 Side Scan Sonar 5.4 Seismic Methods (HR) 5.5 Processing
T6. Electrical logging: physical properties (seminars)	6.1 Gamma density and natural gamma 6.2 Resistivity and poropermeability 6.3 Susceptibility and other magnetic properties 6.4 Color and imaging 6.5 X-Rays 6.6 Corescanning: GEOTEK and 2G
T7 Geochemical Methods (seminars)	7.1 Elemental analyses 7.1.1 LECO 7.1.2 Spectrometry 7.1.3 XRF 7.2 Mineralogical Analyses 7.2.1 XRD 7.2.2 SEM-EDAX 7.3 Corescanning: ITRAX and AVAATECH
T8 Dating Techniques	8.1 Radiometry 8.1.1 14C 8.1.2 210Pb 8.1.3 137Cs 8.2 Other Methods 8.2.1 d18O 8.2.2 Magnetic 8.2.3 Thermoluminescence
PA1 Survey Planning	How to plan a cruise (practical case) PA1.1 Objective definition PA1.2 Selection of methodologies PA1.3 Definition of tasks and scope PA1.4 Time Planning PA1.5 Economic assessment and budgets PA1.6 Reports
PA2 RV Mytilus Mini Cruise	PA2.1 Administrative requirements and basic security norms in oceanographic cruises PA2.2 Onboard life PA2.3 Sediment sampling techniques and operations PA2.4 Geophysical surveying techniques and operations PA2.5 Data management and archives

Planning			
	Class hours	Hours outside the classroom	Total hours
Seminars	7	9	16
Studies excursion	5	5	10
Introductory activities	2	4	6
Case studies	15	30	45
Lecturing	23	48	71
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
Seminars	2:20 h long seminars on complementary topics
Studies excursion	It includes ship minicruises oriented to experience oceanographic work in real conditions
Introductory activities	It comprises the activities carried out during the two first lectures, like subject presentation, time schedule, qualification procedures and other pertinent indications for the course well-being.
Case studies	Preparation of a project in real terms: analysis of the problematic, definition of aims, methodological planning, timing and economic estimate.
Lecturing	Lectures comprising the major topics of the course program

Personalized assistance	
Methodologies	**Description**
Lecturing	The tutorials will take place preferably on Monday and Thursday from 12:00 to 14:00 The tutoring sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement. In the face-to-face modality, the tutorials will be held in office D42, block C, 3rd floor of the CC Experimental Building, as long as the teacher does not have to attend to other academic obligations. To optimize the time, it is necessary for the student to contact the teacher in advance
Seminars	The tutorials will take place preferably on Monday and Thursday from 12:00 to 14:00 The tutoring sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement. In the face-to-face modality, the tutorials will be held in office D42, block C, 3rd floor of the CC Experimental Building, as long as the teacher does not have to attend to other academic obligations. To optimize the time, it is necessary for the student to contact the teacher in advance
Studies excursion	The tutorials will take place preferably on Monday and Thursday from 12:00 to 14:00 The tutoring sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement. In the face-to-face modality, the tutorials will be held in office D42, block C, 3rd floor of the CC Experimental Building, as long as the teacher does not have to attend to other academic obligations. To optimize the time, it is necessary for the student to contact the teacher in advance
Introductory activities	The tutorials will take place preferably on Monday and Thursday from 12:00 to 14:00 The tutoring sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement. In the face-to-face modality, the tutorials will be held in office D42, block C, 3rd floor of the CC Experimental Building, as long as the teacher does not have to attend to other academic obligations. To optimize the time, it is necessary for the student to contact the teacher in advance
Case studies	The tutorials will take place preferably on Monday and Thursday from 12:00 to 14:00 The tutoring sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement. In the face-to-face modality, the tutorials will be held in office D42, block C, 3rd floor of the CC Experimental Building, as long as the teacher does not have to attend to other academic obligations. To optimize the time, it is necessary for the student to contact the teacher in advance

Assessment					
	Description	Qualification		Evaluated Competencess	
Seminars	Individual written report on the seminar activities. May include tests.	10	CB2	CE1 CE5 CE13 CE16 CE17	CT6 CT16

Studies excursion	It comprises an individual brief written summary. It has to reflect the activities performed in the field trip.	10	CB2	CE1 CE5 CE13 CE16 CE17	CT16
Case studies	Group report that comprise the practical activities, including objectives, methodology, results and conclusions	10 ó 20	CB2	CE5 CE13 CE16	CT16
Lecturing	Written individual test of 2 to 4 hours, whose aim will be the global evaluation of the process of learning and the acquisition of skills and knowledge. It will comprise one or several of the following types of assessments: long questions to elaborate, short questions, tests, problem resolution, interpretation of images, maps and diagrams. It will require a minimum of 4 over 10 to be able to compute with the rest of evaluation elements.	60	CB2 CB5	CE1 CE2 CE6	CT6
Essay questions exam	Individual written report on an additional activity derived from the lectures, practicals or seminars, pursuing the students own interest. It does not have compulsory character. Its execution takes 10% off the laboratory practicals.	10 ó 0	CB2 CB5	CE1 CE2 CE5 CE6	CT6

Other comments on the Evaluation

The attendance to the field trip, seminars and practical is compulsory. A 20% or more of absence of attendance in the lectures or the non-attendance to a field trip will automatically disqualify. It is necessary to attain at least 40% of the maximum mark in each block to compensate. If one of the methodologies is not qualified, the final qualification will be the pure average divided by 2.

Students failing the course will have to retake all the parts the following year.

The official exam dates will be available at: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

The students are strongly asked to fulfill a honest and responsible behavior.

It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

Sources of information

Basic Bibliography

E.A. Hailwood, R. Kidd, **Marine Geological Surveying and Sampling**, 978-94-010-6763-8 (Print) 978-94-009-0615-0 (Online), Springer, 1990

E. J. W. Jones, **Marine Geophysics**, 978-0-471-98694-2, Wiley, 1999

Horst D. Schulz, Matthias Zabel, **Marine Geochemistry**, 978-3-540-32143-9 (Print) 978-3-540-32144-6 (Online), Springer, 2006

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K Mohamed, D. Rey, **Capítulo XXX. Técnicas de magnetismo ambiental de utilidad en el estudio de sedimentos marinos. En: En: Métodos Y Tecnicas En Investigacion Marina**, 9788430952083, TECNOS, 2011

B. Rubio, D. Rey, A.M. Bernabeu, F. Vilas, I. Rodríguez Germade, A. Ares, **Capítulo XXXI. Nuevas técnicas de obtención de datos geoquímicos de alta resolución. En: Métodos Y Tecnicas En Investigacion Marina**, 9788430952083, TECNOS, 2011

Complementary Bibliography

http://walrus.wr.usgs.gov/pubinfo/margeol2.html,

Comission of marine cartography, **http://www.shoa.cl/ica/index.html**,

GEODAS Geophysical Data Management System of the NOAA National Geophysical Data Center (NGDC), **http://www.ngdc.noaa.gov/mgg/geodas/geodas.html**,

Recommendations

Subjects that continue the syllabus

Geological oceanography II/V10G060V01603

Subjects that are recommended to be taken simultaneously

(*)/
Physical oceanography I/V10G060V01503

Subjects that it is recommended to have taken before

(*)/

Other comments

DELIVERY OF ASSIGNMENTS
Unless it is stated otherwise, all the hand outs have to be delivered in electronic format and uploaded to the TEMA platform. No email, or paper submission will be accepted or acknowledged.
IMPORTANT
All deadlines expire at 24:00 of the marked day.
REGARDING THE AUTHORSHIP OF THE GROUP ASSIGNMENTS
Submission of the assignment is the responsibility of the coordinator, who must state the participants. All coauthors must upload their copy at FAITIC to claim co-authorship.
Authorship cannot be modified after the deadline of the assignment.
Authors that appear in more than one assignment will cause the assignment to fail for all authors.
Plagiarism, partly or in whole, will cause course to fail and will be reported to the Dean for disciplinary action.
THE TEMA PLATFORM IS THE OFFICIAL COMMUNICATION CHANNEL OF THE COURSE
Any agreement has to be stated in the TEMA platform to be official.

Contingency plan

Description

In the case of having to assume mixed teaching or teaching completely online, the training activities will be modified as follows:

1. Theoretical classes: they will be taught through the Campus Remoto

2. Practical classes: They will be taught through the Campus Remoto

3. Field trip: information and audiovisual resources will be given to students related to the content and learning outcomes associated with this methodology.

4. Seminars: They will be taught through Campus Remoto with additional supporting information

Regarding the assessment of the subject, it will be modified increasing the weight in the final grade of the continuous evaluation. The distribution of% will be as follows:

1. Theoretical contents:
Exam 20%
Continuous assessment 20%

2. Practical content: 25%
Group report reflecting the activities
made during the practices, which will include
objectives, methodology, results and conclusions

3. Field trip: 15%
Includes an individual written report of the
material and information provided

4. Seminars: 20%
Individual written report on the activity carried out in
seminars. May include questionnaires.

IDENTIFYING DATA				
Chemistry applied to the marine environment I				
Subject	Chemistry applied to the marine environment I			
Code	V10G060V01505			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Couce Fortúnez, María Delfina Besada Pereira, Pedro			
Lecturers	Besada Pereira, Pedro Castro Fojo, Jesús Antonio Couce Fortúnez, María Delfina			
E-mail	delfina@uvigo.es pbes@uvigo.es			
Web				
General description	This subject includes the study of elements, inorganic substances and organic substances that can reach and alter the marine environment, acting as pollutants. Behaviour, influence and prevention of the effects produced by these elements, inorganic substances and organic substances in the environment will be studied. Moreover, the study of marine natural products (classification, function, farmacological interest) will be addressed.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE12	To be able to operate the instrumental techniques applied to sea
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CE30	Identify and assess environmental impacts in the marine environment
CT1	Analysis and synthesis ability
CT15	Ability to apply knowledge in practice
CT17	Sensitivity towards environmental issues

Learning outcomes			
Learning outcomes	Competences		
To describe global cycles of the elements, including the input and output processes.	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18	CT1

To define and to explain concepts, principles and sources related to chemical pollution.	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18 CE30	CT1 CT17
To describe the chemical composition and speciation in seawater and to determine the mechanisms and factors that regulate it.	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18	CT1
To determine the processes that regulate chemical species complexation.	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18	CT1
To identify the toxicity mechanisms of metal ions, as well as the factors that determine and control the biomethylation processes.	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18 CE30	CT1 CT17
To identify the toxicity mechanisms of the major organic pollutants.	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18 CE30	CT1 CT17
To identify the most important natural products in the marine environment.	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18	CT1
To identify the main interactions between marine organisms.	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18	CT1
To describe the main applications of marine natural products.	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18	CT1
To analyze the results obtained in the laboratory using the theoretical concepts.	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE5 CE6 CE12 CE15 CE17 CE18 CE30	CT1 CT15
To develop the necessary skills for the resolution of the applications related with the subject.	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE5 CE6 CE12 CE15 CE17 CE18 CE30	CT15 CT17

Contents	
Topic	
1. Introduction to environment	Cycles of the elements in the environment
2. Pollution of marine environment	Generalities. Major sources of pollution
3. Metal speciation	Aerobic and anaerobic enviroments. Pourbaix diagrams
4. Metals and metallic species	General characteristics. Effects of metal complexation with natural ligands
5. Pollution by heavy metals	Biogeochemical cycles. Methylation processes. Mechanisms of toxicity associated. Applicable defense and detoxication procedures.

6. Reactivity of pollutants non-metallic chemical species	Introduction: carbonates, nitrates, phosphates,sulfates, perchlorates
7. Radioactive pollution in marine environment	Study, behavior and control of radioactive pollutants
8. Organic pollutants in the marine water	Classification. Functional and structural description. Origin of marine pollution
9. Chemical transformations of organic compounds	Solubility of organic compounds. Reactions of organic pollutants with nucleophilic species. Redox processes. Photochemical and biological transformations
10. Types of natural products	Terpenes, steroids and carotenoids. Oxigen compounds: Phenols, lignans, coumarins, macrolides and polyethers. Nitrogenous compounds: alkaloids, peptides
11. Marine natural products and their biologic function	Metabolite transfer in marine ecosystems. Biogenesis. Incorporation of halogens: Haloperoxidases
12. Marine chemical ecology	Chemical interactions between organisms. Organic compouds of marine origin and their ecological function
13. Marine natural products in drug discovery	Organic compounds of marine origin: isolation, characterization and biological activity

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	16	24	40
Laboratory practical	12	2	14
Mentored work	0	17	17
Lecturing	24	48	72
Problem and/or exercise solving	3	0	3
Report of practices, practicum and external practices	0	4	4

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

Methodologies

	Description
Seminars	Seminars will be used for further working on some of the theoretical contents, and also for problems resolution as a complement of the masterclass. Students may prepare a topic of interest related with the subject.
Laboratory practical	Application of laboratory techniques in practical problems related to the subject
Mentored work	Preparation and presentation of a tutored work on a topic related to the contents
Lecturing	Basic concepts of the subject will be introduced in the masterclass

Personalized assistance

Methodologies	Description
Lecturing	Tutoring, support and motivation in the learning process, in the classroom, personally in the professor´s office as well as through e-mail or the virtual campus. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. Tutorial hours: P. Besada: monday, wednesday and thursday from 11:00 to 13:00 h D. Couce: tuesday, wednesday and thursday from 12:00 to 14:00 h
Seminars	Tutoring, support and motivation in the learning process, in the classroom, personally in the professor´s office as well as through e-mail or the virtual campus. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. Tutorial hours: P. Besada: monday, wednesday and thursday from 11:00 to 13:00 h D. Couce: tuesday, wednesday and thursday from 12:00 to 14:00 h
Laboratory practical	Tutoring, support and motivation in the learning process, in the classroom, personally in the professor´s office as well as through e-mail or the virtual campus. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. Tutorial hours: P. Besada: monday, wednesday and thursday from 11:00 to 13:00 h J. Castro: tuesday and thursday from 10:00 to 13:00 h
Mentored work	Tutoring, support and motivation in the learning process, in the classroom, personally in the professor´s office as well as through e-mail or the virtual campus. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. Tutorial hours: P. Besada: monday, wednesday and thursday from 11:00 to 13:00 h D. Couce: tuesday, wednesday and thursday from 12:00 to 14:00 h

Assessment					
	Description	Qualification	Evaluated Competencess		
Seminars	Participation, attitude and ability to relate and apply acquired concepts will be evaluated	5	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18 CE30	CT17
Mentored work	Students will carry out a brief tutored work, evaluating the report presented and its presentation	20	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18	CT1 CT17
Problem and/or exercise solving	Final exam in which the theoretical contents of the subject worked in the master sessions and in the seminars will be evaluated. The contents of this subject are divided in two blocks (Chapters 1-7 and 8-13) so the test will also be divided into two parts. To get promoted the student must obtain a minimun of 3.5 out of 10 in each of the two parts into which the exam is divided.	65	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18 CE30	CT1
Report of practices, practicum and external practices	Students must present a report of the virtual practices carried out. Attendance at the laboratory sessions as well as preparation of the report is compulsory to get promoted. The attitude in the lab sessions, the skills and the understanding of the experimental techniques used will be evaluated.	10	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE5 CE6 CE12 CE15 CE17 CE18 CE30	CT15

Other comments on the Evaluation

The official exam schedule can be checked at the following link:

http://mar.uvigo.es/index.php/gl/alumnado-actual/examenes-3

The final qualification will be the sum of all paragraphs whenever the required minimum is reached. If the required minimum is not reached the final qualification will be the one of the final exam.

The participation of the student in the laboratory sessions, in the tutored work or in any exam will involve the condition of presented and the assignment of a score.

The percentages in each of the paragraphs will be maintained in the call of July.

Students are strongly requested to fulfil a honest and responsible behaviour. It is consider inadmissible any kind of fraud (copy or plagiarism) aimed to falsify the level of knowledge and skills achieved in exams, evaluations, reports or any kind of teacher´s proposed work. Fraudulent behaviour may involve failing the subject during a whole academic year. An internal record of these actions will be kept to request, in case of reincidence, the opening of a disciplinary file.

Sources of information

Basic Bibliography

I. Bodek, W.J. Lyman, W.F. Reehl y D.H. Rosenblatt, **Environmental Inorganic Chemistry**, Pergamon Press, 1988

R.P. Schwarzenbach, P.M. Gschwend, D.M. Imboden, **Environmental Organic Chemistry**, 2, John Wiley & Sons Inc, 2003

R. Chang, **Química**, 11, Mc Graw Hill, 2013

P. Yurkanis Bruice, **Química Orgánica**, 5, Prentice Hall México, 2007

Complementary Bibliography

S. E. Manahan, **Environmental chemistry**, 9, CRC Press, 2009

H. G. Seiler, H. Sigel, A. Sigel, **Handbook on toxicity of inorganic compounds**, Marcel Dekker, 1988

J. W. Moore, **Inorganic Contaminants of Surface Water**, Springer, 1991

Paul M. Dewick, **Medicinal natural products: A biosynthetic approach**, 3, John Wiley & Sons Inc, 2009

J. B. McClintock, B.J. Baker, **Marine chemical ecology**, CRC Press, 2001

M.A. Martínez Grau, A.G. Csákÿ, **Técnicas experimentales en síntesis orgánica**, 2, Síntesis, 2012

Journal of Natural Products,

Natural Products Reports,

Marine Chemistry,

Marine Pollution Bulletin,

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

Seminars
Lecturing

* Teaching methodologies modified

Laboratory practical: Virtual activities related to the application of laboratory techniques in practical problems related to the subject will be carried out.
Mentored work: Preparation of a tutored work on a topic related to the contents of the subject.

* Non-attendance mechanisms for student attention (tutoring)

Tutoring may be carried out by telematic means (email or videoconference) under the modality of prior agreement

* Modifications (if applicable) of the contents

Not applicable

* Additional bibliography to facilitate self-learning

The necessary bibliography will be recommended along the presentation of the topics

* Other modifications

=== ADAPTATION OF THE TESTS ===
* Tests already carried out
Test XX: [Previous Weight 00%] [Proposed Weight 00%]

If the health situation forces a change from face-to-face teaching to teaching in a mixed or non-face-to-face mode, all the tests already carried out will keep their weight on the final grade.

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

If the health situation forces a change from face-to-face teaching to teaching in a mixed or non-face-to-face mode, the following tests would be maintained:

Seminars: [Previous Weight 5%] [Proposed Weight 5%]. Participation, attitude and ability to relate and apply acquired concepts will be evaluated.

Problem and/or exercise solving: [Previous Weight 65%] [Proposed Weight 65%]. Final exam in which the theoretical contents of the subject worked in the master sessions and in the seminars will be evaluated.
The contents of this subject are divided in two blocks (Chapters 1-7 and 8-13) so the test will also be divided into two parts.
To get promoted the student must obtain a minimun of 3.5 out of 10 in each of the two parts into which the exam is divided.

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

If the health situation forces a change from face-to-face teaching to teaching in a mixed or non-face-to-face mode, the following tests would be modified:

Mentored work [Previous Weight 20%] => Mentored work [Proposed Weight 20%]. Students will carry out a brief tutored work, evaluating the presented report.
Report of practices, prácticum and external practices [Previous Weight 10%] => Report of practices, prácticum and external practices [Proposed Weight 10%]. Students must present a report of the virtual practices carried out.
The realization of the virtual practices as well as preparation of the report is compulsory to get promoted.

* New tests

* Additional Information

In the case of need to implement teaching in a mixed or non-face-to-face mode, the teaching activity will be taught through the Remote Campus and using the Faitic platform as a reinforcement and without prejudice of other measures that can be adopted to guarantee the accessibility of the students to the teaching content.

IDENTIFYING DATA				
Biological oceanography II				
Subject	Biological oceanography II			
Code	V10G060V01601			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Marañón Sainz, Emilio			
Lecturers	Marañón Sainz, Emilio Martínez García, Sandra Teira Gonzalez, Eva Maria			
E-mail	em@uvigo.es			
Web				
General description	This course addresses the study of the interaction between the composition and dynamics of biological communities and the production and fate of organic matter in the ocean. The diversity and metabolic activity of microbial plankton receive special attention, due to their key role in the regulation of marine biogeochemical cycles. Multiple levels of organization are considered, including cells, populations, communities and the ecosystem. The ultimate aim is to understand the role of ocean's biology in the functioning of the Earth system.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CT1	Analysis and synthesis ability
CT6	Problem management and solving skills

Learning outcomes	Competences		
Learning outcomes			
Know and understand how organisms and communities drive the cycling of matter in the ocean, linking the physiological and ecological traits of key functional groups with their biogeochemical role.	CB1 CB3	CE1 CE2	CT1
Ability to connect the different physical, chemical and biological processes that determine the role of the ocean within the Earth system.	CB1 CB2 CB3 CB4	CE1 CE2 CE6	CT1
Know and understand the natural and anthropogenic variability in pelagic ecosystems and marine biogeochemical cycles, as well as their response to processes of global environmental change.	CB1 CB3	CE1 CE2 CE6	CT1
Ability to interpret biological oceanography data.	CB3	CE13	CT1 CT6
Ability to use computing applications to run mathematical models of biogeochemical processes.		CE13	CT6
Ability to use specialised bibliography	CB3		CT1

Contents	
Topic	
Unit 1. Introduction	Distribution and abundance of chemical elements in the sea. Metabolic pathways and key plankton functional groups. Properties of element cycles.

Unit 2. Production of organic matter.	Variability and control of primary production. Stoichiometry of phytoplankton production. Dynamics of dissolved organic matter. New and regenerated production. Trophic organization and biogeochemical functioning of the ecosystem.
Unit 3. Remineralization.	Distributions of nutrients and oxygen. Oxygen utilization rates. Stoichiometric relations. Heterotrophic processes: quantification and variability. Photosynthesis respiration balance. Balance between N2 fixation and denitrification. Global nitrogen cycle.
Unit 4. Export.	The biological pump. Methodological issues. Spatio-temporal variability in export. Attenuation of vertical fluxes: controlling factors. Shallow and deep sedimentation. Coast-ocean gradients.
Unit 5. Biogeochemical processes in the sediments.	Physical structure of the sediment. Coast-ocean gradients. Reactions of organic matter oxidation. Redox potential. Spatio-temporal variability in benthic fluxes. Global carbon budget in the sediments.
Unit 6. The global carbon cycle.	Chemistry of dissolved inorganic carbon (DIC). Distribution and abundance of main DIC forms. CO2 fluxes between ocean and atmosphere. The biological pump and the solubility pump. Global C cycle: current unbalances.
Unit 7. The calcium carbonate cycle.	CaCO3 oceanic budget. Carbonate saturation. Production, export and redissolution of CaCO3. Distribution of carbonates in the sediments. Pelagic calcification: coccolithophore blooms and biogeochemical impacts.
Unit 8. Global change and the biology of the ocean.	Multiple environmental stressors. Warming. Acidification. Deoxygenation. Eutrophication. Impacts on species, communities, ecosystems and biogeochemical cycles. Global feedback processes.
Seminar program.	Biomass, production and growth of phytoplankton. Ecological and biogeochemical role of iron. Distribution patterns of diatoms and coccolithophores. Ocean acidification. Designing observations and experiments for hypothesis testing.
Practical session program.	Data analysis of phytoplankton cell size, abundance and metabolism. Modelling the global carbon cycle using computer models. Case analysis.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	22.5	49.5	72
Seminars	10	15	25
Problem solving	10	25	35
Practices through ICT	10	5	15
Problem and/or exercise solving	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	Presentation of fundamental contents of the course, supported by graphic material.
Seminars	Using data and scientific articles, specific topics are exlored in detail. Subjects tackled include, amongst others, the ecology and biogeochemical role of diatoms and coccolithophores, the ecological and biogeochemical importance of iron, and ocean acidification.
Problem solving	Practical cases are solved using real data presented numerically and graphically.
Practices through ICT	Numerical modelling of the carbon biogeochemical cycle. Analysis of data on the size-scaling of phytoplankton abundance, biomass and metabolism.

