



(*)Facultade de Ciencias do Mar

(*)Grao en Ciencias do Mar

Subjects			
Year 3rd			
Code	Name	Quadmester	Total Cr.
V10G060V01318	Internships	2nd	6
V10G060V01501	Physiology of marine organisms	1st	6
V10G060V01502	Biological oceanography I	1st	6
V10G060V01503	Physical oceanography I	1st	6
V10G060V01504	Geological oceanography I	1st	6
V10G060V01505	Chemistry applied to the marine environment I	1st	6
V10G060V01601	Biological oceanography II	2nd	6
V10G060V01602	Physical oceanography II	2nd	6
V10G060V01603	Geological oceanography II	2nd	6
V10G060V01604	Chemistry applied to the marine environment II	2nd	6
V10G060V01901	Basin Analysis	2nd	6
V10G060V01902	Fish and shellfish biology	2nd	6
V10G060V01903	Economics and legislation	2nd	6
V10G060V01904	Geographic analysis methods	2nd	6
V10G060V01905	Modelling	2nd	6
V10G060V01906	Marine microbiology and parasitology	2nd	6
V10G060V01907	Marine genetic resources	2nd	6
V10G060V01908	Oceanographic remote sensing	2nd	6

IDENTIFYING DATA				
Internships				
Subject	Internships			
Code	V10G060V01318			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	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 in 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	
A2	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
C14	To recognize and analyze new problems and to propose problem-solving strategies
C17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
C27	To understand the operation details of enterprises linked to the marine environment, and to recognize their specific problems and solutions
D8	Teamwork ability
D12	Ability to adapt to new situations
D15	Ability to apply knowledge in practice

Learning outcomes			
Expected results from this subject		Training and Learning Results	
New	A2	C14 C17 C27	D8 D12 D15

Contents	
Topic	
The contents of the external academic practices have to obtain 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	Training and Learning Results		
Practicum, External practices and clinical practices	<p>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.</p> <p>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.</p> <p>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.</p>	100	A2	C14 C17 C27	D8 D12 D15

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 and 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	Choose	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	
A1	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
A2	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
A3	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
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C4	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
C5	Basic knowledge of research methodology in oceanography
C6	Ability to identify and understand the problems in the field of oceanography
C12	To be able to operate the instrumental techniques applied to sea
C17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
D3	Written and oral communication in the official languages of the University
D5	Information technology skills (search and data analysis)
D6	Problem management and solving skills

Learning outcomes			
Expected results from this subject	Training and Learning Results		
PLANT PHYSIOLOGY	A1	C1	
1. To identify and understand key physiological processes in the development of photosynthetic marine organisms.	A2		
	A3		
2. To know the relationships among the photosynthetic marine organisms and the marine environment by means of the study of changing physiological processes	A1	C6	
	A2		
	A3		
	A5		
3. To handle equipments and techniques to study plant physiology.	A2	C4	D5
	A3	C5	
		C12	
4. To understand the scientific methodology and the technologies applied to plant physiology research.	A1	C1	D5
	A3	C4	
	A5	C5	
		C12	

5. To gain capacity of analysis and approaching to hypothesis in plant physiology.	A2 A3	C5 C6	D3 D6
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).	A2 A3 A5	C1	D3
ANIMAL PHYSIOLOGY:	A2	C1	
7. To know the mechanisms of acquisition and integration of the sensory information in marine animals	A3 A5		
8. To know the physiological bases of muscular activity and its implication in aquatic locomotion	A3	C1	
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 occur.	A2 A3	C1	
10. Knowing the corporal fluids and the functioning of cardiovascular systems.	A3	C12 C17	D6
11. To know the mechanisms of gas exchange between the animals and the water where they live.	A3	C1	D6
12. To know the mechanisms for wastes elimination and of osmotic regulation in distinct groups of marine animals.	A3	C1	D6
13. To know how animals obtain energy through food consumption, and how to use such energy as well.	A3 A5	C1	D3 D5
15. To know the general and basic terminology in Animal Physiology.	A3	C1	
16. To know and to understand the general functioning of different systems in animals addapted to different environmental conditions.	A2 A3	C1	D5 D6
17. To understand the general functioning of the animal as a whole, emphasizing in the role played by the integratory and coordinatory systems.	A2 A3	C1	D5
18. To understand basic aphysiology-related aspects, such as aquaculture.	A2 A3 A5	C1 C5	D6

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, electrorception, 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		Qualification	Training and Learning Results		
	Description				
Lecturing	Attendance will be valued	0	A1	C1	D3
	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.		A2	C4	D5
			A3	C5	D6
			A5	C6	
	The final exam will consist on short answer tests, long answer tests, and resolution of exercises.				