Personalized assistance

Methodologies	Description
Lecturing	Students can ask for assistance on any aspect of the course both on line and during personal interviews. Schedule for personal attention is Mon, Tue from 12:00 to 14:00. This schedule may be modified due to other teacher's commitments. Students are encouraged to contact the teacher via email to schedule interviews at a mutually convenient time.
Seminars	Students can ask for assistance on any aspect of the course both on line and during personal interviews. Schedule for personal attention is Mon, Tue from 12:00 to 14:00. This schedule may be modified due to other teacher's commitments. Students are encouraged to contact the teacher via email to schedule interviews at a mutually convenient time.
Problem solving	Students can ask for assistance on any aspect of the course both on line and during personal interviews. Schedule for personal attention is Mon, Tue from 12:00 to 14:00. This schedule may be modified due to other teacher's commitments. Students are encouraged to contact the teacher via email to schedule interviews at a mutually convenient time.

Assessment

	Description	Qualification	Evaluated Competencess		
Seminars	Students write a short assay in which they provide a critical synthesis of a scientific article. The clarity and correctness of the writing, as well as the rigour in the use and application of scientific concepts, are particularly valued. The mark obtained is conserved for the July call. Upon consultation with the course's coordinator, students may resubmit this work for the July call.	20	CB2 CB3 CB4	CE13	
Problem solving	Students solve practical cases similar to those used during the practical sessions. The mark obtained is conserved for the July call. Upon consultation with the course's coordinator, students may resubmit this work for the July call.	20	CB2 CB4		CT6
Problem and/or exercise solving	Written test includes a questionnaire, short questions and practical cases. The test is designed to assess the acquisition of knowledge and skills covered during the lectures, seminars and practical sessions.	60	CB1 CB2	CE1 CE2 CE6	CT1 CT6

Other comments on the Evaluation

The date, time and place of exams will be published in the official web of the Faculty of Marine Sciences:

http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Students must behave honestly and responsibly. Any form of copying or plagiarism, intended to alter the level of acquired knowledge and abilities, in exams, evaluations, reports or any other kind of student work is completely unacceptable. Fraudulent behaviour may result in the failing of the course for a whole academic year. An internal dossier of these activities will be kept and, in cases of reoffending, the University Rectorate will be asked to open a disciplinary enquiry

Sources of information

Basic Bibliography

Libes, S., **An introduction to marine biogeochemistry**, Wiley, 2009

Sarmiento, J., L., Gruber, N, **Ocean biogeochemical dynamics**, Princeton University Press, 2006

Williams RG, Follows MJ, **Ocean dynamics and the carbon cycle : principles and mechanisms**, Cambridge University Press, 2011

Complementary Bibliography

Falkowski PG, **Life's Engines: How Microbes Made Earth Habitable**, Princeton University Press, 2015

Gasol JM, Kircvhman (Eds.), **Microbial ecology of the oceans**, 3a, Wiley-Blackwell, 2018

Miller, C. B., **Biological Oceanography**, Blackwell, 2012

Schlesinger, W.H., **Biogeoquímica: un análisis del cambio global.**, Ariel, 2000

Steele JH, Turekian KK, Thorpe SA, **Encyclopedia of Ocean Sciences**, 2a, Elsevier, 2008

Recommendations

Subjects that are recommended to be taken simultaneously

Physical oceanography II/V10G060V01602

Subjects that it is recommended to have taken before

Biological oceanography I/V10G060V01502
Physical oceanography I/V10G060V01503

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 methodologies are maintained, with modifications, when needed, for online implementation.

* Teaching methodologies modified

The computer-based modelling of the carbon cycle is modified so that the use of restricted software will not be necessary.

* Non-attendance mechanisms for student attention (tutoring)

Students can request, via e-mail, personalised tutoring sessions, which will take place online using the Camus Remoto application.

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===

All tests remain unchanged. The only difference is that, if needed, the exam will be conducted online using Faitic.

IDENTIFYING DATA				
Physical oceanography II				
Subject	Physical oceanography II			
Code	V10G060V01602			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Varela Benvenuto, Ramiro Alberto			
Lecturers	Varela Benvenuto, Ramiro Alberto			
E-mail	rvarela@uvigo.es			
Web	http://www.gofuvi.org			
General description	This course, mostly a practical one, brings to the student knowledges of the fundamental methodologies used in physical oceanography			

Competencies	
Code	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE4	To know the basic techniques to sample the water column, organisms, sediments and sea bottom, as well as the surveying methods for dynamic and structural variables
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE12	To be able to operate the instrumental techniques applied to sea
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE38	Technical use of renewable energies
CT4	Basic computing skills related to the field of study
CT15	Ability to apply knowledge in practice

Learning outcomes			
Learning outcomes	Competences		
The student should be able to interpret the meaning, implications and interrelationships of the main meteorological and oceanographic variables/parameters	CB3	CE1 CE4 CE5 CE12 CE13	
The student has to know how to calculate variables derived from the basic parameters such as speed of the sound, dynamic height, density, frequency of Brunt-Vaisala, stability and interpret them properly.	CB2 CB3	CE1 CE4 CE12 CE13 CE15	CT4 CT15
The student has to understand the principles and main uses of several advanced oceanographic instruments and its implications in current physical oceanography (i.e., High Frequency radars, gliders, lines of data)	CB2 CB3	CE1 CE12 CE13	CT4 CT15
The student should understand and distinguish the advantages and disadvantages of the several wave and tide related energy systems available	CB2 CB3	CE1 CE5 CE6 CE15 CE38	CT15
The student has to be able to understand the complete process of treatment of pertinent data of oceanographic probes (CTD), and to use at an intermediate user level programs of generation of charts and analysis of the oceanographic information such as Surfer, Ocean Data View and the Seabird proprietary Seabird system.		CE2	CT4 CT15

Contents	
Topic	
Sea Temperature	Horizontal and vertical distribution of temperature. Temperature measurement at the sea. Termistors. Temperature sensors
Sea Salinity	Horizontal and vertical distribution of the salinity. Measurement of sea salinity. Salinity sensors.
Sea surface circulation	Methods of measurement of the sea surface circulation. Geostrophic approximation. Current meters
Light radiation and thermal balance	How to measure light irradiance at the sea. Computing light attenuation in the water column. Method to determine light absorbance by the water, and dissolved or particulate matter I. Computation of a simple thermal balance.
Wind Waves	Sea wave velocity, heigh and period. Diagrams of waves. Approximation of a train of waves to the coast. Influence of the bathymetry.
Tides	Mechanisms of measurement of the level of the mar. Newton Equilibrium tide theory. Dynamyc tides. Dynamic models. How to compute FPM in a particular point on the earth surface
Sound and speed of sound in the sea	Sea sound velocity estimation. Influence of diverse parameters (temperature, salinity, pressure). Vertical sound profiles. Sound reflection and refraction. Sound channels.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	18	54	72
Seminars	25.75	25.75	51.5
Studies excursion	4	2	6
Mentored work	9	9	18
Objective questions exam	0.25	0	0.25
Essay questions exam	2.25	0	2.25
*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 lecturer will give an insight of the main subjects treated during the course.
Seminars	Student work on subjects and exercises brought by the teachers. Data come from the real world and the discussion can either individual or in small groups. A questionnaire must be solved at the end of each session
Studies excursion	Cruise to practise several physical oceanography instruments.
Mentored work	Practical problems that the students must solve with the help of other students and/or the teacher

Personalized assistance	
Methodologies	**Description**
Lecturing	Master class. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Seminars	At the beginning of every seminar, the teacher will describe the objetives and purpose of the seminar. The students will have a guide on the TEMA platform describing all que exercises and questions required.The exercises can be solved individually or in small groups, but a personalised report is required. At the end of this seminar a 15 minute multiple option quest will be fulfilled.
Studies excursion	The teacher will describe the tasas to do, explain the different instruments and technic, and monitors the students' use of such instruments
Mentored work	The teacher presents several real problems to salve and offers guiding to its solution.
Tests	**Description**
Objective questions exam	A multiple option test to calíbrate the students' knowledge, always closely related to what was done during seminars, classroom practical work, etc.
Essay questions exam	An examen to validate the general knowledge of the student.

Assessment

	Description	Qualification	Evaluated Competencess		
Seminars	During the seminars the student will be asked to solve several theoretical and practical subjects taken from real cruises/data. At the end of the seminar a questionnaire must be solved (and evaluated)	5	CB2 CB3	CE1 CE4 CE5 CE6 CE12 CE13	CT4 CT15
Studies excursion	After the cruise a report is required.	5	CB3	CE1 CE4 CE5 CE6 CE12 CE13 CE15	CT15
Mentored work	After classroom work reports are required	5	CB2 CB3	CE1 CE2 CE4 CE5 CE6 CE15 CE38	CT4
Objective questions exam	Multiple option test to validate the student's knowledge.	20		CE1 CE2 CE4 CE5 CE6 CE12 CE38	CT15
Essay questions exam	A series of questions and problems presented to the students to judge its knowledge.	65	CB2 CB3	CE1 CE2 CE4 CE12 CE13 CE38	CT15

Other comments on the Evaluation

It is necessary to have approved with a minimum qualification of 5 both the final exam and the questionnaires, and have presented all the required works (seminars and practical) to approve the course. Both the seminar and practical works are individual and must be delivered before the date term established in class. Any memory presented out of term will have a qualification to 0. The cycle of presentations that realises in class goes compulsory in the theory of the examination.

The questionnaires consist in 10 questions that have each one 5 options, with a value of a point each question. Only one of the possible options is correct. If two questions are answered wrong, 1 correct answer is deduced from the whole exam computation. If the qualification obtained by a student in the final examination is greater than the one obtained in the seminars, will appear in the final record the note of the examination, that will not see like this diminished by the one of questionnaires. If the note of the examination is lower that the one of the questionnaires, the final qualification will be computer using the proportion examination 70% questionnaires 30%. The questionnaires can be repeated (two times maximum), if the professor considers it necessary, so that the students can improve his note, but always answering to different questions for a determinate subject. The valid note final for a questionnaire will be the always the corresponding to the last questionnaire realised.

The assessment of questionnaires keeps during two academic courses. Happened this term, the student will have to redo the questionnaires. Qualifications obtained during the May-June period are kept to the July period.
The official exam dates can be obtained at: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record

Sources of information

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Sverdrup, HU; Johnson, MW y Fleming, RH, **The Oceans. Their physics, chemistry and general biology**, 2, Prentice-Hall, 1946

Varela, R y Rosón, G, **Métodos en oceanografia Fisica**, 1, Anthia., 2008

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Beer, T, **Environmental Oceanography. An introduction to the behavior of coastal waters**, Pergamon Press, 1983

Newman, G y Pierson, Jr, WJ, **Principles of Physical Oceanography**, Prentice-Hall, 1966

Kennish, MJ, **Practical handbook of Marine Science**, 3, CRC Press, 2001

Recommendations

Subjects that it is recommended to have taken before

Physical oceanography I/V10G060V01503

Contingency plan

Description

The plan of development and evaluation described contemplates the case of a normal development of the theoretical and practical classes in a face-to-face context. If by exceptional circumstances this context varies, having to take into account mixed or telematic teaching, we will proceed as follows:

1. Mixed teaching. The master classes will be issued in direct with the means that the University of Vigo supply, guaranteeing in all the cases the opportunity to be able to make questions or consult doubts.

2. If the face-to-face or mixed teaching is not possible, we will prepare the necessary videos to cover the theoretical classes, the seminars and the practices and will put them at student's disposal.

In case that the face-to-face teaching is not possible, the relative weight of the different sections changes, calculating the final note of the following form:

Reports of seminars and memories of practices: 30%

Questionnaires: 30%

Examination: 40%

In each one of these sections the student will have to obtain a minimum of 5 points (total, 10) to approve. We will allow the repetition of the questionnaires one time only (two opportunities in total) using the higher notices obtained for the final qualification.

IDENTIFYING DATA				
Geological oceanography II				
Subject	Geological oceanography II			
Code	V10G060V01603			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Alejo Flores, Irene			
Lecturers	Alejo Flores, Irene García Gil, María Soledad Nombela Castaño, Miguel Angel Pérez Arlucea, Marta María			
E-mail	ialejo@uvigo.es			
Web	http://https://sites.google.com/site/oceangeolvigo/			
General description	The subject Geological Oceanography II, intends to train the student in the direct and indirect techniques for the characterization of the submarine bottoms, as well as the geological record in marine environments of continental shelf and deep environments (continental slope, continental abyssal plains, dorsal flanks , Ridges and ocean trenches). Therefore this subject has a different approach to the one of the Geological Oceanography I dedicated to the coastal and coastal areas. It is intended therefore that the student acquire the knowledge in the use and application of the latest generation techniques in sea surveys, as well as the ability to plan and develop oceanographic geological field works and prepare and submit reports. Students are required to take this course in responsible and honest behavior. Any form of fraud (i.e. copy and / or plagiarism) intended to falsify the level of knowledge or skill attained by a student in any type of test, report or work designed for this purpose is considered inadmissible. This fraudulent conduct will be sanctioned with the firmness and rigor that establishes the current regulation.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE4	To know the basic techniques to sample the water column, organisms, sediments and sea bottom, as well as the surveying methods for dynamic and structural variables
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
CE9	To be familiar with the public and private, national and international organizations and institutions related to the Marine Sciences
CE12	To be able to operate the instrumental techniques applied to sea
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CE20	To find and evaluate marine resources of various kinds
CE26	To plan, direct and write technical reports on marine issues
CT2	Organization and planning skills
CT7	Decision making
CT15	Ability to apply knowledge in practice

Learning outcomes			
Learning outcomes	Competences		
1. Get skills to plan and carry out geological oceanographyc surveys	CB1 CB2	CE1 CE4 CE5 CE9 CE13 CE17	CT2 CT15
2. Get familiar with oceanographic databases in public repositories	CB1 CB2 CB5	CE1 CE5 CE9 CE13 CE16 CE20	CT2 CT7
3. To know the basic methods of geophysical exploration	CB3 CB4 CB5	CE1 CE5 CE12 CE13 CE14 CE15 CE16 CE17	CT2 CT15
4. To know the basic techniques of compositional analysis and physical properties of sedimentary cores	CB2 CB3	CE1 CE4 CE5 CE12 CE13 CE15 CE16 CE17	CT2 CT7 CT15
5. To know and apply the techniques of geochemical characterization in sediments.	CB2 CB3 CB4 CB5	CE1 CE4 CE12 CE13 CE16 CE17	CT2 CT7 CT15
6. Get familiar with geophysical and geochemical data processing methods	CB3 CB4 CB5	CE1 CE5 CE6 CE12 CE13 CE15 CE16 CE17	CT2 CT15
7. Get skills to write and submit reports	CB3 CB4	CE1 CE6 CE9 CE13 CE14 CE15 CE16 CE17 CE18 CE26	CT7
8. Security during the execution of an oceanographic survey	CB5	CE1 CE5 CE6 CE8 CE12 CE13 CE15 CE17	CT2 CT7 CT15

Contents
Topic

THEMATIC UNITY I-: INTRODUCTION TO THE MARINE GEOLOGICAL RESEARCH IN THE SEA	THEME 1.- Introduction to the subject Geological Oceanography II. Introduction to the geological oceanography technologies applied to the study of shelf and deep sea environments. Presentation of public data repositories.
THEMATIC UNITY -II: POSITION SYSTEMS IN THE SEA	THEME 2.- Topic to select a position system. Global position systems and integration with acoustic position systems.
THEMATIC UNITY III-: ACOUSTIC SYSTEMS IN DEEP SEA	THEME 3.- Acoustic underwater and sonar systems. THEME 4.- Sidescan Sonar
THEMATIC UNIT IV-: MARINE SEISMIC SURVEYING	THEME 5.- Marine Seismic surveying: conceptual aspects. THEME 6.- Description of the diferents equipment and collected records
THEMATIC UNIT V-: MARINE GRAVIMETRY SURVEYING	THEME 7.- Gravimetry surveying and its application to marine research.
THEMATIC UNIT -VI-: MARINE MAGNETIC SURVEYING	THEME 8.- Magnetic surveying and its application to marine research.
THEMATIC UNIT-VII-: MARINE GEOTHERMAL FLOW	THEME 9.- Geothermal flow and its application to marine research.
THEMATIC UNIT -VIII: ELECTROMAGNETIC AND RADIOMETRIC SURVEYING IN MARINE ENVIRONMENTS	THEME 10.- Electromacnetic and radiometric surveying and its application to marine research.
THEMATIC UNIT IX-: SAMPLING SEDIMENTS AND ROCKS METHODS IN SHELF AND DEEP SEA ENVIRONMENTS. GEOTHECNICS TECHNICS	THEME 11.- Sampler methods for Particulate Suspended Matter and bottom sediment samples at deep environments. THEME 12.- Deep sea coring technics. methods. Ocean Drilling Projects. THEME 13.- Geophisical observation into the corers.
THEMATIC UNIT X-: OCEANOGRAPHY INFRAESTRUCTURES	THEME 14.: Sampler platforms in geological oceanography. THEME 15: New technology in submarine observatoties.
THEMATIC UNIT -XI: PLANNING OCEANOGRAPHIC SURVEYS	THEME 16.: Project and planification of oceanographic surveys.

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	24	51.6	75.6
Laboratory practical	15	16.08	31.08
Mentored work	2.16	10.8	12.96
Seminars	4.34	13.02	17.36
Studies excursion	5	5	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
Introductory activities	Detailed introduction about the content of the subject and the methodology followed aswell as the form of evaluation, field trips, practical classes and seminars. The materials neccesary to follow lecturesrs ans practical sessions and references will be presented.
Lecturing	This include the theoretical contents about all methods used in Oceanography Geology surveys, including selected aplicated examples. The student will be evaluated about this content in a final exam.
Laboratory practical	Laboratory practices consist of three sessions: 1- Corer description and interpretation. 2- Introduction to the interpretation of seismic records: reflection and refraction systems. 3- Data processing for the elaboration of bathymetric maps (the computer classroom will be used). Attendance is MANDATORY.
Mentored work	In groups of two or three students, the students will choose a applied scientific study on the subject for an oral presentations. The student will show there ability to work as a team and his ability to make an oral presentation on a scientific topic. In the ensuing discussion, the capacity for synthesis and understanding of the proposed topic will be evaluated. The activity is MANDATORY.

Seminars	The seminars that students will have to hold and deliver, consists of three sessions: 1- Handling of nautical charts, navigation parameters, point positioning and sampling path. Key tools for the preparation and conduct of oceanographic surveys. 2- Interpretation of Side Scan Sonar records. 3- Exhibition of examples of studies applied in Geological Oceanography, focusing into the specific methodology used for each specific work. These activities are MANDATORY.
Studies excursion	There will be a session onboard the B/O Mytilus along the Ria de Vigo were the student will participate in a oceanographyc survey. The objetive is to be able to familiarize themselves with the systems of acquisition of submarine acoustic data and of marine sediment samples (sediment cores, dredgers, etc.). It is also intended that they become familiar with the organization and procedure of an oceanographic survey, for which smaller groups of work will be created to carry out the activity on board the oceanographic vessel. At the end of the activity, each group will have to produce a "cruisse report". Some of the collected data will be worked out in practical sessions. The activity is MANDATORY.

Personalized assistance

Methodologies	Description
Introductory activities	This first part corresponds to the presentation of the subject: activities that will be develop along the course, material that will be needed and to specify the deliverables that the students will have to present along the course. The evaluation system to be followed will also be presented. The active participation of the students will be encouraged, basically aimed at clarifying all the doubts related to the approach and development of the subject. The tutoring schedule will be presented: Tuesday from 13:00 h to 14:00 h, Wednesday from 12:00 h. to 14:00 h. and Thursday from 11:00 h to 14:00 h. However, it will be that the student can contact the teacher to clarify doubts at all times, preferably in person, individually or in a group. The hours of tutoring may vary on time when the teacher has other teaching, research or management duties to attend. Also in case the student is unable to adjust to that schedule, it will be possible to arrange tutorial meetings outside the same.
Lecturing	The active participation of the students in the classes will be encouraged, encouraging the discussion and approach of small questions to be solved in class. The student can contact at all times with the teacher to clarify doubts, in person, individually or in a group. If the doubts require a greater personal attention will be agreed a tutorial to solve problems. Tutoring hours: Tuesday from 13:00 h to 14:00 h, Wednesday from 11:00 h h to 14:00 and Thursday from 12:00 h to 14:00 h. This schedule may vary on time when the teacher has other teaching, research or management duties to attend. Likewise in case that the student is impossible to adjust to that schedule, it will be possible to agree meetings of tutorials outside the same one.
Laboratory practical	The practical exercises presented in the three laboratory sessions will be solved in the same classroom, in order to resolve the doubts gradually as they arise as the work progresses in the complexity of the exercises. The active participation of students will be encouraged. Each practice will have a deliverable for evaluation. Once completed, the student can contact at all times with the teacher to clarify doubts, preferably in person, individually or in a group. If the doubts require a greater personal attention will be agreed a tutorial to solve problems. Tutoring hours: Tuesday from 13:00 h to 14:00 h, Wednesday from 11:00 h to 14:00 h and Thursday from 12:00 h to 14:00 h. This schedule may vary on time when the teacher has other teaching, research or management duties to attend. Also in case the student is unable to adjust to that schedule, it will be possible to arrange tutorial meetings outside the same.
Studies excursion	A Oceanography Survey will be acrried out in the B/O Mytilus, in groups of 5-6 students, where they will put in practique the methodology involve into Geological Oceanographyc cruisse. Some of the data collected on board will be worked out in practical sessions. After the activity, each group of student have to produce a cruisse report, that will be evaluated. This will include: description of the methodology achieve and collected data.
Mentored work	In groups of two or three people, students will choose a current publication that shows an applied practical work of any of the equipment and methodologies that are included in the assignment. They will have to make an exhibition of the same before their colleagues and present a written paper with an article format. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. Tutoring schedule: Tuesday from 13:00 h to 14:00 h, Wednesday from 11:00 h to 14:00 h and Thursday from 12:00 h to 02:00 h. This schedule may vary on time when the teacher has other teaching, research and/or management duties to attend.

Seminars	The practical exercises presented in the different seminars will be solved in the same classroom, in order to resolve the doubts gradually as they arise as the work progresses in the complexity of the exercises. The active participation of students will be encouraged. Once completed, the student can contact at all times with the teacher to clarify doubts, preferably in person, individually or in a group. If the doubts require a greater personal attention will be agreed a tutorial to solve problems. Tutoring hours: Tuesday from 13:00 h to 14:00 h, Wednesday from 11:00 h to 14:00 h and Thursday from 12:00 h to 14:00 h. This schedule may vary on time when the teacher has other teaching, research or management duties to attend. Also in case the student is unable to adjust to that schedule, it will be possible to arrange tutorial meetings outside the same.

Assessment

	Description	Qualification	Evaluated Competencess		
Laboratory practical	Attendance at the laboratory practices is MANDATORY. The correct implementation of the exercises proposed in these practices will be evaluated.	15	CB1 CB2 CB3 CB4 CB5	CE1 CE4 CE5 CE6 CE12 CE13 CE15 CE17 CE20	CT2 CT7 CT15
Mentored work	The assignment of individual or paired work will be evaluated, assessing both the preparation of the topic, the presentation of a summary document of the subject as well as the presentation of the same. This activuty is MANDATORY	15	CB1 CB2 CB3 CB4 CB5	CE1 CE4 CE5 CE6 CE9 CE13 CE14 CE15 CE16 CE17 CE18 CE20 CE26	CT2 CT7 CT15
Seminars	Seminar attendance is MANDATORY. The correct implementation of the exercises proposed in these seminars will be evaluated.	5	CB1 CB2 CB3 CB4 CB5	CE1 CE4 CE5 CE6 CE9 CE14 CE18 CE20 CE26	CT2 CT7 CT15
Studies excursion	Attendance at the sea survey is MANDATORY. The correct implementation of the exercises proposed in these practices will be evaluated.	10	CB5	CE1 CE4 CE5 CE6 CE12 CE13 CE15 CE16 CE17 CE18 CE26	CT2 CT7 CT15
Objective questions exam	Questions and exercises to assess understanding, analytical capacity and synthesis of acquired knowledge.	55	CB1 CB2 CB3 CB4 CB5	CE1 CE4 CE5 CE6 CE8 CE9 CE12 CE13 CE14 CE15 CE16	CT7 CT15

Other comments on the Evaluation

In each of these sections it will be necessary to obtain a minimum of 5 points out of 10 to carry out the weighting and pass the subject.

Date, time and place of exams will be published in the official web of Marine Sciences
Faculty: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record

Sources of information

Basic Bibliography

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Mienert, J., Weaver, P., (Eds), **European margin sediment dynamics. Side scan sonar and seismic images.**, Springer.,

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Telford,W.M.; Geldart,L.P., Sheriff, R.E., **Applied Geophysics, 2nd Edition.**, Cambridge University Press, 770 pp.,

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Udias, A., Mézcua, J., **Fundamentos de Geofísica**, Ed. Alhambra. 419 pp,

Wille, P. C., **Sound images of the Ocean in Research and Monitoring.**, Springer-Verlag, 471,

OpenCourseWare, **http://ocw.mit.edu/index.htm**,

Recommendations

Subjects that continue the syllabus

Applied marine geology/V10G060V01909

Subjects that are recommended to be taken simultaneously

Basin Analysis/V10G060V01901

Subjects that it is recommended to have taken before

Geological oceanography I/V10G060V01504

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

1.- Mixed teaching: they are all maintained. The master class would adapt to the available resources. The rest would be face-to-face.
2.- Non-face-to-face teaching: They are all kept adapting to the available resources (through the remote campus), except for the field trip.

* Teaching methodologies modified

1.- Mixed teaching: don't change
2.- Non-face-to-face teaching: They are all kept adapting to the available resources (through the remote campus). A new virtual activity will be added to replace the field trip (supported by audio-visual resources). This activity will collect the content and learning results collected in the guide.

* Non-attendance mechanism for student attention (tutoring)

1.- Mixed teaching: previous agreement by email, face-to-face and/or virtual through Remote Campus.
2.- Non-face-to-face teaching: prior agreement by email or virtual through Remote Campus.

* Modifications (if applicable) of the contents

1.- Mixed teaching: don´t change.
2.- Non-face-to-face teaching: don´t change.

* Additional bibliography to facilitate self-learning

No need.

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

1.- Mixed teaching: the percentages of the face-to-face situation are maintained.
2.- Non-face-to-face teaching: the percentages of the face-to-face situation are maintained.

* Pending tests and test modified

1.- Mixed teaching: don´t change.
2.- Non-face-to-face teaching: are modified as follows

Seminars [previous value 5%)] => [proposed value 10%]
Laboratory practices [previous value 15%)] => [proposed value 20%]
Mentored work [previous value 15%)] => [proposed value 20%]
Field trip [previous value 10%)] => alternative activity [proposed value 10%]
Final exam [previous value 55%)] => [proposed value 40%]

* Additional Information

In each section, a minimum rating of 5 points out of 10 will have to be obtained to make the weighting and overcome the subject.

During contactless teaching, students must, in these exceptional circumstances, address this issue with responsible and honest conduct. Any form of copying intended to falsify the level of knowledge and skills achieved in the preparation of deliverables, as well as during the virtual examination, will be considered inadmissible. If there is any suspicion of any kind of fraudulent conduct, students may undergo additional verification to verify its veracity.

IDENTIFYING DATA				
Chemistry applied to the marine environment II				
Subject	Chemistry applied to the marine environment II			
Code	V10G060V01604			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Moldes Moreira, Diego Leao Martins, Jose Manuel			
Lecturers	Calle González, Inmaculada de la Leao Martins, Jose Manuel Moldes Moreira, Diego			
E-mail	leao@uvigo.es diego@uvigo.es			
Web				
General description	The student will acquire competences and skills on several topics of the chemistry in the marine environment. In the first part of the subject, students will tackle important application such as wastewater treatment, desalination and marine biotechnology. In the second part will acquire theoretical and practical competences in the analysis of chemical contaminants as well as other compounds of interest in the marine environment. In this case they will learn to use simple techniques for sample preparation prior to the measurement step and their applications in the compartments of the marine environment. The students will get knowledge about the relevance of the control of the environmental quality.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE3	Critical understanding of the history and current status of the Marine Sciences
CE4	To know the basic techniques to sample the water column, organisms, sediments and sea bottom, as well as the surveying methods for dynamic and structural variables
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
CE9	To be familiar with the public and private, national and international organizations and institutions related to the Marine Sciences
CE12	To be able to operate the instrumental techniques applied to sea
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CE22	To control marine pollution problems
CE27	To understand the operation details of enterprises linked to the marine environment, and to recognize their specific problems and solutions
CE30	Identify and assess environmental impacts in the marine environment
CE32	Quality control of seafood

CE35	Water quality control in water treatment plants
CT1	Analysis and synthesis ability
CT3	Written and oral communication in the official languages of the University
CT6	Problem management and solving skills
CT17	Sensitivity towards environmental issues

Learning outcomes

Learning outcomes	Competences		
Recognise the main characteristics of the wastewater. Classify the wastewater depending on their origin.	CB1 CB2 CB3 CB4	CE1 CE8 CE27 CE35	CT1 CT17
Knowing the main technologies used for wastewater treatment and choosing the suitable one depending on the wastewater properties.	CB1 CB2 CB3 CB4	CE14 CE18 CE22 CE27 CE35	CT1 CT17
Elaborate scientific documents with own data obtained by means of a simulation software	CB1 CB2 CB3 CB4 CB5	CE1 CE8 CE14 CE18 CE35	CT1 CT3
Recognise the main methodologies of sea water desalination	CB1 CB3 CB4	CE1 CE3 CE8 CE9 CE14 CE27	CT1 CT17
Knowing the potential of the marine environment as a source of marketable products by means of biotechnological processes	CB1 CB2 CB3 CB4 CB5	CE1 CE3 CE8 CE9 CE14 CE27	CT1
Enumerate the most important points regarding the setup of a control plan about marine pollution.	CB2 CB4 CB5	CE1 CE3 CE5 CE6 CE13 CE14 CE16 CE18 CE22 CE30 CE35	CT3 CT6 CT17
Choose and use the suitable material for sediments sampling. Choose the most important sentinel organisms for studing marine pollution.	CB3 CB4 CB5	CE1 CE4 CE5 CE6 CE12 CE13 CE15 CE16 CE17 CE18 CE22 CE30	CT3 CT6 CT17

Apply the suitable chemical analytical techniques for the most interesting compounds in Environmental Chemistry. Knowing the suitable experimental conditions for the determination of a chemical compound depending on the selected technique.	CB2 CB3 CB4 CB5	CE1 CE3 CE5 CE6 CE12 CE13 CE14 CE15 CE16 CE17 CE18 CE22 CE30 CE32 CE35	CT1 CT3 CT6 CT17
Being able to determine the concentration of a chemical compound in the marine environment depending on the analytical technique employed.	CB2 CB3 CB4 CB5	CE4 CE5 CE6 CE12 CE13 CE15 CE16 CE18 CE22 CE32 CE35	CT1 CT3 CT6
Apply the fundamental concepts of quality control in an analytical laboratory.	CB2 CB3 CB5	CE1 CE4 CE5 CE9 CE13 CE15 CE16 CE17 CE18 CE22 CE32 CE35	CT1 CT3 CT6 CT17

Contents	
Topic	
Wastewater treatment	Sources and classification of wastewaters. Physical, chemical and biological properties of wastewater. General operation of a wastewater treatment plant (WWTP). Pretreatment and primary treatment. Secondary treatment: aerobic and anaerobic systems, suspended and fixed biomass systems. Tertiary or advanced treatment.
Desalination of seawater	Technologies of desalination: thermal processes and processes with membranes. Environmental effects.
Marine biotechnology	Definition and importance of biotechnology. General diagram of biotechnological production. Procedures to obtain biotechnological products from marine organisms (biofuels, pharmaceutical products , biorremediation of pollutants)
Chemical analysis of pollutants in the water column, sediments and marine organisms.	Sampling methods. Methods for sample preparation and determination in the water column. Extraction, purification and determination methods of pollutants in sediments and marine organisms.
Analysis of marine biotoxines.	Chemical structure of marine biotoxines. Toxicity of marine biotoxines. Sample preparation. Methods of separation and detection.
Control and guarantee of quality in the measures.	Systems of guarantee of quality. Validation of analytical methods. Intercomparison assays.

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	2	3

Lecturing	22	40	62
Mentored work	7	21	28
Laboratory practical	10	10	20
Practices through ICT	5	0	5
Studies excursion	5	0	5
Presentation	0.5	1.5	2
Objective questions exam	0.5	1	1.5
Problem and/or exercise solving	1	4	5
Essay	0	12	12
Report of practices, practicum and external practices	0	2	2
Essay questions exam	1.5	3	4.5

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

Methodologies

	Description
Introductory activities	The syllabus will be presented to the students (mainly aims, competences and evaluation criteria). Moreover the activities of the semester will be presented.
Lecturing	The professor will make an exhibition of the contents of the syllabus to develop, where the professor can pose some question to the students for his resolution in class. Likewise, the students can ask to the professor the questions that go arising along the exhibition. The material of the presentation will be available for the students before the session and will have to assist to her with said material. At the end of each subject, or of each group of subjects, will have to make a questionnaire that will resolve individually.
Mentored work	During the session of practices in the room of computing, the students will obtain data related with the purification of residual waters. With the data obtained will have to elaborate a report with the same format that a scientific article. On the other hand, the students will study a practical case based in the analysis of a contaminant which developed in base to a bibliographic research and of agreement to some criteria of evaluation published in the platform TEMA. They do not have obligation to make these works those students that made and approved them in the previous course.
Laboratory practical	The students will make some lab practices regarding the analysis of environmental pollutants and will present the corresponding report that will be evaluated in agreement to the criteria published in the platform FAITIC. They do not have obligation to make these practices those students that already made them and approved in the previous course.
Practices through ICT	The students will make some practices of computer on the treatment of residual waters. They will consist in the utilisation of a simulator in which it will study the effect of diverse parameters in the process of treatment of the residual waters. The students will have to take data of the different parameters studied, which will be employed for the preparation of the Supervised Works.
Studies excursion	It will make a visit to the main Station Debugger of Residual Waters of the municipality of Vigo, the EDAR of Lagares. In case that it was not possible, will treat to visit another EDAR. After the visit the students will have to answer to a brief questionnaire related with the same. In the measure of the economic possibilities of the centre, schedules and availability of companies of interest, could visit some company of interest related with the subject. This visit would have would have voluntary character.
Presentation	The students will do a brief presentation in public related with the analytical work made in the Supervised Works. The mates and the professor will be able to make questions on the presentation made.

Personalized assistance

Methodologies	Description
Introductory activities	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Mentored work	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Presentation	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Laboratory practical	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation

Practices through ICT	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Studies excursion	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Lecturing	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation

Assessment

	Description	Qualification	Evaluated Competencess		
Laboratory practical	Some lab activities regarding the analysis of marine contaminants will be carried out. A report should be presented following the previously provided rules. The evaluation criteria will be previously published in the web platform (FAITIC). Those students that have pass this activity in the previous course, may conserve their qualifications.	2.5	CB3 CB4 CB5	CE5 CE12 CE13 CE15 CE16 CE17 CE18 CE22	CT1 CT3 CT6 CT17
Studies excursion	The students will visit a wastewater treatment facility. After that, a brief questionaire must be answer.	5	CB1 CB3	CE9 CE22 CE27 CE35	CT17
Presentation	The students will do a brief public presentation related to the analytical work performed in tutored works. The lecturer will make questions about the presented work. The evaluation criteria will be previously published in the web platform (FAITIC).	2.5	CB3 CB4	CE1 CE4 CE5 CE6 CE12 CE13 CE14 CE15 CE16 CE17 CE18 CE22 CE30 CE32	CT1 CT3 CT17
Objective questions exam	When finalising lessons 1 to 3, as well as in the final examination (for these lessons), a test exam will be performed.	15	CB2 CB3 CB4 CB5	CE1 CE8 CE14 CE22 CE30	CT1
Problem and/or exercise solving	In the final exam, a writing exam about the calculation of chemical concentrations wil be carried out. The result obtained, as well as the clarity and the reasoning used to achieve this will be considered for evaluation.	12.5	CB2 CB3 CB4 CB5	CE13 CE18 CE22	CT1 CT3 CT6 CT17
Essay	A scientific article must be written by the students. The data will be obtained by means of a wastewater simulation software. Moreover, a bibliographic study must be carried out regarding the analysis of a typical marine contaminant. The evaluation criteria will be previously published in the web platform (FAITIC). Those students that have pass this activity in the previous course, may conserve their qualifications.	30	CB2 CB3 CB4 CB5	CE1 CE5 CE6 CE12 CE13 CE14 CE16 CE18 CE22 CE32	CT1 CT3 CT6 CT17
Report of practices, practicum and external practices	Some lab activities regarding the analysis of marine contaminants will be carried out. A report should be presented following the previously provided rules. The evaluation criteria will be previously published in the web platform (FAITIC). Those students that have pass this activity in the previous course, may conserve their qualifications.	10	CB2 CB3 CB4 CB5	CE1 CE5 CE12 CE13 CE15 CE18 CE22 CE32	CT1 CT3 CT6 CT17

Essay questions exam	When finalising lessons 1 to 3, as well as in the final examination (for these lessons), some questions should be answered by the students. This exam will count for 10% of the final qualification. At the end of the subject, some questions about the methodologies used in chemical analysis will be aswered. It will count for 12,5% of the final qualification.	22.5	CB2 CB4	CE1 CE4 CE6 CE8 CE9 CE12 CE13 CE15 CE18 CE22 CE27 CE30 CE32 CE35	CT1 CT3 CT17

Other comments on the Evaluation

Date, time and place of exams will be published in the official web of Marien Sciencies Faculty:

http://mar.uvigo.es/alumnado/examenes/

To pass the subject, students have to achieve a minimum of 5 points up to 10 in each one of the qualified activities.

The activities with a lower qualification than 5 points will be repeated in the final exam.

The reports of practices, works and projects that do not reach the minimum qualification, will have to send with the timely corrections in the term that will estimate the lecturers in each case.

The realisation by part of the student of any proof of which show previously will be taken into account immediately for the final qualification and will be recorded in the record like student presented in the corresponding announcement.

An absence to one of the sessions of seminars or practical supposes the no evaluation of that qualified activity and will be repeated on next year.

For the following course, the qualification of the following activities will be conserved in the case of being surpassed:

- Presentations exhibitions

- Practical of laboratory

- Gone out of practical/study of field

- Works and projects

- Inform/memories of practices

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record

Sources of information

Basic Bibliography

Metcaf & Eddy, **Wastewater Engineering. Treatment and Resource Recovery**, 5, McGrawHill, 2014

Aminot A., Kérouel R., **Hydrologie des écosystèmes marins: paramètres et analyses**, Editions Quae, 2004

García Estévez J.M., Olabarría C., Pérez S., Rolán Álvarez E., Rosón G., **Métodos y Técnicas en Investigación Marina**, Tecnos-Anaya, 2011

Gianguzza A., **Marine chemistry: an environmental analytical chemistry approach**, Springer, 2012

Complementary Bibliography

Clark, Robert B, **Marine Pollution**, Oxford University Press, 2001

Mackenzie L. Davis, **Water and Wastewater Engineering. Design Principles and Practice**, McGraw-Hill, 2010

José A. Ibáñez Mengual, **Desalación de aguas**, Instituto Euromediterráneo del Agua, 2009

Se-Kwon Kim, **Springer Handbook of Marine Biotechnology**, Springer London Ltd., 2014

A. Aminot, M. Chaussepied, **Manuel des Analyses Chimiques en Millieu Marin**, Centre National pour l'Explorations des Oceanes. B, 1983

OECD, **Marine Biotechnology Enabling Solutions for Ocean Productivity and Sustainability**, OECDiLibrary, 2013

Beiras R., Pérez S., **Manual de métodos básicos en Contaminación Acuática**, Universidade de Vigo, 2013
K. Grasshoff, K. Kremling, M. Ehrhardt, **Methods of Seawater Analysis**, 3, Wiley-VCH, 1999
Fifield F.W., Haines P.J., **Environmental Analytical Chemistry**, Blackie Academic, 1995
Harris D.C., **Análisis Químico Cuantitativo**, Reverté, 2007

Recommendations

Subjects that it is recommended to have taken before

Chemistry applied to the marine environment I/V10G060V01505

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 will be kept
Introductory Activities
Lectures
Works
Practice with ICT support
Presentations
These methodologies will not be modified , but they will be adapted to the extraordinary situation by means of the utilisation of telematic tools like videoconferences through Campus Remoto, or similar, as well as the utilisation of FAITIC platform, although the utilisation of other tools could be possible in order to guarantee and facilitate the access of the students to the learning contents.

* Educational methodologies that modify
Visits: a virtual visit using Remote Campus will be performed; one of the most important wastewater treatment platns of the region can be visited by Google Maps; a virtual by using this tool, with explanations of the teacher, will be performed; also he or she will show photos of visits of previous years.
Lab Practices: the classes of laboratory will be substituted by short videos of the conventional lab practices. Later, the student will have to perform the activities programmed and indicated in the conventional syllabus.

* Mechanism of no face-to-face attention to the students (*tutorías)
The student will receive attention through the tool available at the Universidade of Vigo (Remote Campus) or similar, as well as by means of email, forums of Faitic, etc. The office hours will be previously booked.

* Modifications (if they proceed) of the contents to give
The contents will not suffer modifications.

* Additional bibliography to facilitate the car-learning
Recent articles will be provided related with the different topics showed in the subject. This activity, although it comes carrying out of general form, will have more importance in the plan of contingency.

* Other modifications
will be able to exist lower modifications in the contents and/or methodologies described in function of the progress of the students in the course using the telematic tools, always with the aim to guarantee the acquisition of competitions by part of the students of the most effective form possible.

=== ADAPTATION OF THE EVALUATION ===

* Test slopes that keep

Examination of questions of development (examination theory - Chemical Engineering): [previous Weight 10%] [Weight

Proposed 20%]
Examination of objective questions (examination test theory - Chemical Engineering): [previous Weight 15%] [Weight Proposed 0%]
Visit questionnaire/virtual visit (Chemical Engineering): [previous Weight 5%] [Weight Proposed 5%]
Work - scientific article (Chemical Engineering): [previous Weight 20%] [Weight Proposed 25%]

Examination of objective questions (examination test theory - Chemical Analytical): [previous Weight 0%] [Weight Proposed 10%]
Examination of questions of development (examination theory - Chemical Analytical): [previous Weight 12,5%] [Weight Proposed 0%]
Resolution of problems and/or exercises (Analytical Chemistry): [previous Weight 12,5%] [Weight Proposed 10%]
Work *tutelado (Analytical Chemistry): [previous Weight 10%] [Weight Proposed 12,5%]
Report of practices of laboratory (Analytical Chemistry): [previous Weight 12,5%] [Weight Proposed 15%]
Presentation (Analytical Chemistry): [previous Weight 2,5%] [Weight Proposed 2,5%]

* Proofs that modify
[Examination of objective questions (Chemical Engineering)] => [Examination of questions of development (Chemical Engineering)]
[Examination of questions of development (Analytical Chemistry)] => [Examination of objective questions (Analytical Chemistry)]

* additional Information
This subject gives in two big blocks by part of two university departments different: Chemical Engineering and Analytical Chemistry, being manager, each one of them, of 50% of the educational allocation and of 50% of the evaluation. It specifies , by clarity, to which block corresponds each proof in the previous sections.

IDENTIFYING DATA				
Marine contamination				
Subject	Marine contamination			
Code	V10G060V01701			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	#EnglishFriendly Galician English			
Department				
Coordinator	Beiras García-Sabell, Ricardo			
Lecturers	Aranguren Gassis, María Beiras García-Sabell, Ricardo Delgado Núñez, Cristina			
E-mail	rbeiras@uvigo.es			
Web	http://www.ecotox.es			
General description	Main pollutants, sources, environmental distribution, toxic effects. Marine environmental legislation.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE4	To know the basic techniques to sample the water column, organisms, sediments and sea bottom, as well as the surveying methods for dynamic and structural variables
CE8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
CE9	To be familiar with the public and private, national and international organizations and institutions related to the Marine Sciences
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE22	To control marine pollution problems
CE26	To plan, direct and write technical reports on marine issues
CE30	Identify and assess environmental impacts in the marine environment
CE31	Ability to function and operate in public and private, national and international institutions in the field of marine science
CE32	Quality control of seafood
CE35	Water quality control in water treatment plants
CE37	Technical advice or assistance on issues related to the marine and coastal environment
CT1	Analysis and synthesis ability
CT9	Critical-review and self-criticism capacity
CT11	Ability to learn independently and continuously
CT15	Ability to apply knowledge in practice
CT16	Research skills
CT17	Sensitivity towards environmental issues

Learning outcomes	
Learning outcomes	Competences

2. Learn to distinguish the different types of pollution that can affect a coastal ecosystem and the distinct environmental parameters that result affected by each type.	CB1 CB2 CB3 CB4 CB5	CG1 CG2 CG4 CG6 CG10 CG17	CE4 CE8 CE9 CE13 CE14 CE16 CE19 CE22 CE24 CE26 CE27 CE30 CE31 CE31 CE32 CE35 CE37	CT1 CT1 CT2 CT3 CT9 CT11 CT15 CT16 CT17
3. Know the effects of the pollution to the distinct levels of organisation, since molecular to ecosystem, from an integrated and practical perspective, aiming at the use of those effects as indicators of pollution.		CG1 CG2 CG4 CG6 CG10 CG17	CE13 CE16 CE19 CE24 CE27 CE31	CT1 CT2 CT3
4. Know how to design an integrated study of evaluation of pollution in a coastal ecosystem, including the variables to measure and the samples to collect.		CG1 CG2 CG3 CG4 CG5	CE8 CE14 CE14 CE19 CE20	CT1 CT2 CT3 CT4 CT5 CT7 CT11
5. To get familiar with the study and the management of the waste water effluents in regard to the uses of the surface water bodies, with particular attention to estuaries and marine waters.		CG1 CG5 CG6 CG14	CE7 CE12 CE16	
6. To get familiar with the instruments of management and control of the human actions with impact on the coastline, and basic notions of the legislation involved in pollution control, within the autonomic, state and international administrations	CB1 CB2	CG1 CG2 CG3 CG4	CE8 CE8 CE10 CE12 CE22	CT1 CT5 CT8 CT14 CT18

Contents

Topic	
Basic concepts	1. Introduction. Pollution, anthropogenic process. Pollution: deleterious effects. Environmental Quality Criteria and Standards. PBT substances. Sources, distribution and fate of pollutants in the marine compartments.
Urban and agriculture pollutants	2. Organic pollution. Sources: liquid wastes. Estimating the organic load in wastewaters and receiving waters: BOD, COD, TOC. Excess of organic matter: hypoxia and annoxia. 3. Pollution by excess of inorganic nutrients. Nitrogen and phosphorus in the marine environment; anthropogenic sources. Eutrophication and hypereutrophication. Detergents. 4. Microbial pollution. Pathogenic microorganisms present in marine waters. Microbiological analysis of water and shellfish. Self-depuration of natural waters. Disinfection of wastewaters.
Industrial pollutants	5. Hydrocarbons. Oil. Polycyclic Aromatic Hydrocarbons. Sources and weathering of oil in the sea. Effects on marine organisms. Oil spills, lessons learnt. 6. Organohalogenated pollutants. Organochlorine pesticides: sources and levels in the marine compartments; bioaccumulation and biomagnification. Toxicity. Polychlorinated biphenyls (PCBs). Polybrominated campounds (PBDEs); sources and levels in the marine compartments; toxicity. Dioxins and dibenzofurans. 7. Trace metals I. Background levels and enrichment factors. Distribution in the oceans. Mercury: Sorces, distribution, bioaccumulation and biomagnification. Toxicity. Methylmercury. 8. Trace metals II. Copper, lead, cadmium. Sources, concentrations in marine compartments, toxicity. Trobutyltin (TBT).