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	A1 A2 A3 A5	C1 C4 C5 C12 C17	D5 D6
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	A1 A2 A3	C1 C6	D5 D6
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	Choose	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	
A1	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
A2	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
A3	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
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C5	Basic knowledge of research methodology in oceanography
C6	Ability to identify and understand the problems in the field of oceanography
C13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
C14	To recognize and analyze new problems and to propose problem-solving strategies
C15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
C16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
C17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
C18	To transmit writing, verbal and graphical information for audiences of various types
D2	Organization and planning skills
D8	Teamwork ability
D16	Research skills

Learning outcomes	
Expected results from this subject	Training and Learning Results
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 anthropic activities in the open ocean.	A1 C1 D2
	A2 C5 D8
	A3 C6 D16
	A4 C13
	A5 C14
	C15
	C16
	C17
	C18

Contents	
Topic	
1. Introduction to the marine habitat	1.1. Types of coastal habitats 1.2. Adequacy 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 zooplankton 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 benthos. 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. Its 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	Training and Learning Results		
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	A1 A2 A3 A4 A5	C1 C5 C6 C13 C14 C15 C16 C17 C18	D2 D8 D16
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	A3 A5	C1 C15 C16 C17	
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	A1 A2 A3 A4 A5	C1 C5 C6 C13 C14 C15 C16 C17 C18	D2 D8 D16

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

Moore P.G. & R. Seed, **The ecology of Rocky coast**, First Edition, Columbia University Press, 1986
Keninsh Michael J., **Coastal Lagoons: Critical habitats of Environmental Change**, First Edition, CRC Press Taylor and Francis Group, 2010
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Nordstrom, K.F., Psuty, N. & Carter, B., **Coastal dunes**, Wiley & sons, 1990
Nybakken, James W., **Marine biology : an ecological approach**, Fourth edition, Pearson Benjamin Cummings, 2005
Brown, A.C. & McLachlan, **Ecology of sandy shores**, Elsevier, 1990

Complementary Bibliography

Knox G.A., **The ecology of seashores**, CRC Press, 2001
D. Bertness et al, **Marine community ecology and conservation**, Second edition, Sunderland, Massachusetts : Sinauer Associates, 2014
Levinton J.S., **Marine Biology: function, biodiversity, ecology**, Oxford University Press, 2001
Rupert F.G. Ormond, John D. Gage, and Martin V. Angel, **Marine biodiversity : patterns and processes**, First Edition, Cambridge University Press, 1997
Raffaelli D.G., **Intertidal ecology**, Second edition, Chapman & Hall, 1999
Little, C. & Kitching, J.A, **The Biology of rocky shores**, Second edition, Oxford University, 2009
Adam, P., **Saltmarsh ecology**, Cambridge University press, 2010
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	Choose	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	
A1	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
A2	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
A3	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
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C2	To know and understand the essential facts, concepts, principles and theories related to oceanography
C5	Basic knowledge of research methodology in oceanography
C6	Ability to identify and understand the problems in the field of oceanography
C14	To recognize and analyze new problems and to propose problem-solving strategies
C16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
C18	To transmit writing, verbal and graphical information for audiences of various types
C25	To participate in and advise on research on wave climate
D1	Analysis and synthesis ability

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Basic knowledge of the climatological processes and the meteorological phenomena, with special attention to his influence on the oceanic processes.	A1	C1 C2 C6 C14 C16 C18	D1
Descriptive knowledge of the main physical processes in the ocean	A2 A3	C1 C2 C5 C6 C18	D1
Descriptive knowledge of the oceanic circulatory systems.		C1 C14 C25	

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. Fundamentals of Meteorology: atmospheric pressure; vertical and horizontal structure. Surface maps: isobaric systems. Accelerations in isobaric systems; geostrophic equilibrium; horizontal and vertical circulation.

II. HYDROGRAPHY 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 non conservative components. Absolute and practical salinity.
 II.2.2. Surface distribution and its 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	Training and Learning Results		
Lecturing	Exams	0	A1 A2 A3	C1 C2 C5 C6 C14 C16 C18 C25	D1
Seminars	Seminars	0	A1 A3	C1 C5 C16	D1
Autonomous problem solving	Exam and seminars	0		C5 C25	D1
Objective questions exam	Exam in a not specified date	20	A1		
Problem and/or exercise solving	Deliverables of seminar exercises	30	A1 A2	C2 C14 C25	
Essay questions exam	Official Exam	50	A1 A2 A3	C1 C2 C5 C6 C14	D1

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 MUÑOZURI, 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

PICKARD, G.L. y W. EMERY, **Descriptive Physical Oceanography**, 6ª edition. Pergamon Press.320 p.,

TOMCZAK, 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://fatic.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 platform fatic if necessary.

* 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	Choose	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 processes affecting sedimentation in littoral 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 littoral and coastal processes.			