Ecotoxicology	9. Distribution of pollutants in the environment. Fugacity models. Environmental persistence and half-life. Biodegradation. Chemical speciation and bioavailability of metals. 10. Bioaccumulation. Toxicokinetics. Uptake, accumulation and biotransformation of pollutants in the organisms. Bioconcentration factor (BCF). First order kinetic bioaccumulation models. Thermodynamic bioaccumulation models, Kow. 11. Molecular and cellular responses to pollutants: biomarkers. Biotransformation and elimination of toxic chemicals. Lisosomal alterations. Metallothioneins and stress proteins. Cytochrome P450. Enzymatic alterations. 12. Lethal and sublethal toxicity. Basic principles of toxicology. Dose:response curves. LC50/EC50 and toxicity threshold. Time and other factors affecting toxicity. Effects on reproduction and development. Effects on the bioenergetics and growth. 13. Effects of pollution at population and community levels. Changes in the presence and abundance of populations. Bioindicators by presence and ausence. Biological indices in communities.
Manage¡ing and assessing marine environmental quality	14. Integrative assessment of marine pollution. Coastal pollution monitoring programs. Integration of chemical and biological methods. Use of wild organisms as bioindicators and laboratory bioassays. The mussel watch approach 15. Ecotoxicological bioassays. requirements and methodological aspects. Liquid phase: copepod survival, Seaurchin Embryo Test (SET). Solid phase: amphipod survival, bivalve burrowing. In situ bioassays. 16. Protection of the marine environment. I. Control at the point source discharges. Identification of priority pollutants. Evaluation of the ecological risk. Regulation of new chemical products. REACH. Regulation of complex effluents. 17. Protection of the marine environment. II. Control of the levels of pollutants in receiving waters. Sediment and Water Quality Criteria and standards. International legislation. Water Framework Directive. Marine Strategy Framework Directive.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	20	40	60
Seminars	12	28	40
Studies excursion	5	0	5
Laboratory practical	15	30	45
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 theoretical contents that will be evaluated in a final exame will be presented
Seminars	The basic scheme of the seminars consists in the following: 1. preparation by the student of a questionary and a practical case available through TEMA. 2. handing over the questionary to the teacher at the beginning of the seminar. 3. resolution and discussion of the case in common with the teacher.
Studies excursion	Field trip to a supposedly polluted zone with basic sampling material for sediments, water and biota. Collection of representative samples with support of the professor for further analysis in laboratory.
Laboratory practical	The practices consist in a field trip to an impacted site in the Port of Vigo, and the collection of environmental matrices (water *sub-superficial with oceanographic bottle, *sediment with *draga Vain *Veen dredge) and native mussels , with object to realize a series of observations, chemical analyses and biological essays in the laboratory, including the solids in suspension, phosphates, BOD5 and faecal microorganisms in water, organic matter, presence of indicator species and ecotoxicological bioassays with the sediments. After the days of laboratory the data obtained are shared in the TEMA platform, and individual memories must be ellaborated and handed over to the teacher by the date of the final exame.

Personalized assistance	
Methodologies	**Description**
Lecturing	Power point presentations in the classroom; personal assitance in my office at tutorial times

Laboratory practical	Practical work in the laboratory
Seminars	Questionaire ellaboration and discussion

Assessment

	Description	Qualification	Evaluated Competencess		
Lecturing	multiple choice questions exame	70	CB1 CB2 CB3 CB4 CB5	CE8 CE9 CE14 CE16 CE22 CE31 CE32 CE35 CE37	CT1 CT9 CT11 CT16 CT17
Seminars	Mandatory presence in the seminars. Delivery of the corresponding individual questionnaires	15		CE22	
Laboratory practical	Mandatory presence in the practices and an individual report	15	CB1 CB2 CB3 CB4 CB5	CE4 CE26 CE31	CT15

Other comments on the Evaluation

Date, time and place of exams will be published in the official web of Marine Sciences Faculty:

http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Students are strongly advised to fulfil an honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record

Sources of information

Basic Bibliography

Beiras, R., **Marine Pollution**, 1, Elsevier, 2018

Clark, R,B., **Marine Pollution**, 5ª ed., Clarendon Press. Oxford, 2001

Walker C.H. et al.,, **Principles of ecotoxicology**, 4th ed., Taylor & Francis, 2012

E. Law, **Aquatic pollution**, 4a, Wiley, 2017

Beiras, R. e Pérez, S, **Manual de métodos básicos en contaminación acuática**, ECIMAT, 2013

Complementary Bibliography

Kennish, M.J., **Estuarine and marine pollution**, CRC Press, 1997

Recommendations

Subjects that it is recommended to have taken before

Biological oceanography I/V10G060V01502
Biological oceanography II/V10G060V01601

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 ===

*Methods that are not modified:
All with the exception of the field trip of the first session in the practical course. This field trip will be replaced by a laboratory session where samples will be provided by the teachers rather than collected by the students in the field.

*Methods that are modified:
The practical course as above described. If laboratory classes are also impossible then this is replaced by on-line teaching through telematics resources and evaluation will be modified as described below.

*Non-face-to-fase attention to students:
All bilateral communications teacher-student should take place through Skype, in particular the tutorial sessions.

*Modification of teaching contents: none.

*Additional bibliography: none.

=== ADAPTATION OF THE TESTS ===

All evaluations involving exchange of documents (exams, seminar questionnaires) relevant for the final mark will take place if needed using the Virtual Campus.

If the practical course is not possible the weight of the written exam in the final mark will increase from 7 to 8.5 pts and the 1.5 pts of the practical course report will be eliminated.

* Additional Information
During contactless teaching, students must, in these exceptional circumstances, address this issue with responsible and honest conduct. Any form of copying intended to falsify the level of knowledge and skills achieved in the preparation of deliverables, as well as during the virtual examination, will be considered inadmissible. If there is any suspicion of any kind of fraudulent conduct, students may undergo additional verification to verify its veracity.

IDENTIFYING DATA				
Ocean Dynamics				
Subject	Ocean Dynamics			
Code	V10G060V01702			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Spanish English			
Department				
Coordinator	Souto Torres, Carlos Alberto			
Lecturers	Souto Torres, Carlos Alberto			
E-mail	ctorres@uvigo.es			
Web				
General description	Equations of the ocean and its solutions. The student will learn about the seven ocean equations and their main solutions, from the ocean waves scale to the planetary scale, like Rossby waves and Sverdrup and Stommel models.			

Competencies
Code
CB4 Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CE2 To know and understand the essential facts, concepts, principles and theories related to oceanography
CE6 Ability to identify and understand the problems in the field of oceanography
CT1 Analysis and synthesis ability

Learning outcomes		
Learning outcomes	Competences	
The hability to calculate solutions to those equations related with those dynamics.	CB4 CE2 CE6	
Basic understanding of the role of the ocean in the global climate dynamics.	CE6	CT1

Contents	
Topic	
Development of the ocean equations.	1.1 f plane approximation. 1.2 Beta plane approximation. Problems. 1.3 Continuity equation, deduction and interpretation. 1.4 Gauss theorem. 1.5 Momentum equation. Pressure forces. Viscous forces. Coriolis acceleration. Application and simplifications. 1.6 Energy conservation equation and salt conservation equation. 1.7 Equation of state. Approximations. 1.8 Recapitulation. 1.9 Problems.
Wavelike solutions of the equations	Wave kinematics. Dispersion relation. 2.1 Wavelike solutions I: Wave's dynamics. Short waves (deep water waves) and long waves (shallow water waves) approximations. Pressure and particles movement. Stokes drift. Problems. 2.2 Inertial movement and forced inertial movement. 2.3 Wavelike solutions II: Planetary waves. Kelvin waves. Rossby waves. Poincaré Waves. 2.4 Wavelike solutions III. Internal waves. Dynamics of internal waves with and without rotation. Stratified Internal waves.

Non wavelike solutions of the equations.	3.1 Geostrophic currents. Thermal wind equations. Sverdrup relation. 3.2 Barotropic currents. Problems 3.3 Ekman's surface and bottom layer and Ekman theory. Ekman's transport. Problems 3.4 Barotropic wind forced oceanic circulation. Ekman's pumping. Vertically integrated equations. Sverdrup and Stommel model's. Vertical structure. Problems 3.5 Baroclinic currents. Theory and applications. Problems. 3.6 Stratification in the ocean. Static stability and friction. Problems. 3.7 Eighth equation: Vorticity conservation. Applications.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	36	58	94
Seminars	16	40	56
Objective questions exam	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	Lectures developing the theory for 36 hours.
Seminars	Guided problem solving during 8 clases of 2 hours.

Personalized assistance

Methodologies	Description
Lecturing	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Seminars	These sessions will be used to solve problems, previously available to the students, and to solve any doubt with the theory related.

Assessment

	Description	Qualification	Evaluated Competencess	
Lecturing	Final test.	80	CB4	CE2 CE6
Seminars	Seminars test.	20		CE6

Other comments on the Evaluation

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

The tests' classroom, date and time will be published at the Marine Sciences' website:

http://mar.uvigo.es/index.php/es/alumnado-actual/examenes

Sources of information

Basic Bibliography

CUSHMAN-ROISIN, B., **Introduction to Geophysical Fluid Dynamics. Physical and Numerical Aspects**, Ray Henderson & Deirde Cavanaugh. U.S.A.,

POND, S., G.L.PICKARD, **Introductory Dynamical Oceanography**, Pergamon Press. Oxford,

Complementary Bibliography

Periáñez, Raúl, **Fundamentos de oceanografía dinámica**, Secretariado de Publicaciones de la Universidad de Sevilla,

Recommendations

Subjects that continue the syllabus

Subjects that it is recommended to have taken before

Physical oceanography I/V10G060V01503
Physical oceanography II/V10G060V01602

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				
Fishing				
Subject	Fishing			
Code	V10G060V01703			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Spanish			
Department				
Coordinator	González Castro, Bernardino			
Lecturers	González Castro, Bernardino			
E-mail	bcastro@uvigo.es			
Web				
General description	This course aims to serve as an introduction to the dynamics of exploited populations and to the basic methodologies used in their assessment and management.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE4	To know the basic techniques to sample the water column, organisms, sediments and sea bottom, as well as the surveying methods for dynamic and structural variables
CE10	To know the problems and the basic principles of sustainability in relation to the use and exploitation of the marine environment
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE29	Skill in the practical use of models and in the incorporation of new data for their validation, improvement and development
CE33	Fisheries control
CT1	Analysis and synthesis ability
CT6	Problem management and solving skills

Learning outcomes			
Learning outcomes	Competences		
Understand the population processes that affect the dynamics of living resources	CB3	CE10 CE33	CT1
Estimate parameters of interest for marine fisheries resources explotation	CB2	CE15 CE29	CT6
Understand the basic methods of fisheries resource assessment	CB2	CE4 CE33	CT1
Understand and apply basic methods of fitting mathematical models for parameter estimation, population dynamics and assessment of marine living resources	CB1 CB2 CB5	CE15 CE29	CT6
Develop skills to use basic fisheries computer programs	CB2 CB5	CE29	CT6

Contents	
Topic	
Characterization of marine fisheries resources	Types of resources. Marine areas of interest in the exploitation of resources. Degree of exploitation of marine living resources.
The fishing process	Fishing gears, boats and methods. Selectivity of fishing gears
The unit stock	Population and stock. Population parameters. Characterization of management units. Estimation of abundance of exploited stocks

Reproduction	Maturation and fecundity. Estimation of maturity. Age and size of first maturity. Estimation of fecundity.
Recruitment	Estimation of recruitment. Stock-recruitment relationship. Population dynamics and stock-recruitment relationships.
Age and growth	Concept of cohort. Determination of age. Length-weight relationship. Allometry and isometry. Condition indices. Mathematical expressions of growth. Age-length keys.
Growth parameters	The von Bertalanffy growth model. Estimation of growth parameters: length-frequency analysis, separation of cohorts, size-at-age analysis, length increments analysis. Conversión of length to age.
Mortality	Survivorship curves. Mortality rates. Natural and fishing mortalities. Fishing effort. Capturability. Catch: Catch equations, Catch rates. Estimation of total, natural and fishing mortalities. Estimation of catchability.
Population dynamics and assessment models of fish stocks	Cohort Analysis: Virtual Population Analysis, Pope's Cohort Analysis. Biomass dynamic models. Yield and biomass per recruit models.
Fisheries Management	Biological reference points. Harvest strategies. Harvest tactics. International organizations and resource management.
Methodologies of parameter estimation	Estimation with Excel. Estimation with FiSAT. Application of an age-structured model of harvested populations.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	32	48	80
Laboratory practical	4	2	6
Practices through ICT	12	6	18
Problem solving	4	4	8
Mentored work	0	34	34
Essay questions exam	3	0	3
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
Lecturing	Oral presentation of the contents of the subject using the blackboard and computer presentations.
Laboratory practical	Size selectivity of a dredge for shellfish resources.
Practices through ICT	Learning and application of numerical methodologies for resolution of parameters and resolution of quantitative problems related to the contents of the subject. Learning and use of basic programs used in the evaluation of marine living resources. Simulation of the dynamics of an exploited population and calculation of Reference Points for fisheries management.
Problem solving	Solution of numerical problems related to the methods explained in the lectures and practices.
Mentored work	Reading of a scientific publication related to the contents of the subject and answering several questions about it.

Personalized assistance

Methodologies	Description
Lecturing	It will available mainly in the tutoring schedule, except for unforeseen circumstances. It is recommended that the student contact the teacher about when to carry out the tutoring. Tutoring hours: Monday and Wednesday from 15:00 to 18:00 h. Outside of these hours according to availability of the teacher.
Laboratory practical	It will available mainly in the tutoring schedule, except for unforeseen circumstances. It is recommended that the student contact the teacher about when to carry out the tutoring. Tutoring hours: Monday and Wednesday from 15:00 to 18:00 h. Outside of these hours according to availability of the teacher.
Practices through ICT	It will available mainly in the tutoring schedule, except for unforeseen circumstances. It is recommended that the student contact the teacher about when to carry out the tutoring. Tutoring hours: Monday and Wednesday from 15:00 to 18:00 h. Outside of these hours according to availability of the teacher.

Mentored work	It will available mainly in the tutoring schedule, except for unforeseen circumstances. It is recommended that the student contact the teacher about when to carry out the tutoring. Tutoring hours: Monday and Wednesday from 15:00 to 18:00 h. Outside of these hours according to availability of the teacher.
Problem solving	It will available mainly in the tutoring schedule, except for unforeseen circumstances. It is recommended that the student contact the teacher about when to carry out the tutoring. Tutoring hours: Monday and Wednesday from 15:00 to 18:00 h. Outside of these hours according to availability of the teacher.

Assessment

	Description	Qualification	Evaluated Competencess		
Lecturing	Written examination on the contents of the master sessions	50	CB1 CB2 CB5	CE10 CE33	CT1
Laboratory practical	Written examination on the contents of the laboratory practices.	5	CB1 CB2	CE4 CE15	
Practices through ICT	Written examination on the contents of the computer room sessions.	10	CB2 CB5	CE15 CE29	
Problem solving	Written examination of numerical problems of the subject.	20	CB1 CB2 CB5		CT6
Mentored work	Reading of a scientific work on content related to the subject and answering in writing a question form about it.. This task is voluntary, if the student does not do it, his qualification will be based exclusively on the written exam.	15	CB2 CB3	CE33	CT1

Other comments on the Evaluation

The "Laboratory practices" and "Practices in computer rooms" are shown separately by requirement of this platform, but their evaluation and scoring is joint, not making a distinction between both. In other words, there will be a single evaluation of "Practices" whose Qualification represents 15% of the total qualification.

The tutored work is voluntary and must be delivered before December 14, 2020 at 13:00 h. The mark of the tutored work will be preserved for the second call. If the student does not do it, the qualification of the subject will be derived exclusively from the rest of the sections, in the following way "Master lesson" 58.3%, Practices ("Laboratory practices" + "Practices in computer classroom") 25% and " Problem solving "16.7%. The mark of the tutored work will be preserved for the second call.

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record

Sources of information

Basic Bibliography

King, M., **Fisheries biology, assessment and management**, Blackwell Publishing, 2007

Sparre, P. y Venema, S. C., **Introduccón a la evaluación de recursos pesqueros tropicales. Part 1**, FAO, 1997

Jennings, S.; Kaiser, M. J. and Reynolds, J. D., **Marine Fisheries Ecology**, Blackwell Science, 2001

Complementary Bibliography

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

Recommendations

Subjects that it is recommended to have taken before

Fish and shellfish biology/V10G060V01902

Other comments

To carry out the exams the student must have a calculator able to perform linear regression.

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
In the case of a blended learning situation, all methodologies are maintained, incorporating the devices provided by the Faculty of Marine Sciences so that non physically present students have synchronous access to the teacher's lectures.
In the distance learning situation, all the methodologies are maintained with the exception of the "Laboratory practices" Teaching will be carried out through the Campus Remoto, synchronously and keeping the student´s groups established for the classroom-based learning

* Teaching methodologies modified
In the distance learning situation, the "Laboratory practical" will be replaced by "Practices through ICT". This change affects one of the three practices in the subject. The practices involved will be partially modified, replacing an initial sampling for obtaining the working data with a computer simulation, and complementing the virtual presentation of the practice with images concerning the sampling process used in the face-to-face situation.

* Non-attendance mechanisms for student attention (tutoring)
1) The student should request tutoring by email.
2) The teacher will indicate to the student, also by email, the date and hour for tutoring, using his virtual desk on Campus Remoto.

* Modifications (if applicable) of the contents
Not needed

* Additional bibliography to facilitate self-learning
None

* Other modifications
In the case of the blended or distance learning situations, the student should have a computer with Excel.

=== ADAPTATION OF THE TESTS ===
The assessment methodologies and qualifications will be kept the same in the three situations, with the exception of where to carry them (in a classroom or by means of computer-based questionnaires in the distance learning situation).

* 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 and coastal management				
Subject	Marine and coastal management			
Code	V10G060V01704			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Méndez Martínez, Gonzalo Benito			
Lecturers	Alejo Flores, Irene Méndez Martínez, Gonzalo Benito Pérez Arlucea, Marta María Santos López, Artai Antón			
E-mail	mendez@uvigo.es			
Web	http://www.researchgate.net/profile/Marta_Perez-Arlucea			
General description	In this matter presents a multidisciplinary vision of the coastal and marine zone, identifying the conflicts and risks associated to these areas. They enter the main tools for the management of these two environments as well as the administrative context-legislative in that it is framed the coastal and marine management.			

Competencies	
Code	
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE3	Critical understanding of the history and current status of the Marine Sciences
CE6	Ability to identify and understand the problems in the field of oceanography
CE8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
CE9	To be familiar with the public and private, national and international organizations and institutions related to the Marine Sciences
CE10	To know the problems and the basic principles of sustainability in relation to the use and exploitation of the marine environment
CE11	To manage the use of littoral and coastal region and their resources in a sustainable way
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE21	To manage marine and coastal protected areas
CE26	To plan, direct and write technical reports on marine issues
CE30	Identify and assess environmental impacts in the marine environment
CE37	Technical advice or assistance on issues related to the marine and coastal environment
CT1	Analysis and synthesis ability
CT2	Organization and planning skills
CT17	Sensitivity towards environmental issues

Learning outcomes	Competences	
Critical understanding of the history and current state of the management of the coastal and marine zones	CE3	CT1
Knowledge and critical assessment of the sources of information for coastal and sea planning and management	CE1	
Elaborate thematic maps	CE11	CT1
Capacity to understand the application of the corresponding sectorial legislations	CE6 CE8 CE9 CE10	CT2
To know and evaluate the legal uses of the coastal and marine areas	CE10 CE11 CE14	CT1 CT2
To understand the sustainable use of the resources	CE21 CE26	CT2 CT17
To evaluate the environmental impacts in the coastal and marine zones	CE30 CE37	CT17

Contents
Topic

1. Processes and state of the coastal environments	1.1. Processes and state of the coastal environments
2. Management of the coastal space	2.1. Criteria of management 2.2. Experiences
3. Tools and Technics for the planning and management of the sea	3.1. Methodologies 3.2. Technics
4. Intervention instruments in the coast and marine areas	4.1. The Law of the Coast 4.2. Urbanistic Legislation applicable to the protection of the seaboard 4.3. Protection of natural areas, elements and species of interest 4.4. Use and conservation of the coastal spaces for turistic uses. 4.5. Management of port spaces 4.6. The management of the installations and spaces for the aquaculture
5. Evaluations of impact	5.1. Basic concepts 5.2. Evaluation of projects 5.3. Evaluation of plans and programs
6. Jurisdictional Waters and territorial sea	6.1. Basic concepts and international norms 6.2. Methodologies 6.3. The Spanish rule 6.4. Examples of application
7. Impact of the global change in the half marine and coastal	7.1.General problems 7.2.Models of prediction and mitigation measures.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	23	46	69
Seminars	14	30	44
Studies excursion	8	11	19
Practices through ICT	7	9	16
Problem and/or exercise solving	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	Theoretical contents. Concepts, etc.
Seminars	7 Seminars on subjects related with the Theory: preparation of bibliographic works and exhibition
Studies excursion	Field trip to Lanzada Beach for the observation of natural environments and human modifications, impacts, etc.
Practices through ICT	P1-Legal territorial boundaries P2-Evaluation of environmental impact

Personalized assistance

Methodologies	Description
Seminars	7 seminars of 2 hours in which the lecturer will enter a subject and the students will work on a questionnaire. All the questions will be solved in the seminars. There will be personal tutorials for the preparation of the oral and written presentations in previously schedulled sesions.
Lecturing	23 classes of 1 hour. Students will have access to tutorials, mainly in the indicated schedules. It is advisable that the student contact the lecturer by e-mail.
Practices through ICT	1 sessions of 4 hours, in the computer room. They will aproach different subjects applied of coastal management, where the students will have to solve problems posed during the practice. The doubts and questions will be addressed during the practice.
Studies excursion	Field trip to Lanzada Beach. The students will have the oportunity to ask any scientific questions along the day to complete their field memory.

Assessment

Description	Qualification	Evaluated Competencess

Lecturing	The evaluation will consist of a written exam. To be approved, the student need to obtain a minimum of 4.5 points on the condition that the global average reaches 5 points.	45	CE3 CE6 CE8 CE9 CE10 CE11 CE14 CE21 CE26 CE30 CE37	CT1 CT2 CT17
Seminars	Assistance is compulsory. To be approved, the student need to obtain a minimum of 4.5 points on the condition that the global average reaches 5 points.	30	CE3 CE6 CE8 CE14 CE30	CT1 CT2 CT17
Studies excursion	Delivery of a memory of field/questionnaire	5		
Practices through ICT	Assistance is compulsory. To pass the proofs, the students will need to obtain a minimum of 4.5 points on the condition that the global average reaches 5 points. The students will present the required tests, memoires, etc. the same day at the end of the practice.	20	CE6 CE8 CE10 CE11 CE14 CE21 CE26 CE30	CT1 CT17

Other comments on the Evaluation

Date, time and place of exams will be published in the official web of Marine Sciences Faculty: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

The students are required a responsible and honest behaviour. Any form of fraud (i.e. copies and/or plagiarism) directed to alter the level of knowledge or skill reached by the student/to in any type of proof, report or work designed with this purpose is consider inadmissible. The fraudulent behaviours will suppose the suspension of the subject during a complete course. An internal file containing these irregular behaviors will be started, and subsequently the lecturer would be able to request the opening of a disciplinary file in the rectorship.

Sources of information

Basic Bibliography

Barragán Muñoz, J.M.,, **Las áreas litorales de España. Del análisis geográfico a la gestión integrada**, Ed. Ariel,

Doménech, J.L., Sardá, R., Carballo, A., Villasante, C.S., Barragán, J.M., Borja, A., Rodríguez, M.J, **Gestión integrada de zonas costeras**, AENOR ediciones,

Masselink, G. y Gehrels, R., **Coastal environments and global change**, Wiley,

Gómez Orea, D. y Gómez Vilarino, A., **Evaluación de impacto ambiental**, MP,

Complementary Bibliography

Barragán Muñoz, J.M., **Coastal management and public policy in Spain**, Ocean and Coastal Management,

Comisión Europea, **Programa de demostración de la UE sobre la Gestión Integrada de las Zonas Costeras 1997-1999. Hacia una estrategia europea para la gestión integrada de las zonas costeras. Principios generales y opcio**, Luxemburgo, Oficina de Publicaciones Oficiales de las Comunidades Europeas,

Prada, A., Vázquez-Rodríguez, M.X., Soliño-Millán, M., **Desarrollo sostenible en la costa gallega**, CIEF, Centro de Investigación Económica y Financiera, Fundación Novacaixagalicia,

Barragán Muñoz, J.M., **Política, Gestión y Litoral: Una nueva visión de la Gestión Integrada de Áreas Litorales**, Tébar Flores,

Barragán Muñoz, J.M., **Medio Ambiente y desarrollo en áreas litorales**, Servicio de publicaciones de la U. Cádiz. ,

Gómez Orea, D., **Evaluación ambiental estratégica**, Mundiprensa,

Prada, A., Vázquez-Rodríguez, M.X., Soliño-Millán, M, **Desarrollo sostenible en la costa gallega,**, CIEF, Centro de Investigación Económica y Financiera, Fundación Novacaixagalicia,

Recommendations

Subjects that continue the syllabus

Final Year Dissertation/V10G060V01991

Subjects that are recommended to be taken simultaneously

Applied marine geology/V10G060V01909

Subjects that it is recommended to have taken before

Economics and legislation/V10G060V01903
Geological oceanography I/V10G060V01504
Geological oceanography II/V10G060V01603

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===
In front of it uncertain and unpredictable evolution of the sanitary alert caused by the COVID- 19, the University establishes join 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.

=== ADAPTATION OF The METHODOLOGIES ===
* teaching Methodologies that keep

-Lessons *maxistrais through the virtual classroom

* teaching Methodologies that modify

-Exits of field

--Option 1: Route coastal pole person from Vigo to *pe.

--Option 2: Analysis and evaluation of coastal spaces by means of aerial images, cartography and technologies of analysis of the territorial information.

-Practical kinds of laboratory: they will be substituted by activities related with the practical *presenciais, but based in the employment of programs *informáticos.

-Seminars: they Will develop employing the virtual classrooms stop the theoretical explanations and using questionnaires and exercises in FAITI*C stop the development of the *actividaddes practical associated (in way *síncrono or *asíncrono).

* Mechanism no *presencial of attention to the students (*titorías)

-The *titorías will realize in the virtual dispatch of the professors of the subject.

* Modifications (proceed) of the contained to impart

* additional Bibliography to facilitate to car-learning

* Other modifications

=== ADAPTATION OF The EVALUATION ===

* Proofs that modify
[previous Proof] => [new Proof]

Practical of laboratory => practical Exercises in FAITI*C

Exits of field => alternative Exits / virtual activities

practical theoretical Examination => theoretical Examination @práctico by telematic road or realization of works

Examination *glogal *presencial => global Examination by New telematic

* road proofs

IDENTIFYING DATA				
Aquaculture				
Subject	Aquaculture			
Code	V10G060V01801			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	4th	2nd
Teaching language	Spanish			
Department				
Coordinator	Rocha Valdes, Francisco Javier			
Lecturers	Paredes Rosendo, Estefanía Rocha Valdes, Francisco Javier			
E-mail	frocha@uvigo.es			
Web				
General description	This course aims to provide to the students with the knowledge, skills and abilities that enable their to conceive, design and carry out research projects in the field of aquaculture. At the same time, this matter allows the student to design, manage and control aquaculture farming facilities on land and sea.			

Competencies	
Code	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CE8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE23	To design, control and manage recovery centers for threatened marine species
CE30	Identify and assess environmental impacts in the marine environment
CE32	Quality control of seafood
CE34	To design, control and manage aquaculture production plants
CE36	aquariology
CT2	Organization and planning skills
CT15	Ability to apply knowledge in practice

Learning outcomes	Competences		
Knowing the potentially cultivable marine species in the world	CB3	CE34 CE36	CT15
Know the aquaculture installations in land and sea		CE23 CE30 CE34 CE36	
Dominate the aquaculture auxiliary techniques (phytoplankton and zooplancton) and the culture technics of the main species that are cultivate now in Europe	CB2	CE14 CE23 CE34 CE36	CT15
Know the treatments for the water in the culture systems		CE30 CE34 CE36	
Recognise and analyse problems and propose solution strategies	CB2 CB3	CE14	CT2 CT15
Identify and control problems of environmental impact and marine pollution caused by marine aquaculture	CB2	CE14 CE30	CT2 CT15
Design, control and management of culture centres and recovery of marine endangered Species		CE16 CE23	CT2 CT15
Known the operational details of marine companies, recognise specific problems and propose solutions		CE8 CE14 CE16 CE30 CE34	CT2

Design, control and manage culture production plants	CB2	CE23 CE30 CE32 CE34 CE36	CT2 CT15
Aquariology	CB2	CE36	CT15

Contents	
Topic	
INTRODUCTION	Aquaculture objectives. Current situation and prospects in the world and Spain. History. Types of aquaculture.
WATER QUALITY AND ITS CONTROL	Seawater as culture medium. Undergoes changes in water cultivation. Biological filtration. Mechanical filtration. Physical absorption. Disinfection. Decantation. Aeration. Water quality criteria for aquaculture.
FACILITIES	Water intake. Storage tanks and slop. Culture tank design. Designs for culture ponds. Floating rafts. Rafts. auxiliary Equipment
FOOD AND NUTRITION	Introduction. Food intake (larval, juvenile and adults). Nutritional requirements (molluscs, crustaceans, fish). types food used in aquaculture. Formulation of diets
SPECIES SELECTION CRITERIA	Introduction. Commercial criteria (consumption and market). Biological criteria (reproductive characteristics, production and health). Freshwater species cultured. Cultured marine species. species potentially cultivable
PHYTOPLANKTON CULTURE	Introduction. Optimum properties to the choice a culturable phytoplankton species. Physical requirements. Nutritional requirements. Culture media. Growth characteristics in culture. Culture phytoplankton methods
ZOOPLANCTON CULTURE	Introduction. Artemia culture: general characteristics, life cycle, culture methodology, employment in aquaculture. Rotifer culture: general characteristics, life cycle, culture methodology, employment in aquaculture. Other planktonic crustaceans used in aquaculture: copepods, cladocerans.
MOLLUSKS FARMING	Culture of Ostrea edulis: collection and transportation of broodstock, preparation and production of larvae, larval rearing, collection natural seeds, cultivation of post-larvae, pre-fattening, fattening. cultivation clams: gathering and transportation of players, conditioning and obtaining gametes, embryo culture, larval rearing, natural seed collection, growing post-larvae, pre-fattening, fattening. Cultivation of Pecten maximus: obtaining and transporting broodstock, Conditioning and obtaining gametes, embryo culture, larval rearing, natural seed collection, growing post-larvae, pre-fattening, fattening. Mussel farming: natural seed collection, fattening on rafts. Treatment plants. Potential species: octopus culture: obtaining and transporting players and conditioning. Embryo culture, larval rearing, juvenile collection and fattening.
CRUSTACEAN FARMING	Shrimp farming: gathering and transportation of spawners, conditioning and obtaining gametes, embryo culture, larval rearing, cultivation of post-larvae, pre-fattening, fattening. Lobster culture: obtaining and transporting players, conditioning, cultivation embryonic, larval rearing, cultivation of post-larvae, pre-fattening, fattening. Caetarias
FLAT FISH FARMING	Turbot culture: obtaining and transporting reproductive individuals, conditioning and obtaining gametes, embryo culture, larval rearing, nursery, pre-fattening, fattening. Cultivation of sole: obtaining and transporting reproductive individuals, conditioning and obtaining gametes, embryo culture, larval rearing, weaning pre-fattening, fattening.
GILTHHEAD SEABREAM FARMING	Collection and transportation of spawners, conditioning and obtaining gametes, embryo culture, larval rearing, weaning pre-fattening, fattening
EUROPEAN SEABASS FARMING	Collection and transportation of reproductive individuals, conditioning and obtaining gametes, embryo culture, larval rearing, weaning pre-fattening, fattening.
SALMON FARMING	Collection and transportation of spawners, conditioning and obtaining gametes, embryo culture, larval rearing, weaning pre-fattening, fattening.
DISEASES OF CULTIVATED SPECIES	Mortality. Prevention, isolation, environmental manipulation and treatment. Examination of the animals. Viral diseases. Bacterial diseases. Fungal Infections. Protozoan diseases. Diseases caused by metazoans.
MACROALGAE FARMING	Introduction of seaweed farming, advantages and features. Cultivated species. Methodology.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	30	45	75
Seminars	7	14	21
Laboratory practical	15	15	30
Seminars	2	0	2
Studies excursion	7	0	7
Essay questions exam	3	7.5	10.5
Objective questions exam	1	1.5	2.5
Report of practices, practicum and external practices	0	2	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	Program contents will be explained through classes. During the sessions the studients will encourage the realization of comments and questions for clarification of questions during class. For the classes preparation by the students, notes on each of the topics will be available on the platform Tem@ before classes begin.
Seminars	Each group will prepare a seminar topic related to aquaculture, which will be presented and discussed in groups. Similarly, each group should prepare a brief abstract on the subject matter to be placed on the platform Tem@. This abstract will be distributed among all students and will be evaluated in the test.
Laboratory practical	They are an essential complement to the theoretical sessions. Laboratory practics will be used to explain the techniques of cultivation and laboratory culture. To take full advantage of these practices, the student will wrote a resume for each practice. Text will include all possible information about this activity, including the theoretical foundation, the purpose of practice and job description to be held.
Seminars	During the tutorials its will be discussed questions concerning any aspect of the subject. Moreover, as this matter is attended in the last year of the degree, this tutoring time may also be used by students to see career or incorporation into different graduate curricula related to aquaculture.
Studies excursion	It is planned to conduct two studio outputs, aimed at students to observe the practical application of knowledge taught in class. The outputs shall be performed: 1. Visit the farmed salmon in Cotobade (Pontevedra). 2. Site visit of the Galician Institute for Aquaculture Training of the Galician Government in the Island of Arousa.

Personalized assistance	
Methodologies	**Description**
Seminars	These activities will be developed in small groups. Students can obtain help and guidance to guide them in the seminar preparation and learning process. These activities will be developed in person (by direct consultations in the classroom or during tutorials and consultation sessions in the teacher's office) or via email.
Seminars	These activities will be developed individually or in small groups. Its purpose will be to meet the needs and queries of students related to the study, topics related to the subject and correction of exams, providing guidance, support and motivation in the learning process. These activities will be developed in person or via email. The tutorials, both individual and group, will be held from Monday to Thursday from 11:30 to 12:30 a.m. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Tests	**Description**
Essay questions exam	For the preparation of the tests, students may consult questions or clarify aspects of the subject that are evaluated in the exam. The assistance will be developed in person (by direct consultations in the classroom or during tutorials and consultation sessions by the teacher in his office) or via email. Similarly, once the test has been completed, the students will have a consultation schedule and review of exams to solve doubts and make inquiries about the exam itself.
Objective questions exam	The tests will be developed weekly with the objective that the students prepare each week the subject that will be discussed during the sessions. For the preparation of the tests, students may consult questions or clarify aspects of the subject that wuill be evaluated in the exam. The assistance will be developed in person (by direct consultations in the classroom or during tutorials and consultation sessions by the teacher in his office) or via email.

Assessment

	Description	Qualification	Evaluated Competencess		
Seminars	Following the completion of the seminars, each student group must submit a summary report of the subject matter, which will be evaluated. A minimum of 5 will required to approve.	10		CE30 CE34 CE36	
Laboratory practical	Laboratory practics are considered an essential part of the subject. Practics will be evaluatted by the attendance and assistance of students to them.	5	CB2	CE14	CT2 CT15
Essay questions exam	There will be a long written test on the official date will be assessed on the knowledge gained throughout the course. This test will assess all the knowledge acquired in the course of the subject. The minimum grade to pass the exam will be 5	40	CB2 CB3	CE14 CE23 CE30 CE34 CE36	
Objective questions exam	There will be several quizzes, multiple choice, during the course of lectures. Since the objective of these tests is that students prepare in advance the subjects to be discussed, questions of each test will cover the topics that are being treated that week (including topics to be covered in that class or the next if they are part of issue). The minimum grade to pass the test will be 5.	15		CE30 CE36	
Report of practices, practicum and external practices	For the evaluation of practices each student must prepare a written report on the implementation and results of laboratory practices, which will be evaluated. The minimum grade to approve the report will be 5.	30		CE14 CE30	CT2

Other comments on the Evaluation

In order to pass the subject, each student **must approve** the evaluation of teaching (long answer test) and laboratory practices (attendance and practice report) **separately** (with a mark higher than 5).

In the case that the student takes the second chance evaluation (July test), the weekly test scores, laboratory practices and seminars will be saved for the estimation of the final calification in the case that the student exceeds (with note on 5) the exam.

The official calendar of the evaluation will be published in:

http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

Sources of information

Basic Bibliography

Barnabe, G., **Bases biológicas y ecológicas de la acuicultura**, 1996,

Abalde, J. et al., **Microalgas: cultivo y aplicaciones**, 1995,

Fingerman, M. y R. Nagabhushanam, **Aquaculture**, 2000,

FAO, **Fichas de la FAO sobre acuicultura**, 2012,

Stickney, R., **Acuicultura. Texto introductorio**, 2016, ACRIBIA S.A., 2016

Complementary Bibliography

Costa-Pierce, B. A., **Ecological Aquaculture: the Evolution of the Blue Revolution**, 2003,

Xunta de Galicia - VV.AA., **Unidades didácticas de acuicultura**, 1991,

Beveridge, M, **Cage Aquaculture**, 2004,

Fernández Souto, B. y X.L. Rodríguez Villanueva, **Guía da piscicultura europea**, 2002,

Huguenin, J. E. y J. Colt, **Design and Operating Guide for Aquaculture Seawater Systems**, 2002,

Lee, D. O. y J. F. Wickings, **Cultivo de crustáceos**, 1996,

Southgate, P. et al., **Aquaculture: farming aquatic animals and plants**, 2012,

Stead, S. M. y L. Laird, **Handbook of Salmon farming**, 2001,

Wedmeyer, G. A., **Physiology of fish in intensive culture systems**, 1996,

Wedemeyer, G. A., **Fish Hatchery Management**, 2001,

Recommendations

Subjects that are recommended to be taken simultaneously

Marine and coastal management/V10G060V01704

Subjects that it is recommended to have taken before

Fish and shellfish biology/V10G060V01902
Marine and coastal management/V10G060V01704

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 in 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

In the event that the teaching has to be taught in a mixed or virtual way, the classes and activities of the seminars will be maintained following the established teaching plan, even when these cannot be done in person.

* Teaching methodologies modified

In the event that teaching must be done in a mixed way, with face-to-face and virtual classes, or exclusively virtual, the same teaching will be carried out in both cases. To this end, classes will be videotaped and made available to students for viewing. The resolution of doubts can be done at the same time of the class, either in the same classroom (face-to-face), through chat or requesting audio during the class (mixed or virtual teaching). Additionally, the FAITIC teledoaching platform will be enabled for the resolution of doubts and the students will be able to send emails to the teacher for the resolution of specific doubts.
In the case of teledoaching, classes will preferably take place through the Remote Campus of the University. If the type of internet connection at home, both for the students and the teacher, prevents the use of the remote campus, other video conferencing systems that work under those technological limitations will be sought, such as Skype or Zoom. Similarly, if the recorded class videos cannot be distributed to students from FAITIC, external cloud storage systems will be sought to store and download the videos.
In the case of the confinement, limitations to the displacement or in the number of people affect the accomplishment of the laboratory practices and the exits, several possible alternatives are contemplated. If possible, both the laboratory practices and the exits will be postponed to a date in which they can be carried out, this conditioned to the limitations of the teaching calendar and always within the current academic year. In the event that it is not possible to carry out one of these activities, priority will be given to carrying out laboratory practices. If it is impossible to carry out these activities in person, then the laboratory practices will be carried out virtually using real databases from previous practices.

* Non-attendance mechanisms for student attention (tutoring)

In case of non-classroom teaching or limitations that imply the convenience of not doing face-to-face tutoring, these will be carried out virtually through videoconferences in the Virtual Office of the Remote Campus of the University or, if there are problems with this system, using Skype or Zoom . At the same time, the doubts, questions or tutorials of the students can be made and answered by email.

* Modifications (if applicable) of the contents

Modifying the contents of the Aquaculture course is not contemplated. This, because if it were not possible to teach the entire content in class, it is considered that all the subjects of the Aquaculture course can be obtained from the class notes given by the teacher at FAITIC, as well as with the videos of the classes and the bibliography provided.

* Additional bibliography to facilitate self-learning

It is recommended to visit the FAO website and read the documents on Aquaculture corresponding to the species and techniques that appear in the program and lecture notes.

* Other modifications

No major modifications are contemplated in terms of the teaching methodology to be carried out.

=== ADAPTATION OF THE TESTS ===

* Tests already carried out and pending

Given that the subject of Aquaculture is evaluated through various types of tests that allow a continuous evaluation and without the excessive preponderance of any of them, it is not considered necessary to change the weight of the evaluation to be carried out, which would be:
Written Test: [Previous Weight 40%] [Proposed Weight 40%]
Test type tests: [Previous weight 15%] [Proposed Weight 15%]
Seminars: [Previous weight 10%] [Proposed Weight 10%]
Laboratory Practices: [Previous Weight 35%] [Proposed Weight 35%]

* Tests that are modified

Written Test: In the event that this test must be performed virtually and not in person, it will be done through the FAITIC Platform and Moodle. Its structure will change, giving greater importance to alternative or short answer answers instead of long development answers.
Test type tests: In the event that the type tests already carried out exceed 60% of the possible tests, these tests will be considered as completed. In the event that they could not be carried out in person, or if those carried out were less than 60%, these will be carried out through weekly questionnaires of alternatives in FAITIC.

* Additional Information

In any case, as in the case of face-to-face teaching, to pass the Aquaculture course, each student must have passed the written test of Theory and Practices separately (with a grade higher than 5.0).

IDENTIFYING DATA				
Basin Analysis				
Subject	Basin Analysis			
Code	V10G060V01901			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	García Gil, María Soledad			
Lecturers	Francés Pedraz, Guillermo García Gil, María Soledad Pérez Arlucea, Marta María			
E-mail	sgil@uvigo.es			
Web	http://http://webs.uvigo.es/c10/webc10/			
General description	This matter allows the introduction to the analysis of sedimentary basins and of the interpretation of the history of his filling using technical multidisciplinary.			

Competencies	
Code	
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE5	Basic knowledge of research methodology in oceanography
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE18	To transmit writing, verbal and graphical information for audiences of various types
CE19	To map and characterize the seabed and the underground in marine and coastal areas
CT1	Analysis and synthesis ability
CT6	Problem management and solving skills
CT15	Ability to apply knowledge in practice

Learning outcomes			
Learning outcomes		Competences	
Recognise and analyse new problems in the analysis of basins and propose new interpretations		CE14	CT6
Schedule, design and execute investigations applied of the analysis of basins from the stage of recognition until the evaluation of results-geological resources.		CE16	CT1 CT6 CT15
Transmit information of form written, verbal and graphic for audiences of diverse types	CB4	CE18	CT1
Caracterice and mapping of marine bottoms, marine sub-bottoms and coastal areas-continental		CE19	CT6 CT15
Interpretation of paleoceanographic proxies	CB3 CB4	CE1 CE2 CE5 CE14 CE18	CT1 CT6 CT15

Contents	
Topic	
SUBJECT 1. INTRODUCTION TO THE ANALYSIS OF BASINS	1.1. Definitions. Sedimentary basins. Classification 1.2. Origin and evolution of the oceanic basins 1.3. Interest and applications of the analysis of basins
SUBJECT 2. EXTERNAL AND INTERNAL FACTORS CONTROLLING THE EVOLUTION OF THE SEDIMENTARY BASINS	2.1. Tectonics, Climate, Supply and Sea-level changes 2.2. Sequential stratigraphy: Types of sections, 3D architecture of facies and correlation criteria
SUBJECT 3. DATING METHODS	3.1. Introduction to dating methods. 3.2. Methods of dating in the Quaternary
SUBJECT 4. SEISMIC STRATIGRAPHY	4.1. Sedimentary discontinuity surfaces: Criteria of recognition 4.2. System tracks in the cycle of se-level oscillation 4.3.Sequences and models of sequences.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	18	27	45
Case studies	15	30	45
Seminars	14	14	28
Report of practices, practicum and external practices	5	25	30
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	Presentations of the theoretical concepts that allow the students to adquire or improve the skills to perform the analysis of sedimentary basins. This involves the relationship of multidisciplinary theoretical concepts. The classes will be of 1h.
Case studies	Each student will have several real seismic profiles corresponding to a sedimentary basin. They will have to perform the interpretation of each one and to elaborate an individual memory explaining the evolution of the basin. 4 practices of 5h
Seminars	The contents of the master sessions will be practiced with different exercises (recognition of sedimentary basins types in different marine contexts, stratigraphic surfaces, system tracks, signals that allow to identify sea-level variations, identification of the presence of gas/oil, dating of sediments and geological and paleoceanographic events. Paleoceanographic reconstruction of basins. They will be 7 theoretical seminars-practical of 2h each one

Personalized assistance	
Methodologies	**Description**
Lecturing	Students that wish it will be able to attend to personalized tutorials to resolve doubts, mainly in the indicated schedules. To optimize time, it is necessary that the student to contact with the lecturer previously. The tutorials will be able to be individual or in group in accordance with the schedules of the lecturer: Prof. Soledad García Gil (Tuesday and Thursday: 11 - 14 h) that would be modified according to educational needs.
Seminars	Students that wish it will be able to attend to personalized tutorials to resolve doubts, mainly in the indicated schedules. To optimize time, it is necessary that the student to contact with the lecturer previously. The tutorials will be able to be individual or in group in accordance with the schedules of the lecturer: Prof. Soledad García Gil (Tuesday and Thursday: 11 - 14 h) that would be modified according to educational needs.
Case studies	Students that wish it will be able to attend to personalized tutorials to resolve doubts, mainly in the indicated schedules. To optimize time, it is necessary that the student to contact with the lecturer previously. The tutorials will be able to be individual or in group in accordance with the schedules of the lecturer: Prof. Soledad García Gil (Tuesday and Thursday: 11 - 14 h) that would be modified according to educational needs.
Tests	**Description**
Report of practices, practicum and external practices	Students that wish it will be able to attend to personalized tutorials to resolve doubts, mainly in the indicated schedules. To optimize time, it is necessary that the student to contact with the lecturer previously. The tutorials will be able to be individual or in group in accordance with the schedules of the lecturer: Prof. Soledad García Gil (Tuesday and Thursday: 11 - 14 h) that would be modified according to educational needs.

Assessment			
	Description	Qualification	Evaluated Competencess
Case studies	Sequential seismic analysis of a sedimentary basin from the interpretation of seismic records and profiles.	30	CE14 CT1 CE16 CT6 CE18 CT15 CE19
Seminars	Reports of Seminars	30	CE5 CT1 CE14 CT6 CE18 CT15 CE19

Report of practices, practicum and external practices	Report/memory of work on the study of a real sedimentary basin.	10		CE14 CE16 CE18 CE19	CT1 CT6 CT15
Objective questions exam	Exam with short answer questions on theory and practical topics.	30	CB3 CB4	CE14 CE16 CE18 CE19	CT1 CT15

Other comments on the Evaluation

Date, time and place of exams will be published in the official web of Marine Sciences Faculty: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher's proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record

Sources of information

Basic Bibliography

Rogers, J.W. y Santosh, M., **Continents and supercontinents**, 1, Oxford University Press, 2004

Allen, P.A. y Allen, J.R., **Basin Analysis: Principles and Application to Petroleum Play Assessment**, 3rd, Wiley-Blackwell, 2013

Walker, M., **Quaternary dating methods**, 1, Wiley-Blackwell, 2005

Shanmugam, G., **Deep-Water Processes and Facies Models: Implications for sandstone petroleum reservoirs**, 1, Elsevier, 2006

Treitel, S. y Helbig, K., **Handbook of Geophysical Exploration: Seismic Exploration**, 1, Elsevier, 2011

Huneke, H. y Mulder, T., **Deep-Sea Sediments**, 1, Elsevier, 2010

Catuneanu, O., **Principles of Sequence Stratigraphy**, 1, Elsevier, 2006

Complementary Bibliography

Leeder, M.R. y Pérez-Arlucea, M., **Physical processes in Earth and environmental sciences**, 1, Wiley, 2006

Recommendations

Subjects that continue the syllabus

Applied marine geology/V10G060V01909
Final Year Dissertation/V10G060V01991

Subjects that are recommended to be taken simultaneously

Geological oceanography II/V10G060V01603

Subjects that it is recommended to have taken before

(*)/
Geological oceanography I/V10G060V01504

Contingency plan

Description

=== EXCEPTIONAL PLANNED MEASURES ===
Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University has established an extraordinary planning that will be activated when the administrations and the institution itself determine it in accordance with the criteria of safety, health and responsibility, and guaranteeing teaching in a non-face-to-face or totally non-face-to-face scenario. These already planned measures guarantee, when required, the development of teaching in a more agile and effective way so that students and teachers know them in advance (or well in advance) through the standardized and institutionalized tool of the DOCNET teaching guides.
=== ADAPTATION OF METHODOLOGIES ===
* Teaching methodologies that are maintained
1.- Mixed education: maintained
2.- Non-attendance teaching: they will be adapted to the available resources.
* Teaching methodologies that change
1.- Mixed education: do not change
2.- Non-attendance teaching: they will be adapted to the available resources.
* Non-attendance mechanism for the attention of students (* tutorials)

1.- Mixed teaching: prior agreement by email, face-to-face and/or virtual through Remote Campus.
2.- Non-attendance teaching: previous agreement by e-mail, virtual through Remote Campus
* Modifications (if applicable) of the contents to be taught
1.- Mixed education: no intention to change the contents
2.- Non-attendance teaching: no intention of changing the content
* Additional bibliography to facilitate self-learning
It's not necessary.
* Other modifications
=== ADAPTATION OF THE EVALUATION ===
* Tests already carried out
Test * XX: [Previous weight 00%] [Proposed weight 00%]
1.- Mixed education: the weights of the face-to-face situation are kept.
2.- Non-contact teaching: the weights of the face-to-face situation are preserved.
* Evidence that changes
[Old test] => [New test]
1.- Mixed education: do not change
2.- Non-attendance teaching: unchanged
During non-contact teaching, students, in these exceptional circumstances, should address this issue with responsible and honest behavior. Any form of copying intended to falsify the level of knowledge and skills attained in the preparation of the deliverables, as well as during the virtual examination, will be considered inadmissible. If there is any suspicion of fraudulent conduct, students may be subject to additional verification to verify its accuracy.