Competencies

Code	
A2	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
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C2	To know and understand the essential facts, concepts, principles and theories related to oceanography
C5	Basic knowledge of research methodology in oceanography
C6	Ability to identify and understand the problems in the field of oceanography
C13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
C16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
C17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
D6	Problem management and solving skills
D16	Research skills

Learning outcomes

Expected results from this subject	Training and Learning Results		
2. Capacity to manage the basic techniques of observation, measurement and description of marine geological materials in these environments	A2 A5	C1 C2 C5 C13 C17	D6 D16
3. Capacity to manage the basic techniques of sampling and surveying	A2	C1 C5 C13 C17	D16
4. Capacity to manage the basic techniques of sediment characterization and analyses	A2 A5	C1 C2 C5 C6	D6 D16
5. Geological mapping and representation skills	A2 A5	C1 C5 C6 C16	D16

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 ¹⁴ C 8.1.2 ²¹⁰ Pb 8.1.3 ¹³⁷ Cs 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	Training and Learning Results		
Seminars	Individual written report on the seminar activities. May include tests.	10	A2	C1 C5 C13 C16 C17	D6 D16

Studies excursion	It comprises an individual brief written summary. It has to reflect the activities performed in the field trip.	10	A2	C1 C5 C13 C16 C17	D16
Case studies	Group report that comprise the practical activities, including objectives, methodology, results and conclusions	10 ó 20	A2	C5 C13 C16	D16
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	A2 A5	C1 C2 C6	D6
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	A2 A5	C1 C2 C5 C6	D6

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

M. E. Tucker, **Techniques in Sedimentology**, 978-0632013722, Wiley-Blackwell, 1991

Bernabeu, A.M., Abilleira, P., Fernández-Fernández, S., Lersundi-Campistegui, A. V., **Capítulo XXIX. Métodos para la evaluación del transporte de sedimentos en el litoral. En: Métodos Y Técnicas En Investigación Marina**, 9788430952083, TECNOS, 2011

K Mohamed, D. Rey, **Capítulo XXX. Técnicas de magnetismo ambiental de utilidad en el estudio de sedimentos marinos. En: Métodos Y Técnicas En Investigación 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 Técnicas En Investigación 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	Choose	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 pbs@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, pharmacological interest) will be addressed.			

Competencies

Code	
A1	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
A2	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
A3	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
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C2	To know and understand the essential facts, concepts, principles and theories related to oceanography
C5	Basic knowledge of research methodology in oceanography
C6	Ability to identify and understand the problems in the field of oceanography
C12	To be able to operate the instrumental techniques applied to sea
C15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
C17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
C18	To transmit writing, verbal and graphical information for audiences of various types
C30	Identify and assess environmental impacts in the marine environment
D1	Analysis and synthesis ability
D15	Ability to apply knowledge in practice
D17	Sensitivity towards environmental issues

Learning outcomes

Expected results from this subject	Training and Learning Results		
To describe global cycles of the elements, including the input and output processes.	A1	C1	D1
	A2	C2	
	A3	C6	
	A4	C18	
	A5		

To define and to explain concepts, principles and sources related to chemical pollution.	A1 A2 A3 A4 A5	C1 C2 C6 C18 C30	D1 D17
To describe the chemical composition and speciation in seawater and to determine the mechanisms and factors that regulate it.	A1 A2 A3 A4 A5	C1 C2 C6 C18	D1
To determine the processes that regulate chemical species complexation.	A1 A2 A3 A4 A5	C1 C2 C6 C18	D1
To identify the toxicity mechanisms of metal ions, as well as the factors that determine and control the biomethylation processes.	A1 A2 A3 A4 A5	C1 C2 C6 C18 C30	D1 D17
To identify the toxicity mechanisms of the major organic pollutants.	A1 A2 A3 A4 A5	C1 C2 C6 C18 C30	D1 D17
To identify the most important natural products in the marine environment.	A1 A2 A3 A4 A5	C1 C2 C6 C18	D1
To identify the main interactions between marine organisms.	A1 A2 A3 A4 A5	C1 C2 C6 C18	D1
To describe the main applications of marine natural products.	A1 A2 A3 A4 A5	C1 C2 C6 C18	D1
To analyze the results obtained in the laboratory using the theoretical concepts.	A1 A2 A3 A4 A5	C1 C2 C5 C6 C12 C15 C17 C18 C30	D1 D15
To develop the necessary skills for the resolution of the applications related with the subject.	A1 A2 A3 A4 A5	C1 C2 C5 C6 C12 C15 C17 C18 C30	D15 D17