IDENTIFYING DATA				
Fish and shellfish biology				
Subject	Fish and shellfish biology			
Code	V10G060V01902			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Domínguez Martín, José Jorge			
Lecturers	Domínguez Martín, José Jorge Fernández Marchan, Daniel			
E-mail	jdguez@uvigo.es			
Web				
General description	This is a special Zoology which studies the main fish and shelfish in the spanish coast			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE4	To know the basic techniques to sample the water column, organisms, sediments and sea bottom, as well as the surveying methods for dynamic and structural variables
CE8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
CE10	To know the problems and the basic principles of sustainability in relation to the use and exploitation of the marine environment
CE11	To manage the use of littoral and coastal region and their resources in a sustainable way
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CE19	To map and characterize the seabed and the underground in marine and coastal areas
CE20	To find and evaluate marine resources of various kinds
CT1	Analysis and synthesis ability
CT3	Written and oral communication in the official languages of the University
CT6	Problem management and solving skills
CT8	Teamwork ability

Learning outcomes	Competences		
Ability to apply knowledge in practice	CB1 CB2 CB3 CB4 CB5	CE4 CE8 CE10 CE11 CE13 CE17 CE18 CE19 CE20	CT1 CT3 CT6

To know the basic techniques of sampling in the water column, organisms, sediments and bottoms, as well as of measurement of dynamic and structural variables.	CB1 CB2 CB3 CB4 CB5	CE4 CE8 CE10 CE11 CE13 CE17 CE18 CE19 CE20	CT1 CT3 CT6
Research skills.	CB1 CB2 CB3 CB4 CB5	CE4 CE8 CE10 CE11 CE13 CE17 CE18 CE19 CE20	CT1 CT3 CT6
Identification of fish and shellfish. Knowledge of the external and internal morphology of fish and shellfish. Knowledge of the distribution, habitat and lifestyles of fish and shellfish. Knowledge of reproduction and life cycles of fish and shellfish. Management of fishery resources and shellfish. Biological bases necessary for the study of Fisheries and Aquaculture.	CB1 CB2 CB3 CB4 CB5	CE8 CE18 CE20	CT1 CT3 CT6 CT8

Contents

Topic	
Introduction	Fish and shellfish in the tree of life Shellfish species Fish species Life-cycle strategies
Biology of Molluscs	General characteristics of molluscs Classification
Biology of bivalves	External morphology: shell, mantle and foot Habits and life styles: soft bottom excavators, fixed surface inhabitants, surface free inhabitants. Feeding and growth. Digestion, circulation, respiration, excretion. Nervous system and sense organs. Reproduction. Embryonic and larval development. Classification.
Commercial bivalves	Mytilus galloprovincialis Cardium edule Tapes decussatus Venerupis pullastra Ostrea edulis Pecten maximus Chlamys opercularis Chlamys varia
Biology of cephalopods	Distribution and habitat External morphology Habits and life styles. Locomotion and buoyancy. Migrations. Color and bioluminescence. Predators Feeding and growth. Digestion, circulation and gas exchange and excretion Nervous system and organs of the senses Reproduction Embryonic and larval development. Classification
Commercial cephalopods	Sepia officinalis Loligo vulgaris Illex coindetti Octopus vulgaris

Biology of crustaceans	General characteristics Classification Decapods Distribution and habitat External morphology Habits and life styles Locomotion Feeding and growth. Moult Nervous system and organs of the senses Excretion Reproduction and Embryonic and larval development
Commercial crustaceans	Palaemon serratus Palinurus elephas Homarus gammarus Necora puber Maja squinado Nephros norvegicus Pollicipes pollicipes
Biology of fishes	General characteristics Phylogeny, systematic and taxonomy General biology of fishes
Pelagic fishes	General characteristics Distribution and Habitat Feeding and growth Biological cycle Reproduction: nesting areas, larvae and larval mortality, absolute fertility Sardine Anchovy Herring Mackerel Horse Mackerel
Demersal fishes	Hake Cod Plueronectiforms Labrids Others

Planning			
	Class hours	Hours outside the classroom	Total hours
Laboratory practical	20	40	60
Seminars	6	18	24
Lecturing	20	40	60
Problem and/or exercise solving	1	1	2
Objective questions exam	1	1	2
Essay questions exam	1	1	2

*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	Lab classes are organized according to the following scheme: at the beginning of each class, the theoretical concepts needed to understand the examples to be observed are briefly explained, and a script is given to the student in which these concepts are remembered, and the techniques to follow and the objectives to be achieved explained.
Seminars	The students must carry out an independent and supervised work that they will expose to their classmates. The work will be done accompanied by the teacher in three seminars, the first will propose the subject and will be directed to the students to seek information on the subject. In the second seminar we will discuss the content found by the students and clarify doubts, and in the third one the presentation will be oriented. The seminars will evaluate the independent work of the students. The topics of the work will be varied, and subjects suggested by the students are welcome.

Lecturing	In these classes the teacher will present the different topics of the program using different formats according to the subject to be studied, formats that will be: theory, case studies and / or general examples. The teacher can be supported by audiovisual and computer media, but in general, students do not need to handle them in class. Attendance to these classes, although it is not mandatory, is highly recommended for the proper follow-up of the course.

Personalized assistance

Methodologies	Description
Lecturing	During them discussions are held on some of the most relevant topics. Tutoring: Mondays and Wednesdays from 12 to 2. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Laboratory practical	At the beginning of each practice, the theoretical concepts necessary for the understanding of the specimens to be observed are briefly explained. All issues that are raised during the practice are resolved. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Seminars	The working groups are chosen and the work topics discussed. They are tracked. A critical review and a general discussion of each work is done. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Tests	**Description**
Problem and/or exercise solving	The student has to complete and pass very short questions, with four possible answers and chose the correct ones.
Objective questions exam	The studen has to answer short questions in his/her own words, including specific and objective questions and some in the form of sintesis, refection and elabrotaion of well constructed arguments.
Essay questions exam	Here, the students have to develop a long topic, including an important amount of info, but being able to make it in a well explained and siinthetic way in order to offer a whole vision and including the important details of the topics, mainly being these different lyfe ccyles of fishes and invertebrates.

Assessment

	Description	Qualification		Evaluated Competencess	
Laboratory practical	Exam	15	CB1 CB2 CB3 CB4 CB5	CE4 CE8 CE18 CE20	CT1 CT3 CT6 CT8
Seminars	Written or expository work	10	CB1 CB2 CB3 CB4 CB5	CE4 CE8 CE18 CE20	CT1 CT3 CT6 CT8
Lecturing	Exam	75	CB1 CB2 CB3 CB4 CB5	CE4 CE8 CE18 CE20	CT1 CT3 CT6 CT8
Problem and/or exercise solving	Exam	40	CB1	CE4	CT1
Objective questions exam	Exam	30	CB1 CB2 CB3 CB4	CE4 CE18	CT1 CT3 CT6
Essay questions exam	Exam	30	CB1 CB2 CB3 CB4	CE4 CE18	CT1 CT3

Other comments on the Evaluation

Date, time and place of exams will be published in the official web of Marine Sciences Faculty:

http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

Sources of information

Basic Bibliography

C.P.J. Hickman, **Principios integrales de Zoología**, 14, McGraw-Hill, 2009

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Aquaculture/V10G060V01801

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
If necessary, the same contents will be maintained by using the virtual classroom for the realization of the master classes and tele-teaching tools will be used for the seminar work and the practical classes.
* Non-attendance mechanisms for student attention (tutoring)
Tutoring may be carried out by telematic means (e-mail, videoconference, FAITIC forums, ...) after prior consultation.
* Modifications (if applicable) of the contents
No
* Additional bibliography to facilitate self-learning
It will be provided via telematic platform FAITIC.
* Other modifications

=== ADAPTATION OF THE TESTS ===
Test will be the same with the same quotation.

IDENTIFYING DATA				
Economics and legislation				
Subject	Economics and legislation			
Code	V10G060V01903			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Amigo Dobaño, Josefina Lucy			
Lecturers	Amigo Dobaño, Josefina Lucy			
E-mail	lamigo@uvigo.es			
Web				
General description	Approach to the main variables that allow to realise basic analyses of situation and evolution of the economy.			

Competencies	
Code	
CE3	Critical understanding of the history and current status of the Marine Sciences
CE7	To know the basics of market economy applied to marine resources
CE8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
CE9	To be familiar with the public and private, national and international organizations and institutions related to the Marine Sciences
CE10	To know the problems and the basic principles of sustainability in relation to the use and exploitation of the marine environment
CT1	Analysis and synthesis ability
CT8	Teamwork ability

Learning outcomes		
Learning outcomes	Competences	
Comprise to handle necessary economic concepts for the management of the natural resources	CE3 CE7 CE8 CE9 CE10	CT1 CT8
Capacity to identify problems related with the marine resources, his consideration from the economic perspective and interpretation of the possible necessary results for the management of the same.	CE3 CE7 CE8 CE9 CE10	CT1 CT8
Capacity to develop works or brief reports in the field of the marine resources	CE3 CE7	CT1 CT8

Contents	
Topic	
I. INTRODUCTION. BASIC APPEARANCES	1. The Spanish Economy. 2. The Spanish economy in the European or world-wide context 3. Income and Distribution
II. The PRODUCTIVE ACTIVITIES	4. Primary activities. 5. Energetic sector. 6. Industry. 7. Service sector
III. ANALYSIS OF THE HALF MARINO. The FISHING	8.-Institutional appearances and juridical frame 9- Análse of the Market

Planning			
	Class hours	Hours outside the classroom	Total hours
Seminars	14	33	47
Practices through ICT	15	37	52
Lecturing	23	28	51
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Seminars	In the seminars, will realise fundamentally tasks of preparation and exhibition of works on appearances related with the temario.
Practices through ICT	Formulation and resolution of problems and/or exercises related with the matter. The student has to develop the solutions.
Lecturing	Exhibition by part of the professor of the contents of the matter. Realisation of partial examinations.

Personalized assistance	
Methodologies	**Description**
Lecturing	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Seminars	Personal tutorials to solve doubts and/or uncertainties

Assessment				
	Description	Qualification	Evaluated Competencess	
Seminars	Workshops of work. Will be able to use the seminars for exhibitions and realisation of partial proofs. Results of learning: -Comprise to handle necessary economic concepts for the management of the marine resources. -Capacity to identify problems relate with the marine resources, economic treatments and interpretation of results.-Comprise to handle necessary economic concepts for the management of the marine resources. -Capacity to identify problems relate with the marine resources, economic treatments and interpretation of results.	35	CE3 CE7 CE8 CE9 CE10	CT1 CT8
Practices through ICT	Study of cases. Empirical analysis. Possibility to realise and present works. Results of learning: -Comprise to handle necessary economic concepts for the management of the marine resources. -Capacity to identify problems relate with the marine resources, economic treatments and interpretation of results.	15	CE3 CE7 CE8 CE9 CE10	CT1 CT8
Lecturing	-Comprise and handle necessary economic concepts for the economic analysis and the management of the marine resources. -Capacity to identify problems relate with the marine resources, economic treatments and interpretation of results.	50	CE3 CE7 CE8 CE9 CE10	

Other comments on the Evaluation

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

Sources of information

Basic Bibliography

Complementary Bibliography

GARCÍA DELGADO, J.L.; MYRO; R:(Dirs), **Lecciones de Economía Española**, duodécima, 2015

GARCIA DELGADO, J.KL; MYRO, R., **Economía Española. Una Introducción**, 2012

GARCÍA DE LA CRUZ, J.M.; RUESGA BENITO, S. (coord.), **Economía española. Estructura y regulación**, 2014

GARZA, M.D., Coord., **La actividad pesquera a escala mundial**, 2008

VARELA, M., COORD., **Unha estratexia marítima para Galicia**, 2010

GONZÁLEZ LAXE, F., **Lecciones de Economía Pesquera**, 2008

J. Surís y M. Varela, **Introducción a la Economía de los Recursos Naturales**, Cívitas, 1995

INSTITUTO NACIONAL DE ESTADÍSTICA Anuario estadístico de España, España en cifras, otras publicacion, **www.ine.es**, 2016

EUROSTAT Anuarios e Informes, **http://epp.eurostat.ec.europa.eu**, 2016

FAO Informes anuales agricultura, pesca, alimentación, **www.fao.org**, 2016

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: they Keep the methodologies, doing feature that in the case of not being possible, will employ telematic means.

* Teaching methodologies modified: telematic means, if were necessary.

* Non-attendance mechanisms for student attention (tutoring): email and telematic (campus remoto)

* 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: they Keep the proofs of evaluation, doing feature that in the case of not being possible, will employ telematic evaluation

IDENTIFYING DATA				
Geographic analysis methods				
Subject	Geographic analysis methods			
Code	V10G060V01904			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Torres Palenzuela, Jesús Manuel Díez Ferrer, José Bienvenido			
Lecturers	Díez Ferrer, José Bienvenido Lago Cameselle, Alejandra Torres Palenzuela, Jesús Manuel			
E-mail	jbdiez@uvigo.es jesu@uvigo.es			
Web				
General description	Principles of territorial analysis and their cartographic representation.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE3	Critical understanding of the history and current status of the Marine Sciences
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE9	To be familiar with the public and private, national and international organizations and institutions related to the Marine Sciences
CE11	To manage the use of littoral and coastal region and their resources in a sustainable way
CE12	To be able to operate the instrumental techniques applied to sea
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE18	To transmit writing, verbal and graphical information for audiences of various types
CE19	To map and characterize the seabed and the underground in marine and coastal areas
CE26	To plan, direct and write technical reports on marine issues
CE37	Technical advice or assistance on issues related to the marine and coastal environment
CT1	Analysis and synthesis ability
CT5	Information technology skills (search and data analysis)

Learning outcomes			
Learning outcomes		Competences	
Projection Systems and Reference Systems	CB1	CE12 CE13 CE15 CE18 CE37	CT5
Digital Terrain Models	CB2 CB3	CE1 CE5 CE6 CE11 CE12 CE13 CE19	CT5

Improvement, corrections and transformation of images	CB3	CE1 CE5 CE6 CE12 CE13 CE15 CE18	CT5
Interpolation of data (Creation of surfaces from point data)	CB1 CB3	CE1 CE5 CE6 CE12 CE13 CE15	CT5
3D visualization and navigation.	CB1 CB3	CE1 CE3 CE5 CE12 CE13 CE15	CT5
GIS Applications	CB1 CB2 CB3	CE1 CE3 CE5 CE6 CE9 CE11 CE12 CE18 CE19 CE26 CE37	CT1 CT5

Contents

Topic	
1. Introduction to cartography and geographic information systems	(*) Non hai subtemas
2. The scale	There are not subtopics
3. Reference systems and projection systems	There are not subtopics
4. Geographic information systems software	There are not subtopics
5. Data acquisition and processing: locations and attributes	There are not subtopics
6. Sources of geographic and cartographic information.	There are not subtopics
7. Digital terrain models	There are not subtopics
8. Digital analysis and processing of geographic information	There are not subtopics
9. 3D visualization.	There are not subtopics
10. Applications of geographic information systems. Thematic maps.	There are not subtopics

Planning

	Class hours	Hours outside the classroom	Total hours
Practices through ICT	20	30	50
Seminars	7	14	21
Lecturing	25	50	75
Problem and/or exercise solving	1.5	0	1.5
Laboratory practice	2.5	0	2.5

*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	The methodology is the directed study.
Seminars	Personalized attention and referring to the techniques and contents and its application in the works and practices
Lecturing	The lecture is the method mainly employed, using the dialogue as much as possible

Personalized assistance	
Methodologies	**Description**
Lecturing	The assessment of the knowledge will be carried out continuously during the course period. This implies, the compulsory accomplishment of a series of exercises by the student, in order to observe his/her progress. The control of all the activities carried out during the teaching period, especially the practical classes, and the verification of the results of the compulsory exercises, will be used by the teacher as elements to judge if the student has achieved the initial objectives of training in the contents of a discipline. Tutorials by Professor Jesus Torres: from Monday to Wednesday from 16h to 17h. Tutorials by Professor Alejandra L. Cameselle: Wednesday and Thursday from 12h to 14h. Tutorials by Professor JoséBienvenido Diez Wednesday from 12 a.m. to 2 p.m. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Practices through ICT	The assessment of the knowledge will be carried out continuously during the course period. This implies, the compulsory accomplishment of a series of exercises by the student, in order to observe his/her progress. The control of all the activities carried out during the teaching period, especially the practical classes, and the verification of the results of the compulsory exercises, will be used by the teacher as elements to judge if the student has achieved the initial objectives of training in the contents of a discipline. Tutorials by Professor Jesus Torres: from Monday to Wednesday from 16h to 17h. Tutorials by Professor Alejandra L. Cameselle: Wednesday and Thursday from 12h to 14h. Tutorials by Professor JoséBienvenido Diez Wednesday from 12 a.m. to 2 p.m. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Tests	**Description**
Problem and/or exercise solving	The assessment of the knowledge will be carried out continuously during the course period. This implies, the compulsory accomplishment of a series of exercises by the student, in order to observe his/her progress. The control of all the activities carried out during the teaching period, especially the practical classes, and the verification of the results of the compulsory exercises, will be used by the teacher as elements to judge if the student has achieved the initial objectives of training in the contents of a discipline. Tutorials by Professor Jesus Torres: from Monday to Wednesday from 16h to 17h. Tutorials by Professor Alejandra L. Cameselle: Wednesday and Thursday from 12h to 14h. Tutorials by Professor JoséBienvenido Diez Wednesday from 12 a.m. to 2 p.m. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.

Assessment					
	Description	Qualification	Evaluated Competencess		
Practices through ICT	The methodology is the directed study.	30	CB2 CB3	CE1 CE5 CE9 CE11 CE12 CE13 CE18 CE19	CT5
Seminars	Personalized attention	10	CB1	CE3 CE6 CE15 CE26 CE37	CT1
Problem and/or exercise solving	The exam should be part of a systematic evaluation, understood as the one that follows a previously established schedule and that is not done in an occasional or incidental way. The intention of the exam is to evaluate: * The knowledge that the student possesses about the subjet. * The ability to relate some knowledge to others. * The application of knowledge to solve specific problems.	30	CB1 CB2 CB3	CE1 CE5 CE6 CE12 CE15 CE26	CT1

Laboratory practice	Practical tests are particularly useful in assessing the application of the acquired knowledge, both theoretical and practical. They imply difficulties of implementation but they provide an excellent mean for the assessment of the application of the acquired knowledge.	30	CB1 CB2 CB3	CE5 CE6 CE9 CE11 CE12 CE13 CE18 CE19 CE26	CT1 CT5

Other comments on the Evaluation

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

Date, time and place of exams will be published in the official web of Marine Sciences Faculty:

http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Sources of information

Basic Bibliography

Robinson, Arthur H., **Elementos de cartografía**, Omega, 1987

Joly, Fernand, **La Cartografía**, Oikos-Tau, 1988

Complementary Bibliography

BOSQUE SENDRA, J. et al, **Sistemas de Información Geográfica.**, Rama, 1994

LONGLEY, P., GOODCHILD M.F., MAGUIRRE, D.J., RHIND, D.W., **Geographic Information Systems and Science.**, John Wiley & Sons., 2011

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: The lectures, seminars and laboratory practices will be in a virtual way through the remote campus. The professor will assist the students in downloading and installing on their personal computers the free software necessary for the practicals and seminars. Most of the data sets needed for the exercises are housed on open repositories with easy access for students.
In the case of semi-presenciality, the theoretical classes would be virtual and the practices classes would be adapted to the presenciality allowed by current regulations.

* Teaching methodologies modified: Not applicable

* Non-attendance mechanisms for student attention (tutoring): Student attention will be held in the virtual offices of the teachers, after making an appointment. For specific matters, institutional email may also be used.

* Modifications (if applicable) of the contents: Not applicable

* Additional bibliography to facilitate self-learning: Not applicable

* Other modifications

=== ADAPTATION OF THE TESTS ===
The same weight is maintained as for face-to-face teaching. The face-to-face tests will be conducted online, using Faitic and the virtual office.

IDENTIFYING DATA				
Modelling				
Subject	Modelling			
Code	V10G060V01905			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Souto Torres, Carlos Alberto			
Lecturers	Souto Torres, Carlos Alberto Varela Benvenuto, Ramiro Alberto			
E-mail	ctorres@uvigo.es			
Web				
General description	The student will learn how to operate an oceanographic numerical simulation model. In order to achieve this goal, besides the specifics of the simulation code, he/she will learn some basics of the operative system Linux, NetCDF file format and Matlab.			

Competencies	
Code	
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE29	Skill in the practical use of models and in the incorporation of new data for their validation, improvement and development
CT2	Organization and planning skills
CT11	Ability to learn independently and continuously

Learning outcomes	Competences		
Hability to calculate ocean dynamic solutions using numerical simulation models.	CB3 CB5	CE29	CT2 CT11

Contents	
Topic	
Ocean equations.	Discretization and introduction of the ocean equations in the model.
Matlab.	Basics of Matlab coding (loops, conditional, input and output of data). Examples.
Numerical integration methods	Implicit and explicit methods. Runge-Kutta, Predictor-Corrector, Leap-Frog, etc.
NetCDF data files.	Structure of a NetCDF file: Global and local attributes, dimensions, data. Reading and writing of NetCDF files.
The ROMS model.	Introduction. Model input structure. Bathymetry, forcing and boundary condition.
Examples with ROMS.	Run and analysis of simple examples.
Nesting with ROMS.	Nested grids: Why and how. Structure, run and analysis of results.
Biogeochemical models.	Examples with simple biogeochemical models. NPDZ and N2P2Z2D2. The PISCES module.

Planning	Class hours	Hours outside the classroom	Total hours
Practices through ICT	50	50	100
Lecturing	20	20	40
Presentation	5	5	10
*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	Using Linux as the operative system and Matlab as a tool, the student will learn to use the NetCDF data file format and the use of a numerical simulation model.

Lecturing	The equations of the ocean and different methods to solve those equations numerically with a computer code will be introduced to the student.

Personalized assistance

Methodologies	Description
Lecturing	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Practices through ICT	Will be adapted to the timeframe determined by the Faculty's dean.
Tests	**Description**
Presentation	The final work will be presented to all the other students and the teacher.

Assessment

	Description	Qualification	Evaluated Competencess	
Practices through ICT	The consecution of different goals (preparation of the input data, run of the model, preparation of graphics with the results, etc...) will be evaluated following a previously informed rubric.	100	CE29	CT2 CT11
Presentation	The previous qualification will be given depending on a final presentation.	0		

Other comments on the Evaluation

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record

Date, time and place of exams will be published in the official web of Marine Sciences Faculty:

http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Sources of information

Basic Bibliography

Cushman-Roisin, Benoit and Beckers, Jean-Marie, **Introduction to Geophysical Fluid Dynamics. Physical and Numerical Aspects**, Academic Press, 2009

Complementary Bibliography

Recommendations

Subjects that it is recommended to have taken before

Ocean Dynamics/V10G060V01702

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: None.

* Non-attendance mechanisms for student attention (tutoring): Using Campus Remoto and other tools like Skype/Chrome Desktop.

* Modifications (if applicable) of the contents: None.

* Additional bibliography to facilitate self-learning: None.

* Other modifications: None.

=== ADAPTATION OF THE TESTS ===
* Tests that are modified: None.

* New tests: None.

* Additional Information. If necessary the test will take place using Campus Remoto or some other similar tool.

IDENTIFYING DATA				
Marine microbiology and parasitology				
Subject	Marine microbiology and parasitology			
Code	V10G060V01906			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	García Estévez, José Manuel			
Lecturers	García Estévez, José Manuel Longo González, Elisa			
E-mail	jestevez@uvigo.es			
Web				
General description	It should be kept in mind that parasitism is the most widespread life strategy in nature. The study of the impact of parasitism can provide relevant information for a better management and exploitation of resources. This is why we describe the diversity of parasitic animals in all their manifestations and the adaptations of each species to their habitat and study the parasite-host relationships: anatomy, morphology, biology, epidemiology, diagnosis and treatment. Microbiology will deal with aspects related to microbial contamination, the infectious pathology of marine organisms and the applications of marine microorganisms.			

Competencies	
Code	
CE11	To manage the use of littoral and coastal region and their resources in a sustainable way
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CE20	To find and evaluate marine resources of various kinds
CE22	To control marine pollution problems
CE23	To design, control and manage recovery centers for threatened marine species
CE26	To plan, direct and write technical reports on marine issues
CE27	To understand the operation details of enterprises linked to the marine environment, and to recognize their specific problems and solutions
CE30	Identify and assess environmental impacts in the marine environment
CE32	Quality control of seafood
CE33	Fisheries control
CE34	To design, control and manage aquaculture production plants
CE35	Water quality control in water treatment plants
CE36	aquariology
CT8	Teamwork ability
CT15	Ability to apply knowledge in practice

Learning outcomes	Competences	
Acquire basic knowledge of Parasitology and identify the main pathogenic parasite groups of marine organisms.	CE18 CE22 CE23 CE26 CE27 CE30 CE32 CE33 CE34 CE35 CE36	CT8 CT15

Know and purchase skill in the technicians of diagnostic in Parasitology.	CE11 CE17 CE22 CE23 CE26 CE27 CE30 CE32 CE33 CE34 CE36	CT15
Understand the complexity of the biological cycles of the parasites of the half marine like key appearance for the control of the parasitic illnesses	CE23 CE26 CE30 CE32 CE33 CE34 CE35 CE36	CT15
Know the importance and the possible applications of the main parasites of the half marine	CE11 CE22 CE26 CE30 CE32 CE33 CE34 CE35 CE36	CT8 CT15
Know the main strategies of control of the parasitic illnesses	CE22 CE27 CE32 CE35	
To know the importance and the possible applications of the main parasites of the marine environment. Implications in public health and fisheries.	CE18	
Know the microbial activities in relation with the half biotic and abiotic	CE32 CE34 CE35	CT8
To know the main infectious diseases by marine microorganisms.	CE30 CE32	
Know how to interpret the origin and consequences of polluting microorganisms in the marine environment.	CE18 CE22 CE30	
Possess general notions on the interest applied of the microorganisms of the half marine	CE11 CE17 CE18 CE20 CE22 CE23 CE26 CE27 CE30 CE32 CE34 CE36	CT8 CT15

Contents	
Topic	
PART I. INTRODUCTION AND GENERAL CONCEPTS	I.1. Parasitology and Marine Parasitology. Concept of parasitism. Adjustments to the parasitism. Actions of the parasite on the host. Parasite specificity. Parasites and biological cycles. I.2. Ecological terms in Parasitology.
PART II. PROTROZOOLOGY	II.1. Introduction to the study of the parasitic protozoans. Classification of Protozoos. II.2. Dinoflagellates. Flagellates. Amoebae. Apicomplexa. Ciliates. II.3. Microsporidia. II.4. Mixosporidia. II.5. Protozoa of bivalve mollusks: Perkinsus, Haplosporidia, Marteilia.

PART III. HELMINTHS AND ARTHROPODS	III.1. Flatworms : Monogenean . Digeneans Tapeworms. Turbellarian. III.2 . Roundworms : Nematodes. Acanthocephala. III.3. Crustacea.
PART IV. RESPONSE HOST - PARASITE	IV.1 . Defense mechanisms of marine organisms against parasites. IV.2 . Production of vaccines against parasites. IV.3 . Drug treatments. Chemical products.
PART V. APPLICATIONS OF MARINE PARASITOLOGY	V.1 . Parasites as biological markers. V.2 . Applications of parasites in the control of fishing operations : Its use in differentiating stocks. V.3 . Economic and hygienic importance of marine parasites.
PART VI . MICROBIAL CONTAMINATION IN THE MARINE ENVIRONMENT	VI.1 . Public Health Risks and biotic pollution of the marine environment. VI.2 . indigenous bacteria and microorganisms introduced by waste disposal. VI.3 . Waterborne infections. Microorganisms indicators of health control methods coastal waters and marine food products. VII.4 . Wastewater treatment and purification of water supplies.
PART VII . MECHANISMS OF MICROBIAL PATHOGENICITY	VII.1. Mechanisms microbial pathogenicity. VII.2. Major bacterial and viral infections of marine organisms. VII.3. Métodos diagnostic and identification of microbial pathogens. VII.4. Prophylaxis in aquaculture.
PART VIII . INDUSTRIAL APPLICATIONS OF MICRO MARINE ENVIRONMENT	VIII.1. Search and genetic manipulation of microorganisms. VIII.2. Principal uses of marine microorganisms for industrial purposes. VIII.3. Use of microorganisms in biodegradation and bioremediation of marine pollutants. VIII.4. Harmful effects of marine microorganisms : biodeterioration biofilms and metal and wood.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	20	30	50
Laboratory practical	20	43.88	63.88
Seminars	8.5	25.5	34
Objective questions exam	0.62	0	0.62
Problem and/or exercise solving	1.5	0	1.5

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

Methodologies

	Description
Lecturing	Professor structure and/or explain the objectives and content of each block. For their study, students have seen in class presentations and worksheets for each topic in the platform Faitic
Laboratory practical	Explanation of the theoretical foundations and practical protocols , overseeing its implementation and resolving doubts raised by students. The practices will focus on techniques useful in the practice of the profession.
Seminars	Discussion, processing and/or exposure by groups of students of subjects related to the theory and practices of matter. Topics will be proposed to the students individually or in groups organized. Before the dates marked for the exhibition, each group of students must submit a written report of the work done to prepare.

Personalized assistance

Methodologies	Description
Lecturing	The doubts that have the students will be attended in class
Laboratory practical	In the laboratory, will be participatory and allow to set custom actions reinforcement. While performing laboratory practices teachers give individual attention to each student for the correct understanding of the experimental objectives and methodology or technique used.
Seminars	In the seminars: Development and exposure by groups of students of subjects related to the theory and practices of matter. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. Tutorials: Prof. García Estévez: Tuesday, Wednesday and Thursday from 9:00 to 11:00 h. Prof. Longo González: Monday, Tuesday and Wednesday from 16:00 to 18:00 h.

Assessment

	Description	Qualification	Evaluated Competencess	
Laboratory practical	The knowledge acquired by students in practical classes will be evaluated by test type / short question organized in two tests corresponding to the contents of Microbiology and Marine Parasitology (30 %). Also it is evaluable attitude and skill shown in the laboratory (10%).	45	CE17 CE22 CE26 CE27 CE30 CE32 CE33 CE34 CE35 CE36	CT8 CT15
Seminars	The quality of the memory of the works presented, the quality of the exhibition and participation and discussion in each of the topics will be valued.	20	CE18 CE23 CE26 CE27	CT8 CT15
Objective questions exam	The theoretical knowledges purchased by the student are evaluated by means of an examination of type test and short questions, organized in two corresponding proofs to the contained of Microbiology and Marine Parasitology	15	CE11 CE17 CE18 CE20 CE22 CE23 CE26 CE27 CE30 CE32 CE33 CE34 CE35 CE36	CT8 CT15
Problem and/or exercise solving	Resolution of problems and cases related with the contained of the Microbiology and Marine Parasitology.	20	CE17 CE22 CE26 CE27 CE30 CE32 CE33 CE34 CE35 CE36	CT8 CT15

Other comments on the Evaluation

The student to pass the subject shall: 1) Perform all mandatory workshops and seminars. To overcome the matter only a fault is allowed, because of force majeure and documented. 2) Get a score of 5 out of 10 in each of the Parasitology and Microbiology parties and a minimum score of 4 out of 10 in each of the evaluable activities. If the June overcomes one of the parties it is kept for July . In successive courses surpassed the ratings of activities be preserved. Students are required to take this course in responsible and honest behavior. Any form of fraud (copying and / or plagiarism) intended to falsify the level of knowledge and skills achieved in any type of test, report or work is considered inadmissible. Fraudulent conduct may involve suspending the course during a full course. An internal record of these actions will be kept so that, in case of recidivism, request the opening to the rectorado of a disciplinary file.

Date, time and place of exams will be published in the official web of Marine Sciences Faculty: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Sources of information

Basic Bibliography

Eiras, J.; Segner, H.; Wahli, T. & Kapoor, B.G., **Fish Diseases**, 2008

Rohde, K., **Marine Parasitology**, 2005

M.T. Madigan; J.M. Martinko; K.S. Bender; D.H. Buckley; D.A. Stahl & T. Brock, **Brock Biology of Microorganisms**, 14, 2015

J.M. Willey; L.M. Sherwood & C.J. Woolverton, **Prescott Microbiology**, 10, 2017

Munn, C. B., **Marine Microbiology Ecology and Applications. (2ª Edición)**, 2011

Patrick T.K. Woo & Kurt Buchmann, **Fish Parasites: Pathobiology and protection**, 2012

Complementary Bibliography

Goater, T.M.; Goater, C.M. & Esch, G.W., **Parasitism: The Diversity and ecology of animal parasites**, 2, 2013

L. Roberts J. Janovy, Jr. & S. Nadler, **Foundations of Parasitology**, 9, 2013

Williams, H. & Jones, A., **Parasitic Worms of Fish**, 1994
Woo, P.T.K., **Fish Diseases and Disorders. Volumen 1. (2ª Edición). Protozoan and Metazoan Infections.**, 2006
Noga, E. J., **Fish Disease. Diagnosis and treatment**, 2010
Loker, E.S. & Hofkin, B.V., **Parasitology: A Conceptual Approach**, 2015
Austin, B., **Infectious Disease in Aquaculture**, 2012
LeBoffe, M.J. & Pierce, B.E., **Microbiology: Lab Theory and Appplication**, 4, 2015

Recommendations

Other comments

As it is an optional subject that can be taken by all the students of the degree in Marine Sciences, previous knowledge is not considered necessary, beyond the knowledge acquired in the subjects of Principles of Marine Microbiology (V10G060V01404) and Marine Zoology (V10G060V01405)
His knowledge can be applied to the study of Biological Oceanography (V10G060V01601), Fisheries (V10G060V01703), Aquaculture (V10G060V01801) or the Biology of Fish and Shellfish (V10G060V01902)

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 ===

MIXED TEACHING SCENARIO
In accordance with the forecasts and recommendations communicated by the Centre and the Rectorate, in the mixed teaching scenario, teaching planning and teaching and assessment methodologies (including their respective percentages and specific comments) will be maintained as set out in the original Teaching Guide (face-to-face modality). With regard to theoretical teaching (master classes and seminars), students enrolled will be divided into the groups necessary to respect the recommended safety distances, taking into account the physical classroom (Aula Integra) assigned to teach the subject, according to the guidelines of the Rector's Office, the Occupational Risk Prevention Service and the Centre itself. Shifts will be established, so that each group will rotate equally through the Integrated Classroom to attend the class taught by the teacher, while students from other groups who are not in the physical classroom that day will be able to follow the class, in a synchronized manner, through the Remote Campus, thanks to the technical solutions enabled by the Rectorate in the Integrated Classrooms.
As for the practical teaching, it will be carried out in a face-to-face way, in groups of no more than 20 students, respecting scrupulously the safety and protection measures established by the Occupational Risk Prevention Service and the Centre itself.

DISTANCE LEARNING SCENARIO
In the event that the health situation involves a new closure of the facilities for the students, the subject will be taught in a non-presential way. For this purpose, the Remote Campus set up by the University for this type of situation and the FaiTIC tele-teaching platform will be used. Regarding the teaching of theoretical contents (master classes and seminars), both the planning and the methodologies included in the original Teaching Guide will be respected (face-to-face mode), since the virtual classrooms of the Remote Campus allow not only the perfect teaching of master classes by the teaching staff but also the giving of presentations by the students (practical cases of seminars). With regard to practical teaching, we will try to replace classroom teaching by combining the following activities/methodologies: 1) Specific virtual sessions where teachers will explain the basic foundations of the main techniques of the subject. 2) Visualization of videos uploaded or recommended by the teaching staff and consultation/search for support information related to these techniques and the interpretation of their results. These tasks will correspond to the student's personal work. 3) Setting up questionnaires/exercises with practical situations/problems that the students will have to solve based on the knowledge and competences previously acquired in the other two activities (it may be necessary in some cases to read additional material). This last activity, which will also involve the student's personal work, will be used as a methodology to evaluate the student's acquisition of knowledge and skills related to practical teaching.
The evaluation of theoretical content will be addressed through the resolution of periodic questionnaires and the rest of the evaluation methodologies will be identical to those reflected in the original Teaching Guide (classroom-based), maintaining

the same percentages of weight for the final grade (questionnaires/practice exercises, 45%; seminars, 20%; problem solving, 20% and theoretical knowledge, 15%). The rest of the criteria that appear in the section "other comments on the evaluation" of the original Teaching Guide will also be respected (face-to-face mode).

ATTENTION TO STUDENTS
Both in the mixed teaching scenario and, mainly, in the non-attendance teaching scenario, the tutorial sessions will be carried out by telematic means (e-mail, videoconference systems, FaiTIC forums, etc.) in all cases by appointment.

IDENTIFYING DATA				
Marine genetic resources				
Subject	Marine genetic resources			
Code	V10G060V01907			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Sanjuan López, Andrés			
Lecturers	Sanjuan López, Andrés			
E-mail	asanjuan@uvigo.es			
Web				
General description	The ""Marine Resources"" appear with frequency in the curricular profile of the graduated in Sciences of the Sea. They are hence one of the fundamental objects of academic study during the career, and of professional management after her. This rol central of the biota marine owes to studied from industrial perspectives, technological, physical-chemical oceanographic and biological (biochemical, physiology, genetic, ecology, etc.). The Genetic ""approach"" is crucial in the management of the biological resources so much since it ponto of natural sight (genetic preservation) how of the sua exploitation well was merely extractiva (pesquerias and marisqueo) or by means of crop to different levels of producción (acuicultura). ¿That it would serve to elaborate a complex plan of exploitation of a resource that include studies of economic feasibility, technical and sociological, yes when putting in practice it realized that the resource lacks of the sufficient genetic diversity to adapt to environmental changes, to design strategies of genetic selection or simply to keep in the his excellent reproductive?. The Genetic plays so a central paper in the management of resources, whose knowledge no can obviate given the current eases stop the analysis of the genomes.			

Competencies	
Code	
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
CE10	To know the problems and the basic principles of sustainability in relation to the use and exploitation of the marine environment
CE12	To be able to operate the instrumental techniques applied to sea
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CE20	To find and evaluate marine resources of various kinds
CE24	To participate and carry out training and outreach programs on the marine and coastal environments
CE32	Quality control of seafood
CE33	Fisheries control
CE36	aquariology
CT6	Problem management and solving skills
CT11	Ability to learn independently and continuously

Learning outcomes	
Learning outcomes	Competences

To. Specific: Cognitive (know): Comprise the concepts and the basic processes of the genetic variability, of the genetic differentiation interpoboacional and of the evolution and divergence of the species in quantitative genetic characters and qualitative	CB5	CE1 CE2 CE5 CE6 CE8 CE10 CE12 CE14 CE15 CE17 CE18 CE20 CE24 CE32 CE33 CE36	CT6 CT11
To. Specific: Procedimentales/Instrumental (know do): Make genetic analyses; Carry out genetic advice: Analyse and characterise biological samples; Make phylogenetic analyses. Obtain and organise information, design experiments and interpret results. Apply the molecular technicians to practical cases of management of the marine genetic resources	CB3	CE1 CE2 CE10 CE12 CE17 CE18 CE20 CE24 CE32 CE33 CE36	
To. Specific: Actitudinales (be): Autonomous; Able to design experiments	CB5	CE20 CE36	CT11
B. Transversal/Generic: - Personal: critical Reasoning; Work in team - Others: capacity to apply the theoretical knowledges in the practice; use of Internet like media and like source of information	CB4		CT6 CT11

Contents

Topic	
Subject 1. Introduction	Presentation and analysis of the program. Taking of decisions on the process of learning and the system of evaluation of the course. Evaluation of the level of genetic knowledge of the students. Review of basic genetic concepts.
Subject 2. The genetic variability. The Mendelian Traits.	Genetic Variability and Classes of Hereditary Characters. Mendelian Genetics. Dominance Relationships and Multiple Alleles. Gene Interactions and Lethal Alleles. Selection of Mendelian Characters in Aquaculture.
Subject 3. Quantitative characters.	Genetic analysis of the Continuous Traits. The biometrical methods in Quantitative Genetics. Heritability. Response to Selection and Application in Aquaculture.
Subject 4. Genetic Structure of Populations and Molecular Markers.	The Discrete Genetic Variability.The Ideal Population. Non Random Mating and Inbreeding. Measuring Genetic Variation at Protein and DNA Levels. Allozyme Polymorphisms. RFLPs. PCR. Minisatellites and Microsatellites. Sequences of DNA Sequence Variation.
Subject 5. Populational Genetic Structure and Evolutionary agents	Agents that Change Gene Frequencies in Populations. Mutation. Migration. Random Genetic Drift. Natural Selection.
Subject 6. Populational Genetic Structure and Management of Marine Genetic Resources.	Populational Genetic Structure. Genetic management of Fisheries and the Biological Stock Concept. Genetic Management in Aquaculture: Exploitation and Aquaculture Stocks. Conservation Genetics and Marine Biodiversity. Genetics and Biological Invasions.
Practice 1. Experimental Genotyping of Populations by PCR. Identification of species.	DNA Extraction. DNA Amplificacion PCR. Molecular separation using Agarose Electrophoretic Migration. Visualisation of PCR Products. Interpretation of genotypes and Record of data.
Practice 2. Experimental Genotyping of Populations by PCR-RFLP. Populational analysis or authentication of Fishery Products.	DNA Extraction. PCR of a mitochondrial gene. Digestión of PCR Products with Restriction Enzymes. Electrophoretic Migration. Interpretation of the Electrophoretic Patterns. Populational analyses or Identification of species for each Fishery Product.
Practice 3. Bioinformatic Analyses of intra e interspecific populational genetic data.	Tabulation of the genetic data obtained in the Laboratory or in the International Databases. Molecular Phylogenetic Inference employing Genetic Distances and Phylogenetic Methods.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	18	21.6	39.6
Practices through ICT	5	7	12
Laboratory practical	15	18	33
Problem solving	12	14.4	26.4
Mentored work	1	8	9
Objective questions exam	1	5	6
Problem and/or exercise solving	2	10	12
Essay questions exam	2	10	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 professor will present the conceptual foundations of each subject. The student has to complete each subject consulting the bibliographic resources and webs corresponding to each subject.
Practices through ICT	The professor will prepare a guide of each one of the practices. The students will make diverse practices with distinct computer applications and with data facilitated by the professor or achieved by the students.
Laboratory practical	The professor will prepare a guide of each one of the practices. The students will make several experiments that will allow to obtain products of PCR and patterns electroforéticos of PCR and PCR-RFLP products of individuals of distinct populations, species or fishery products.
Problem solving	Problems resolved in the classroom and practical cases adapted to each theoretical concept, technic or biological situation of the resources.
Mentored work	Individual work or in group on subjects or articles related with the subjects. The professor will propose a list of the subjects or articles, although it admits the suggestion of the same by the students. Identification of the subject and of the materials, preparation and presentation.

Personalized assistance	
Methodologies	**Description**
Practices through ICT	There will be a personalised attention according to the needs of each student.
Lecturing	In the case of questions or explanations by part of the students, there will be a personalised attention according to the needs of each student
Laboratory practical	There will be a personalised attention according to the needs of each student
Mentored work	There will be a personalised attention according to the needs of each student
Problem solving	There will be a personalised attention according to the needs of each student

Assessment					
	Description	Qualification	Evaluated Competencess		
Practices through ICT	Correct execution of the analytical process alone based on a series of data previously provided by the teacher or obtained from international databases. A report will be sent with the Tables, Figures, statistical tests, relevant hypotheses and conclusions.	10		CE12 CE18 CE32 CE33	CT6 CT11
Mentored work	Realization of a written work on a subject or articles previously agreed with the tutor. The interaction with the tutor and the rest of the group will be taken into account, if applicable, the interest and depth of the approach, clarity and precision in the concepts and developments carried out.	10		CE12 CE18 CE32 CE33	CT6 CT11
Objective questions exam	Tests to strengthen the concepts, clarify the differences between different concepts or processes or laws, to perform simple data calculations or significance tests.	10	CB3 CB4 CB5	CE1 CE2 CE8 CE14 CE32 CE33 CE36	CT6 CT11

Problem and/or exercise solving	Resolution of 50% of the written partial or final exam, consisting of problems, or practical cases with simple mathematical applications	35	CE1 CE2 CE8 CE14 CE32 CE33 CE36	CT6 CT11
Essay questions exam	Resolution of 50% of the written partial or final exam, consisting of questions of more or less long development, laws, demonstrations, exhibition of models, etc.	35	CE1 CE2 CE8 CE14 CE32 CE33 CE36	CT6 CT11

Other comments on the Evaluation

The contents imparted, incluided lectures, experimental and informatic practises and seminars, will be evaluate in the control proofs and in the partial and final examinations.
Date, time and place of exams will be published in the official web of Marine Sciences Faculty: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3
Along course, but mainly in the first 6 weeks will realize at least 2 short proofs of 30 min each (no eliminatory of subject). These marks, joint the appreciations of the active participation in the class in the resolution of problems, and in the experimental and informatic practices will be about 10 % of the Final Qualification. The assessment of the report of the Informatic Application to distinct data, and of other work will be other 10 % of the Total. An examination or partial proof will be realize for the first half of the course that will be subject to elimination. At the end of the course a final examination will include the two halves of the course. These last examinations will consist in distinct definitions, demonstrations, exercises, problems and developmental questions.

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

Sources of information

Basic Bibliography

Hedrick, P.W., **Genetics of Populations**, 4th, Jones & Bartlet Publ, 2011

Pandian, T.J, Strüssmann, C.A. & Marian, C. (Eds.), **Fish Genetics and Aquaculture Biotechnology**, Oxford & IB Publi./Science Publish, 2005

Fontdevila, A. & Moya, A., **Introducción a la genética de poblaciones**, Ed. Sintesis, 1999

Complementary Bibliography

Avise, J., **Molecular Markers: Natural Hist ory and Evolution**, Chapman & Hall, 1994

Recommendations

Other comments

The students that take this subject, would have previous knowledges on the nature of the hereditary material (DNA), his transmission, mutation, and expression (Biology, first course of the degree), on the calculation of probabilities, test of of significance (as Tests of X2), and on concepts and calculations of correlation, regression and analysis of variance.
It is required of the students a responsible and honest behaviour.
It is considered inadmissible any form of fraud (as Copy or Plagiarism) to change the level of knowledge or skill reached by a person in any type of proof, test, report or work designed with this purpose. This fraudulent behaviour will be sanctioned with the firmness and rigour that establishes the valid rule.

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 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 no totally face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a way but agile and effective 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 **DOCNET.

=== ADAPTATION OF The METHODOLOGIES ===
* educational Methodologies that keep :
The indicated in the guide, except the derivatives of the does not witness in the common classrooms, like the practices of laboratory.

* Educational methodologies that modify :
they will employ the resources of the Remote Virtual classroom for the teaching and debate of the on-line classes, *asi like the Platform *FAITIC of the University of of Vigo for the access to documents of theory (the presentations in format PDF, distinct texts, articles, problems resolved with detail or no, test type "test", etc.). It will require the presentation of some problems and individual works in concert with the professor.
The students will be able to execute the distinct reports, works or exercises by manual writing (with photo or scan of the pertinent pages) or in digital format with a processor of text and insertion, yes proceeds, of the diagrams or figures.
You practise them of laboratory, of not being possible to make them of face-to-face way, will adapt with distinct computer programs, *videos and experimental calculations (these last will remit to the professor).