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 environments. 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. Oxygen 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 compounds 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	Training and Learning Results		
Seminars	Participation, attitude and ability to relate and apply acquired concepts will be evaluated	5	A1 A2 A3 A4 A5	C1 C2 C6 C18 C30	D17
Mentored work	Students will carry out a brief tutored work, evaluating the report presented and its presentation	20	A1 A2 A3 A4 A5	C1 C2 C6 C18	D1 D17
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 minimum of 3.5 out of 10 in each of the two parts into which the exam is divided.	65	A1 A2 A3 A4 A5	C1 C2 C6 C18 C30	D1
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	A1 A2 A3 A4 A5	C1 C2 C5 C6 C12 C15 C17 C18 C30	D15

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
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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
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J. B. McClintock, B.J. Baker, **Marine chemical ecology**, CRC Press, 2001
M.A. Martínez Grau, A.G. Csáky, **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 minimum 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 Fatic 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	Choose	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				
A1	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			
A2	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			
A3	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			
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences			
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field			
C2	To know and understand the essential facts, concepts, principles and theories related to oceanography			
C6	Ability to identify and understand the problems in the field of oceanography			
C13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use			
D1	Analysis and synthesis ability			
D6	Problem management and solving skills			

Learning outcomes

Expected results from this subject	Training and Learning Results		
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.	A1 A3	C1 C2	D1
Ability to connect the different physical, chemical and biological processes that determine the role of the ocean within the Earth system.	A1 A2 A3 A4	C1 C2 C6	D1
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.	A1 A3	C1 C2 C6	D1
Ability to interpret biological oceanography data.	A3	C13	D1 D6
Ability to use computing applications to run mathematical models of biogeochemical processes.		C13	D6
Ability to use specialised bibliography	A3		D1

Contents

Topic	
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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 N ₂ 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. CO ₂ fluxes between ocean and atmosphere. The biological pump and the solubility pump. Global C cycle: current unbalances.
Unit 7. The calcium carbonate cycle.	CaCO ₃ oceanic budget. Carbonate saturation. Production, export and redissolution of CaCO ₃ . 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 explored 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	Training and Learning Results		
Seminars	Students write a short essay 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	A2 A3 A4	C13	
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	A2 A4		D6
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	A1 A2	C1 C2 C6	D1 D6

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

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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	Choose	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	
A2	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
A3	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
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C2	To know and understand the essential facts, concepts, principles and theories related to oceanography
C4	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
C5	Basic knowledge of research methodology in oceanography
C6	Ability to identify and understand the problems in the field of oceanography
C12	To be able to operate the instrumental techniques applied to sea
C13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
C15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
C38	Technical use of renewable energies
D4	Basic computing skills related to the field of study
D15	Ability to apply knowledge in practice

Learning outcomes

Expected results from this subject	Training and Learning Results		
The student should be able to interpret the meaning, implications and interrelationships of the main meteorological and oceanographic variables/parameters	A3	C1 C4 C5 C12 C13	
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.	A2 A3	C1 C4 C12 C13 C15	D4 D15
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)	A2 A3	C1 C12 C13	D4 D15
The student should understand and distinguish the advantages and disadvantages of the several wave and tide related energy systems available	A2 A3	C1 C5 C6 C15 C38	D15
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.		C2	D4 D15

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 calibrate 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	Training and Learning Results		
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	A2 A3	C1 C4 C5 C6 C12 C13	D4 D15
Studies excursion	After the cruise a report is required.	5	A3	C1 C4 C5 C6 C12 C13 C15	D15
Mentored work	After classroom work reports are required	5	A2 A3	C1 C2 C4 C5 C6 C15 C38	D4
Objective questions exam	Multiple option test to validate the student's knowledge.	20		C1 C2 C4 C5 C6 C12 C38	D15
Essay questions exam	A series of questions and problems presented to the students to judge its knowledge.	65	A2 A3	C1 C2 C4 C12 C13 C38	D15

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

Basic Bibliography

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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 oceanografía Física**, 1, Anthia., 2008

Complementary Bibliography

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	Choose	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	<p>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.</p> <p>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.</p>			

Competencies

Code	
A1	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
A2	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
A3	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
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C4	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
C5	Basic knowledge of research methodology in oceanography
C6	Ability to identify and understand the problems in the field of oceanography
C8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
C9	To be familiar with the public and private, national and international organizations and institutions related to the Marine Sciences
C12	To be able to operate the instrumental techniques applied to sea
C13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
C14	To recognize and analyze new problems and to propose problem-solving strategies
C15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
C16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
C17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
C18	To transmit writing, verbal and graphical information for audiences of various types
C20	To find and evaluate marine resources of various kinds
C26	To plan, direct and write technical reports on marine issues
D2	Organization and planning skills
D7	Decision making
D15	Ability to apply knowledge in practice