* Mechanism no face-to-face of attention to the students (*tutorías)
The *tutorias will make in group in day and hour (1-2 *h) by week *ce agreement with the students. Individually, it will attend by email, or by telephone, or by "*Skype".

* Modifications (if it proceeds) of the contents to give
keep as in the guide.

* Additional bibliography to facilitate to car-learning
As in the guide, and including some bibliographic material in format "pdf", and *videos and computer programs.

* Other modifications

=== ADAPTATION OF The EVALUATION ===
keep the percentages proposed, with the exception of the type of presentation of the same (see. To continuation)

* Proofs 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] =&**gt; [new Proof]

* New proofs:
The different works, problems resolved, calculations of experimental process, Test of control, etc., made by writing along the course will be sent by post *electronico to the professor with limit of date of reception of each one. The final exercise will make by writing and with sequential access to each fourth part of the examination in the platform *FAITIC and the answer will be envoy to the professor before a suitable time (*p.And., 25 *m), that to continuation (5 *m afterwards) will facilitate the access to the following batch of questions or problems in the platform *FAITIC, and *asi until the total of the examination. Alternatively it will employ the Resources of the Remote Virtual Classroom of the University of Vigo.
The students will be able to execute the distinct reports, works or exercises by writing manually (with photo or scan of the pertinent pages) or in digital format with a processor of text and insertion, yes proceeds, of the diagrams or figures.

* Additional information

IDENTIFYING DATA				
Oceanographic remote sensing				
Subject	Oceanographic remote sensing			
Code	V10G060V01908			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Torres Palenzuela, Jesús Manuel			
Lecturers	Torres Palenzuela, Jesús Manuel			
E-mail	jesu@uvigo.es			
Web	http://www.tgis.uvigo.es			
General description	Introduction to the physical principles of the Teledetection and his Oceanographic Applications			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE12	To be able to operate the instrumental techniques applied to sea
CE18	To transmit writing, verbal and graphical information for audiences of various types
CT4	Basic computing skills related to the field of study
CT5	Information technology skills (search and data analysis)

Learning outcomes		Competences	
Know the physical principles of the Teledetection and applications in the field of the Oceanography		CE12	CT4 CT5
Learn to use programs of Treatment of Images of Satellite in marine applications.	CB1 CB2 CB5	CE18	CT4

Contents	
Topic	
1.-INTRODUCTION To THE Objective TELEDETECTION Pretend with this first subject enter to the student in the world of the teledetection and the paper that this plays in the modern oceanography.	1.1.- Teledetection in Oceanography 1.2.- Brief history of the space observation of the oceans 1.3.- Possibilities for the oceanography 1.4.- Temporary and space scales of the phenomena of interest.
2.- PHYSICAL PRINCIPLES OF THE Objective TELEDETECTION In this unit pretends that the student know the principles of the physics of the electromagnetic radiation, his interaction with the atmosphere, as well as the spectral characteristics of the covers.	Contents 2.1.- Radiation and electromagnetic spectrum. 2.2.- Terms and units of measure. 2.3.- Principles of the electromagnetic radiation. 2.4.- *Caractrísticas Spectral of the covers. 2.5.- Interaction of the atmosphere with the radiation. 2.5.1.- Absorption. 2.5.2.- Dispersion. 2.5.3.- Broadcast.

3.- ELEMENTS OF A SYSTEM OF TELEDETECTION: In this unit enters to the student in the characteristics that define to a sensor and space platform as well as the steps required from the capture of an image by a sensor until his application and utilisation by part of an user. Finally they describe the most used satellites.	Objective Contents: 3.1. System of reception of images Elements of the system Platform and sensor Orbits Resolution of a sensor Types of sensors Platforms
4.- *ANALISIS And DIGITAL TREATMENT OF IMAGES: In this unit establish the principles of visual and digital interpretation as well as the processing of the information with the object to delete errors (correction), improve some appearance of the information obtained (enhance) or obtain other parameters from the data of radiance (transformations). Finally it will enter to the student in the digital classification and the integration of information in systems of geographic information.	Objective Contents: 4.1. Visual analysis 4.1.1. Criteria of Interpretation 4.2. Digital treatment 4.2.1. Digital image 4.2.2. Corrections 4.2.3. It enhance 4.2.4. Transformations
5.- APPLICATIONS	Aims: In this last unit enumerate the applications of the teledetection in meteorology and study of the oceans. In each one of these applications realises a description of the physical principles that make it possible, as well as the interpretation of the results obtained and the sensors used.

Planning			
	Class hours	Hours outside the classroom	Total hours
Practices through ICT	20	10	30
Seminars	7	15	22
Lecturing	25	52	77
Laboratory practice	4	0	4
Essay	0	15	15
Problem and/or exercise solving	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	The methodology that uses in the practical is the one of study directed.
Seminars	There will be an individualized tracking techniques and content for the development of the scheduled jobs. Its main objective is to clarify the concepts that have been explained in the kind of theory or solve any of the problems of practical classes.
Lecturing	The lesson *magistral is the method mainly employee, using in the measure of the possible the lesson had a conversation.

Personalized assistance	
Methodologies	**Description**
Lecturing	The master lesson is the method mainly employee, using in the measure of the possible the lesson had a conversation. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Practices through ICT	The methodology that uses in the practical is the one of study directed.

Seminars	It will realise a individualised follow-up of technicians and contents for the development of the works scheduled . His main aim is to clear the concepts that have been explained in the class of theory or resolve any of the problems of the practical classes.

Tests	**Description**
Essay	They will be works on subjects of applications of the teledetection in base to scientific publications and the matter of the subject

Assessment

	Description	Qualification	Evaluated Competencess		
Practices through ICT	The methodology that uses in the practical is the one of study directed.	10-20	CB1 CB2	CE12	
Seminars	It will realise a follow-up *individualizado of technicians and contents for the development of the works scheduled	0-5	CB1 CB2		CT5
Lecturing	The lesson *magistral is the method mainly employee, using in the measure of the possible the lesson had a conversation.	0	CB1 CB2		
Laboratory practice	By his part, the practical examinations outline of particular use to the hour to evaluate the application of the knowledges purchased. So many theorists like practical. They comport difficulty of implementation regarding the available places for the same and to the necessary variety of examinations, but provide an excellent half for the assessment regarding the application of the knowledges.	20	CB1 CB2		CT4
Essay	*Seran Assigned subjects by groups of two students	10-60	CB1 CB2	CE12	CT4 CT5
Problem and/or exercise solving	The examination has to form part of a systematic evaluation, understood this as the one who obeys to a previously established programming and that does not realise of an occasional or incidental way. By means of the realisation of an examination pretends , generally, evaluate: * The knowledges that about a matter possesses the student. * The capacity of relation of some knowledges with others. * The application of the knowledges to the resolution of concrete problems.	60-0	CB1 CB2 CB5	CE12	

Other comments on the Evaluation

Date, time and place of exams will be published in the official web of Marine Sciences Faculty: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record

Sources of information

Basic Bibliography

Oceanografía y Satélites, Tebar, 2009

CRACKNELL, A.P. u HAYES, L.W.B., **Introduction to Remote Sensing**, Taylo & Francis, 1991

Complementary Bibliography

Recommendations

Subjects that are recommended to be taken simultaneously

Geographic analysis methods/V10G060V01904

Other comments

Date, time and place of exams will be published in the official web of Marine Sciences Faculty:

http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

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)
By post, virtual classroom and *Faitic
* Modifications (if they proceed) of the contents to give
does not proceed
* additional Bibliography to facilitate the car-learning
does not proceed
* Other modifications

=== ADAPTATION OF THE EVALUATION ===
* Test already made
Proof XX: [previous Weight 00%] [Weight Proposed 00%]
keep percentages

* Test slopes that keep
Proof XX: [previous Weight 00%] [Weight Proposed 00%]
keep percentages

* Test that they modify
Any

* New proofs
Any

* additional Information
Any

IDENTIFYING DATA				
Applied marine geology				
Subject	Applied marine geology			
Code	V10G060V01909			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Gago Duport, Luís Carlos			
Lecturers	Díez Ferrer, José Bienvenido Francés Pedraz, Guillermo Gago Duport, Luís Carlos Méndez Martínez, Gonzalo Benito			
E-mail	duport@uvigo.es			
Web	http://http://webc10.webs.uvigo.es/ficha.php?id=16			
General description	It is a theoretical-practical subject that is directed to the integration of previous acquired geological knowledge, focusing its application on the study of geological risks, marine geological resources and advice in coastal engineering.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE6	Ability to identify and understand the problems in the field of oceanography
CE11	To manage the use of littoral and coastal region and their resources in a sustainable way
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE20	To find and evaluate marine resources of various kinds
CE26	To plan, direct and write technical reports on marine issues
CE30	Identify and assess environmental impacts in the marine environment
CE37	Technical advice or assistance on issues related to the marine and coastal environment
CT1	Analysis and synthesis ability
CT6	Problem management and solving skills

Learning outcomes	Competences		
1. Know and locate the main marine geological resources	CB1 CB2 CB3 CB5	CE6 CE20	CT1
2.- Know interpret and integrate geophisical and geological data in the exploration and prospection of marine geological resources	CB1	CE13 CE20	CT1 CT6
3. Know the main geological risks sea coasts and submarines and the consequences	CB3	CE6 CE14 CE16 CE30	CT1
4. Geochemical modelling of pollution processes in the marine environment.	CB2 CB3	CE11 CE13 CE16 CE30 CE37	CT1

5. Realisation of geological reports.	CB3	CE14 CE26 CE30 CE37	CT1

Contents	
Topic	
1-Introduction. (1 hour class).	1.0. Introduction.
2 - Coastal and submarine Geological Risks (GR). (6 hours class) (6 hours seminars) (8 hours field trip) (4 hours practical works)	Theory 2.1. Definition and types of coastal and submarine GR. 2.2. Coastal and submarine GR linked to the external geodynamics 2.3. Coastal and submarine GR linked to the internal geodynamics. 2.4. Changes in sea level. Field trip: Risks of coastal flood. Data collection. Practices: Geochemistry of marine pollution processes. Seminars 1, 2 and 3: Submarines volcanic risks and tsunamis.
3- Marine Geological Resources (11 hours class) (6 hours seminars)	Theory 3.1. Distribution and origin of the elements present in the sea and in the marine sediments. 3.2. Methods and technical of exploration and exploitation of marine geological resources. 3.3. Marine mineral resources (MMR). 3.3.1. Sediments no consolidated: Arid, placers deposits and salts. 3.3.2. deposits in nodules and crusts: Phosphorites, nodules and crusts of Fe-Mn. 3.3.3. Hydrothermal deposits. 3.4. Marine energetic resources (MER) and Geology of the Carbon. 3.4.1. Exploration and exploitation of hydrocarbons 3.4.2. Origin and interest of the hydrates of gas as resource. 3.5. Mechanisms of capture and transformation of the CO2 Seminars 4, 5 and 6: Resolution of practical exercises in relation to the exploration of hydrocarbons.
4 □ Impact of human activity in the coast. Marine geology and Society (8 hours field trip) (2 hours seminars)	Field Trip: Different coastal examples in which detailed geological studies are needed Seminar 7. Discussion on the treatment given to different past and present coastal geological problems.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	18	54	72
Seminars	14	28	42
Laboratory practical	4	12	16
Studies excursion	16	0	16
Essay questions exam	2	0	2
Problem and/or exercise solving	1	0	1
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
Lecturing	Theoretical classes
Seminars	Exhibition of practical cases. Resolution of exercises related. Debate.
Laboratory practical	Seawater pollution geochemistry
Studies excursion	Risks of coastal flood and data collection. Human activity in coasts, geological context analysis.

Personalized assistance	
Methodologies	**Description**

Lecturing	Theoretical classes. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Seminars	Analysis of different topics related to the competences of the subject. Detailed instructions on how to report a file. Specialised Database query. Advise on the choice of a topic to develop in the report. Resolution of doubts through individualised tutoring. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Laboratory practical	Explanation and preparation of geological risk maps in coastal zones in small groups. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Studies excursion	Risk mapping. Data analysis of anthropic activity in the coast and its relationship with the geological environment. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation

Tests	**Description**
Essay questions exam	Part of the theoretical-practical test
Problem and/or exercise solving	Part of the theoretical-practical test
Problem and/or exercise solving	Part of the theoretical-practical test

Assessment

	Description	Qualification	Evaluated Competencess		
Lecturing	Compulsory assistance	0			
Seminars	It will considered the participation on the seminars as well as the work performed on the different topics treated in the seminars. In the debate we will be evaluated the strenghing of the scientific arguments presented by each working group.	40	CB1 CB2 CB3	CE6 CE30	CT1
Laboratory practical	Assistance, participation and delivery of the memory.	10	CB1 CB3	CE11 CE13	CT1 CT6
Studies excursion	Assistance, participation and delivery of the report.	10	CB3	CE11 CE13 CE14 CE20 CE30	CT1
Essay questions exam	Part of the theoretical-practical test.	30	CB1 CB5	CE11 CE20 CE30 CE37	
Problem and/or exercise solving	Part of the theoretical-practical test.	5	CB1	CE20 CE30	CT6
Problem and/or exercise solving	Part of the theoretical-practical test.	5	CB2	CE6 CE11	CT1 CT6

Other comments on the Evaluation

The attendance to the theoretical classes, practices, seminars and field trips is obligatory. Students who do not attend seminars or practices may not submit the relevant reports and be presented to the overall assessment.

For a student to be considered "Not Presented" does not have to have been evaluated in any item.

The final exam, in any of the calls, will include any theoretical and/or practical aspects exposed during the course, including fieldtrips, practices and seminaries.

Ordinary call.

In order to pass the subject by **continuous evaluation** and to take the final written test that represents 40% of the mark, it

will be necessary to exceed 40% of the mark in each and every evaluable items. Otherwise it is considered that the student goes to **global evaluation** and is presented to a single final written test for 100% of the score.

Extraordinary call

A single exam that counts 100% of the score.

Exam dates and classes can be viewed on the website of the Faculty of Marine Sciences.

Individualised tutoring

Tutoring schedules of teachers of the subject can be found on the TEMA platform.

Students are strongly requested to fulfil an honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher's proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record

Sources of information

Basic Bibliography

Beatley, T., **An Introduction to coastal zone management**, second edition, Island Press, 2002

Burns, R. (Ed.), **Marine Minerals. Reviews in Mineralogy, vol 6**, Mineralogical Society of America, 1979

Craig, J.R., Vaughan, D.J. & Skinner, B.J., **Recursos de la Tierra y el Medio Ambiente.**, 4ª Ed., Pearson Education, 2012

Cronan, D.S., (Ed.), **Marine Minerals in Exclusive Economics Zones**, Chapman & Hall, 1992

Earney, P.C.E., **Marine Mineral Resources**, Taylor & Francis, 2012

Complementary Bibliography

Couper, A., **The Times Atlas and Encyclopaedia of The Sea**, Times Book Ltd., 1989

Cronan, D.S., **Handbook of Marine Mineral Deposits**, CRC Press, 1999

Keller, E.A., Blodgett, R.H., **Riesgos Naturales: Procesos de la Tierra como riesgos, desastres y catástrofes**, Pearson Educación, 2007

Méndez, G., Rey, D., Bernabeu, A.M., Manso, F. y Vilas, F., **Recursos minerales marinos en la costa gallega y plataforma adyacente**, Journal Iberian Geology, 26, 2000

Seibold, E.; Berger, W.H., **The sea floor. An introduction to marine geology**, third Edition, Springer, 2010

Teleki, P.G, Dobson, M.R., Moore, J.R. & von Stackelberg, U. (Eds.), **Marine Minerals. Advances in Research and Resource Assessment**, Springer, 1987

Recommendations

Subjects that are recommended to be taken simultaneously

Marine contamination/V10G060V01701
Marine and coastal management/V10G060V01704

Subjects that it is recommended to have taken before

Geological oceanography I/V10G060V01504
Geological oceanography II/V10G060V01603

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

-Teoretical teaching and Seminars through the virtual classroom

educational Methodologies that modify :

-Field work:

Option 1. Geological journey accross the campus. Geomorphological description of the Vigo's ria view from the forest park.

Option. 2. Evaluation of the anthropic risks associated to various coastal places through the analysis of aerial photographies. Analysis of marine pollution through geochemical modelling

Laboratory practices:

- Laboratory teaching will be substituted by activities related with the use of computer programs by using free software.The installers will be placed in faitic.

Tutorials:

-Tutoríals will be done in the virtual office of the professors.

The seminars will be performed in the Virtual Classrooms and with the addtional use of questionnaires and exercises in FAITIC for the development of the associated practical activities (asynchronous way).

* Additional bibliography to facilitate the car-learning

* Other modifications

=== ADAPTATION OF THE EVALUATION ===

* Test assessment that keep unaltered :

Seminars: [previous Weight 40%] [Weight Proposed 40%]

* Test assessment that are modfied :

Practices of laboratory => practical Exercises in Faitic [previous Weight 10%] [Weight Proposed 10%]

Fiield work/virtual activities [previous Weight 10%] [Weight Proposed 10%].

-Theoretical-practical examination: Will be substituted by the realisation of written works realted to different theoretical topics. His assessment will be able to reach until 40% of the final note.

* New proofs:

Global Examination by telematic way

*Additional information

In the case of applying to the Global Evaluation, the physical classroom examination will be substituted by an Oral Examination (theoretical part) in the Virtual Classroom together with the resolution of Questionnaires in FAITIC (practical part).

IDENTIFYING DATA				
Final Year Dissertation				
Subject	Final Year Dissertation			
Code	V10G060V01991			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	12	Mandatory	4th	2nd
Teaching language	Spanish Galician English			
Department				
Coordinator	Francés Pedraz, Guillermo			
Lecturers	Francés Pedraz, Guillermo			
E-mail	gfrances@uvigo.es			
Web	http://http://webs.uvigo.es/facultadeccdomar/index.php/es/trabajo-fin-de-grado			
General description	The final degree project is a matter inside the plan of studies of the Degree of Marine Sciences. It is a personal work that each student will prepare in a autonomous form under supervision educational and has to allow him show of form integrated the acquisition of formative contents and the competitions associated to the title of Marine Sciences.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE3	Critical understanding of the history and current status of the Marine Sciences
CE4	To know the basic techniques to sample the water column, organisms, sediments and sea bottom, as well as the surveying methods for dynamic and structural variables
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE7	To know the basics of market economy applied to marine resources
CE8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
CE9	To be familiar with the public and private, national and international organizations and institutions related to the Marine Sciences
CE10	To know the problems and the basic principles of sustainability in relation to the use and exploitation of the marine environment
CE11	To manage the use of littoral and coastal region and their resources in a sustainable way
CE12	To be able to operate the instrumental techniques applied to sea
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CE19	To map and characterize the seabed and the underground in marine and coastal areas
CE20	To find and evaluate marine resources of various kinds
CE21	To manage marine and coastal protected areas
CE22	To control marine pollution problems
CE23	To design, control and manage recovery centers for threatened marine species
CE24	To participate and carry out training and outreach programs on the marine and coastal environments
CE25	To participate in and advise on research on wave climate

CE26	To plan, direct and write technical reports on marine issues
CE27	To understand the operation details of enterprises linked to the marine environment, and to recognize their specific problems and solutions
CE28	To teach marine science at diferent levels
CE29	Skill in the practical use of models and in the incorporation of new data for their validation, improvement and development
CE30	Identify and assess environmental impacts in the marine environment
CE31	Ability to function and operate in public and private, national and international institutions in the field of marine science
CE32	Quality control of seafood
CE33	Fisheries control
CE34	To design, control and manage aquaculture production plants
CE35	Water quality control in water treatment plants
CE36	aquariology
CE37	Technical advice or assistance on issues related to the marine and coastal environment
CE38	Technical use of renewable energies
CT1	Analysis and synthesis ability
CT2	Organization and planning skills
CT3	Written and oral communication in the official languages of the University
CT4	Basic computing skills related to the field of study
CT5	Information technology skills (search and data analysis)
CT6	Problem management and solving skills
CT7	Decision making
CT8	Teamwork ability
CT9	Critical-review and self-criticism capacity
CT10	Ethical commitment
CT11	Ability to learn independently and continuously
CT12	Ability to adapt to new situations
CT13	Ability to generate new ideas (creativity)
CT14	Initiative and entrepreneurship
CT15	Ability to apply knowledge in practice
CT16	Research skills
CT17	Sensitivity towards environmental issues

Learning outcomes

Learning outcomes	Competences

Includes all the learning outcomes of the degree, developing more in depth one or the other depending on the focus and the specific subject of each Final Degree Work	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE3 CE4 CE5 CE6 CE7 CE8 CE9 CE10 CE11 CE12 CE13 CE14 CE15 CE16 CE17 CE18 CE19 CE20 CE21 CE22 CE23 CE24 CE25 CE26 CE27 CE28 CE29 CE30 CE31 CE32 CE33 CE34 CE35 CE36 CE37 CE38	CT1 CT2 CT3 CT4 CT5 CT6 CT7 CT8 CT9 CT10 CT11 CT12 CT13 CT14 CT15 CT16 CT17

Contents

Topic	
Given his special character to matter does not have own contents, will depend of the subject assigned to the student. Inside the offer of final degree projects of the faculty, the student will have the option to opt by any one of them.	It has to have in consideration the rules of final degree projects of the Faculty, published in the web page , whereby assign the different kind of projects and the respective supervisors. The works can be done and defended in Spanish, Galician and English. Both the language of performance and the language of presentation will be recorded in the individual record of each student.

Planning

	Class hours	Hours outside the classroom	Total hours
Presentation	1	10	11
Lecturing	2	0	2
Mentored work	0	282	282
Essay	2	1	3

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

Methodologies

	Description
Presentation	The TFG must be defended in front of a tribunal formed by three professors of the degree, in the terms established in the regulations of the Faculty. http://mar.uvigo.es/index.php/es/alumnado-actual/trabajo-fin-de-grado
Lecturing	Two hours of class are reserved, where the coordinator of the subject of Final Degree Work will present the keys for the elaboration and defense of the TFG.

Mentored work	As a final result, a report adjusted to the conditions established in the regulations of the Faculty will be presented. http://mar.uvigo.es/index.php/es/alumnado-actual/trabajo-fin-de-grado

Personalized assistance

Methodologies	Description
Mentored work	It will correspond to the tutor assigned for each final degree project supervise the student in the development of the work chosen. Students must attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimize the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Lecturing	The professor coordinator of the subject will be the responsible of the master sessions, in which will be able to give some advice to the students in reference to the structure, editorial, inclusion of references and how to obtain the final document for the defence in the special software application for this subject. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimize the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.

Assessment

	Description	Qualification	Evaluated Competencess
Essay	Evaluation by part of the tutor of the competitions developed by the student in the work and in the editorial of the final memory. Value: 30% Evaluation of the written memory and oral presentation by the tribunal. Value: 70% In the rule of final degree project of the Faculty you can find in detail all the procedure that has to adopt the student and his tutor, both for the written part and for the evaluation.	100	

Other comments on the Evaluation

The final degree project is governed by the rule approved in the Marine Science Faculty, which is published in the web page of the centre.

The Academic Commission of the final degree project, prior to the start of the work, will make public the criteria of evaluation that will use so much the tutor to issue his report like the court to evaluate the memory of the work and his defence.

They will make public in the web page all the terms that reach the presentation of the memories, the defences and the presentation of the reports by the tutors. These terms will be approved by the Academic Commission of the final degree project. In case that the student surpass the evaluation of the Tutor and do not surpass the court of evaluation will issue a justificative report. Once attended the recommendations of the report, said student will be able to go back to present the final degree project in the following period of evaluation.

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

Other comments

As in all subjects, personal effort is essential, as well as attending to the instructions of the tutor and delivering the report in the deanery within the deadlines set by the Academic Committee of TFG.

It is recommended to read carefully the regulations related to the elaboration and defense of TFG of the Center and all the related documentation that can be found in
http://mar.uvigo.es/index.php/es/alumnado-actual/trabajo-fin-de-grado

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
The face-to-face session on Elaboration and defense of the TFG becomes an online session.

* Non-attendance mechanisms for student attention (tutoring)
The attention to students by their tutor and the TFG coordinator will be carried out through different channels, such as email, Faitic and the virtual offices of the Remote Campus. In the latter case, it will be necessary to make an appointment.
* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===
* Tests already carried out
The same value is maintained...

* Pending tests that are maintained
The same value is maintained
...

* Tests that are modified
Face-to-face defense of the TFG => Online defense of the TFG

* New tests

* Additional Information