Learning outcomes			
Expected results from this subject	Training and Learning Results		
New			
New			
1. Get skills to plan and carry out geological oceanographic surveys	A1 A2	C1 C4 C5 C9 C13 C17	D2 D15
2. Get familiar with oceanographic databases in public repositories	A1 A2 A5	C1 C5 C9 C13 C16 C20	D2 D7
3. To know the basic methods of geophysical exploration	A3 A4 A5	C1 C5 C12 C13 C14 C15 C16 C17	D2 D15
4. To know the basic techniques of compositional analysis and physical properties of sedimentary cores	A2 A3	C1 C4 C5 C12 C13 C15 C16 C17	D2 D7 D15
5. To know and apply the techniques of geochemical characterization in sediments.	A2 A3 A4 A5	C1 C4 C12 C13 C16 C17	D2 D7 D15
6. Get familiar with geophysical and geochemical data processing methods	A3 A4 A5	C1 C5 C6 C12 C13 C15 C16 C17	D2 D15
7. Get skills to write and submit reports	A3 A4	C1 C6 C9 C13 C14 C15 C16 C17 C18 C26	D7
8. Security during the execution of an oceanographic survey	A5	C1 C5 C6 C8 C12 C13 C15 C17	D2 D7 D15

Contents

Topic

THEMATIC UNIT 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 UNIT -II: POSITION SYSTEMS IN THE SEA	THEME 2.- Topic to select a position system. Global position systems and integration with acoustic position systems.
THEMATIC UNIT 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 different 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.- Electromagnetic and radiometric surveying and its application to marine research.
THEMATIC UNIT IX-: SAMPLING SEDIMENTS AND ROCKS METHODS IN SHELF AND DEEP SEA ENVIRONMENTS. GEOTECHNICS TECHNIQUES	THEME 11.- Sampler methods for Particulate Suspended Matter and bottom sediment samples at deep environments. THEME 12.- Deep sea coring techniques. methods. Ocean Drilling Projects. THEME 13.- Geophysical observation into the corers.
THEMATIC UNIT X-: OCEANOGRAPHY INFRASTRUCTURES	THEME 14.: Sampler platforms in geological oceanography. THEME 15: New technology in submarine observatories.
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 as well as the form of evaluation, field trips, practical classes and seminars. The materials necessary to follow lectures and practical sessions and references will be presented.
Lecturing	This includes the theoretical contents about all methods used in Oceanography Geology surveys, including selected applied 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 presentation. The student will show their 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	<p>The seminars that students will have to hold and deliver, consists of three sessions:</p> <ol style="list-style-type: none"> 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. <p>These activities are MANDATORY.</p>
Studies excursion	<p>There will be a session onboard the B/O Mytilus along the Ria de Vigo where the student will participate in a oceanographic survey. The objective 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.).</p> <p>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 "cruise report".</p> <p>Some of the collected data will be worked out in practical sessions.</p> <p>The activity is MANDATORY.</p>

Personalized assistance

Methodologies	Description
Introductory activities	<p>This first part corresponds to the presentation of the subject: activities that will be developed 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.</p>
Lecturing	<p>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.</p>
Laboratory practical	<p>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.</p>
Studies excursion	<p>A Oceanography Survey will be carried out in the B/O Mytilus, in groups of 5-6 students, where they will put in practice the methodology involved in Geological Oceanographic cruise. 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 cruise report, that will be evaluated. This will include: description of the methodology achieved and collected data.</p>
Mentored work	<p>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.</p>

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.
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Assessment						
	Description	Qualification	Training and Learning Results			
Laboratory practical	Attendance at the laboratory practices is MANDATORY. The correct implementation of the exercises proposed in these practices will be evaluated.	15	A1 A2 A3 A4 A5	C1 C4 C5 C6 C12 C13 C15 C17 C20	D2 D7 D15	
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 activity is MANDATORY	15	A1 A2 A3 A4 A5	C1 C4 C5 C6 C9 C13 C14 C15 C16 C17 C18 C20 C26	D2 D7 D15	
Seminars	Seminar attendance is MANDATORY. The correct implementation of the exercises proposed in these seminars will be evaluated.	5	A1 A2 A3 A4 A5	C1 C4 C5 C6 C9 C14 C18 C20 C26	D2 D7 D15	
Studies excursion	Attendance at the sea survey is MANDATORY. The correct implementation of the exercises proposed in these practices will be evaluated.	10	A5	C1 C4 C5 C6 C12 C13 C15 C16 C17 C18 C26	D2 D7 D15	
Objective questions exam	Questions and exercises to assess understanding, analytical capacity and synthesis of acquired knowledge.	55	A1 A2 A3 A4 A5	C1 C4 C5 C6 C8 C9 C12 C13 C14 C15 C16	D7 D15	

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

Danovaro, R., **Methods for the Study of Deep-Sea Sediments, Their Functioning and Biodiversity**, CRC Press. 458 pp,

Hailwood, E.A., Kidd, R., **Marine Geological Surveying and Sampling. Marine geophysical Researches.**, Kluwer academic Publishers. 12:169pp,

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Kearey, Ph. Brooks, M., Hill, I., **An Introduction to Geophysical exploration Third edition**, Blacwell Scientific Publications, 262 pp.,

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Rebesco M, Camerlenghi A (eds), **Contourites**, Developments in Sedimentology, 60, Elsevier, pp 688,

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Sheriff, R., **Encyclopedic Dictionary of Exploration Geophysics. Second Edition.**, Society of Exploration Geophysicists, 323 pp,

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

Trabant, P.K., **Applied High-Resolution Geophysical Methods Offshore Geoengineering Hazards.**, D. reidel Publishing Company. International Human Resources Development Corporation. Boston., 265 p.,

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	Choose	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	<p>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.</p> <p>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.</p>			

Competencies	
Code	
A1	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
A2	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
A3	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
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C3	Critical understanding of the history and current status of the Marine Sciences
C4	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
C5	Basic knowledge of research methodology in oceanography
C6	Ability to identify and understand the problems in the field of oceanography
C8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
C9	To be familiar with the public and private, national and international organizations and institutions related to the Marine Sciences
C12	To be able to operate the instrumental techniques applied to sea
C13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
C14	To recognize and analyze new problems and to propose problem-solving strategies
C15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
C16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
C17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
C18	To transmit writing, verbal and graphical information for audiences of various types
C22	To control marine pollution problems
C27	To understand the operation details of enterprises linked to the marine environment, and to recognize their specific problems and solutions
C30	Identify and assess environmental impacts in the marine environment
C32	Quality control of seafood

C35 Water quality control in water treatment plants

D1 Analysis and synthesis ability

D3 Written and oral communication in the official languages of the University

D6 Problem management and solving skills

D17 Sensitivity towards environmental issues

Learning outcomes

Expected results from this subject	Training and Learning Results		
Recognise the main characteristics of the wastewater. Classify the wastewater depending on their origin.	A1 A2 A3 A4	C1 C8 C27 C35	D1 D17
Knowing the main technologies used for wastewater treatment and choosing the suitable one depending on the wastewater properties.	A1 A2 A3 A4	C14 C18 C22 C27 C35	D1 D17
Elaborate scientific documents with own data obtained by means of a simulation software	A1 A2 A3 A4 A5	C1 C8 C14 C18 C35	D1 D3
Recognise the main methodologies of sea water desalination	A1 A3 A4	C1 C3 C8 C9 C14 C27	D1 D17
Knowing the potential of the marine environment as a source of marketable products by means of biotechnological processes	A1 A2 A3 A4 A5	C1 C3 C8 C9 C14 C27	D1
Enumerate the most important points regarding the setup of a control plan about marine pollution.	A2 A4 A5	C1 C3 C5 C6 C13 C14 C16 C18 C22 C30 C35	D3 D6 D17
Choose and use the suitable material for sediments sampling. Choose the most important sentinel organisms for studying marine pollution.	A3 A4 A5	C1 C4 C5 C6 C12 C13 C15 C16 C17 C18 C22 C30	D3 D6 D17

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.	A2 A3 A4 A5	C1 C3 C5 C6 C12 C13 C14 C15 C16 C17 C18 C22 C30 C32 C35	D1 D3 D6 D17
Being able to determine the concentration of a chemical compound in the marine environment depending on the analytical technique employed.	A2 A3 A4 A5	C4 C5 C6 C12 C13 C15 C16 C18 C22 C32 C35	D1 D3 D6
Apply the fundamental concepts of quality control in an analytical laboratory.	A2 A3 A5	C1 C4 C5 C9 C13 C15 C16 C17 C18 C22 C32 C35	D1 D3 D6 D17

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 biotoxins.	Chemical structure of marine biotoxins. Toxicity of marine biotoxins. 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

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	Training and Learning Results		
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	A3 A4 A5	C5 C12 C13 C15 C16 C17 C18 C22	D1 D3 D6 D17
Studies excursion	The students will visit a wastewater treatment facility. After that, a brief questionnaire must be answer.	5	A1 A3	C9 C22 C27 C35	D17
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	A3 A4	C1 C4 C5 C6 C12 C13 C14 C15 C16 C17 C18 C22 C30 C32	D1 D3 D17
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	A2 A3 A4 A5	C1 C8 C14 C22 C30	D1
Problem and/or exercise solving	In the final exam, a writing exam about the calculation of chemical concentrations will 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	A2 A3 A4 A5	C13 C18 C22	D1 D3 D6 D17
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	A2 A3 A4 A5	C1 C5 C6 C12 C13 C14 C16 C18 C22 C32	D1 D3 D6 D17
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	A2 A3 A4 A5	C1 C5 C12 C13 C15 C18 C22 C32	D1 D3 D6 D17

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 answered. It will count for 12,5% of the final qualification.	22.5	A2 A4	C1 C4 C6 C8 C9 C12 C13 C15 C18 C22 C27 C30 C32 C35	D1 D3 D17
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Other comments on the Evaluation

Date, time and place of exams will be published in the official web of Marien Sciences 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., K  rouel R., **Hydrologie des   cosyst  mes marins: param  tres et analyses**, Editions Quae, 2004
- Garc  a Est  vez J.M., Olabarri  a C., P  rez S., Rol  n   lvarez E., Ros  n G., **M  todos y T  cnicas en Investigaci  n 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
- Jos   A. Ib    ez Mengual, **Desalaci  n de aguas**, Instituto Euromediterr  neo del Agua, 2009
- Se-Kwon Kim, **Springer Handbook of Marine Biotechnology**, Springer London Ltd., 2014
- A. Aminot, M. Chaussepied, **Manuel des Analyses Chimiques en Milieu Marin**, Centre National pour l'Explorations des O  anes. B, 1983
- OECD, **Marine Biotechnology Enabling Solutions for Ocean Productivity and Sustainability**, OECDiLibrary, 2013

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 plants 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 Fatic, 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				
Basin Analysis				
Subject	Basin Analysis			
Code	V10G060V01901			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	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	
A3	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
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C2	To know and understand the essential facts, concepts, principles and theories related to oceanography
C5	Basic knowledge of research methodology in oceanography
C14	To recognize and analyze new problems and to propose problem-solving strategies
C16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
C18	To transmit writing, verbal and graphical information for audiences of various types
C19	To map and characterize the seabed and the underground in marine and coastal areas
D1	Analysis and synthesis ability
D6	Problem management and solving skills
D15	Ability to apply knowledge in practice

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Recognise and analyse new problems in the analysis of basins and propose new interpretations	C14	D6	
Schedule, design and execute investigations applied of the analysis of basins from the stage of recognition until the evaluation of results-geological resources.	C16	D1	
		D6	
		D15	
Transmit information of form written, verbal and graphic for audiences of diverse types	A4	C18	D1
Caracterice and mapping of marine bottoms, marine sub-bottoms and coastal areas-continental		C19	D6
			D15
Interpretation of paleoceanographic proxies	A3	C1	D1
	A4	C2	D6
		C5	D15
		C14	
		C18	

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 sea-level oscillation

4.3. Sequences and models of sequences.

SUBJECT 5. PALEOCEANOGRAPHY AND PALAEOCLIMATOLOGY

5.1. Palaeoceanography and palaeoclimatology proxies

5.2. Natural mechanisms of climatic and oceanographic changes

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 acquire 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. Paleoclimatological 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	Training and Learning Results
Case studies	Sequential seismic analysis of a sedimentary basin from the interpretation of seismic records and profiles.	30	C14 D1 C16 D6 C18 D15 C19

Seminars	Reports of Seminars	30		C5 C14 C18 C19	D1 D6 D15
Report of practices, practicum and external practices	Report/memory of work on the study of a real sedimentary basin.	10		C14 C16 C18 C19	D1 D6 D15
Objective questions exam	Exam with short answer questions on theory and practical topics.	30	A3 A4	C14 C16 C18 C19	D1 D15

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

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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	Choose	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	jdguetz@uvigo.es			
Web				
General description	This is a special Zoology which studies the main fish and shellfish in the spanish coast			

Competencies	
Code	
A1	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
A2	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
A3	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
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C4	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
C8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
C10	To know the problems and the basic principles of sustainability in relation to the use and exploitation of the marine environment
C11	To manage the use of littoral and coastal region and their resources in a sustainable way
C13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
C17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
C18	To transmit writing, verbal and graphical information for audiences of various types
C19	To map and characterize the seabed and the underground in marine and coastal areas
C20	To find and evaluate marine resources of various kinds
D1	Analysis and synthesis ability
D3	Written and oral communication in the official languages of the University
D6	Problem management and solving skills
D8	Teamwork ability

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Ability to apply knowledge in practice	A1	C4	D1
	A2	C8	D3
	A3	C10	D6
	A4	C11	
	A5	C13	
		C17	
		C18	
		C19	
		C20	

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.	A1 A2 A3 A4 A5	C4 C8 C10 C11 C13 C17 C18 C19 C20	D1 D3 D6
Research skills.	A1 A2 A3 A4 A5	C4 C8 C10 C11 C13 C17 C18 C19 C20	D1 D3 D6
Identification of fish and shellfish.	A1	C8	D1
Knowledge of the external and internal morphology of fish and shellfish.	A2	C18	D3
Knowledge of the distribution, habitat and lifestyles of fish and shellfish.	A3	C20	D6
Knowledge of reproduction and life cycles of fish and shellfish.	A4		D8
Management of fishery resources and shellfish.	A5		
Biological bases necessary for the study of Fisheries and Aquaculture.			

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. Molt 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	<p>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.</p> <p>The teacher can be supported by audiovisual and computer media, but in general, students do not need to handle them in class.</p> <p>Attendance to these classes, although it is not mandatory, is highly recommended for the proper follow-up of the course.</p>
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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 student has to answer short questions in his/her own words, including specific and objective questions and some in the form of sintesis, refecton 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	Training and Learning Results		
Laboratory practical	Exam	15	A1	C4	D1
			A2	C8	D3
			A3	C18	D6
			A4	C20	D8
			A5		
Seminars	Written or expository work	10	A1	C4	D1
			A2	C8	D3
			A3	C18	D6
			A4	C20	D8
			A5		
Lecturing	Exam	75	A1	C4	D1
			A2	C8	D3
			A3	C18	D6
			A4	C20	D8
			A5		
Problem and/or exercise solving	Exam	40	A1	C4	D1
Objective questions exam	Exam	30	A1	C4	D1
			A2	C18	D3
			A3		D6
			A4		
Essay questions exam	Exam	30	A1	C4	D1
			A2	C18	D3
			A3		
			A4		

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	Choose	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	
C3	Critical understanding of the history and current status of the Marine Sciences
C7	To know the basics of market economy applied to marine resources
C8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
C9	To be familiar with the public and private, national and international organizations and institutions related to the Marine Sciences
C10	To know the problems and the basic principles of sustainability in relation to the use and exploitation of the marine environment
D1	Analysis and synthesis ability
D8	Teamwork ability

Learning outcomes		
Expected results from this subject	Training and Learning Results	
Comprise to handle necessary economic concepts for the management of the natural resources	C3 C7 C8 C9 C10	D1 D8
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.	C3 C7 C8 C9 C10	D1 D8
Capacity to develop works or brief reports in the field of the marine resources	C3 C7	D1 D8

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	Training and Learning Results	
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	C3 C7 C8 C9 C10	D1 D8
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	C3 C7 C8 C9 C10	D1 D8
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	C3 C7 C8 C9 C10	

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:(Dir), **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

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	Choose	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	
A1	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
A2	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
A3	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
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C3	Critical understanding of the history and current status of the Marine Sciences
C5	Basic knowledge of research methodology in oceanography
C6	Ability to identify and understand the problems in the field of oceanography
C9	To be familiar with the public and private, national and international organizations and institutions related to the Marine Sciences
C11	To manage the use of littoral and coastal region and their resources in a sustainable way
C12	To be able to operate the instrumental techniques applied to sea
C13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
C15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
C18	To transmit writing, verbal and graphical information for audiences of various types
C19	To map and characterize the seabed and the underground in marine and coastal areas
C26	To plan, direct and write technical reports on marine issues
C37	Technical advice or assistance on issues related to the marine and coastal environment
D1	Analysis and synthesis ability
D5	Information technology skills (search and data analysis)

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Projection Systems and Reference Systems	A1	C12 C13 C15 C18 C37	D5
Digital Terrain Models	A2 A3	C1 C5 C6 C11 C12 C13 C19	D5

Improvement, corrections and transformation of images	A3	C1 C5 C6 C12 C13 C15 C18	D5
Interpolation of data (Creation of surfaces from point data)	A1 A3	C1 C5 C6 C12 C13 C15	D5
3D visualization and navigation.	A1 A3	C1 C3 C5 C12 C13 C15	D5
GIS Applications	A1 A2 A3	C1 C3 C5 C6 C9 C11 C12 C18 C19 C26 C37	D1 D5

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 Díez 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 Díez 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 Díez 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	Training and Learning Results		
Practices through ICT		The methodology is the directed study.	30	A2 A3	C1 C5 C9 C11 C12 C13 C18 C19	D5
Seminars		Personalized attention	10	A1	C3 C6 C15 C26 C37	D1
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 sujet. * The ability to relate some knowledge to others. * The application of knowledge to solve specific problems.	30	A1 A2 A3	C1 C5 C6 C12 C15 C26	D1

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	A1 A2 A3	C5 C6 C9 C11 C12 C13 C18 C19 C26	D1 D5
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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/examen-es-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 Faltic and the virtual office.

IDENTIFYING DATA				
Modelling				
Subject	Modelling			
Code	V10G060V01905			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	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	
A3	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
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C29	Skill in the practical use of models and in the incorporation of new data for their validation, improvement and development
D2	Organization and planning skills
D11	Ability to learn independently and continuously

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Hability to calculate ocean dynamic solutions using numerical simulation models.	A3 A5	C29	D2 D11

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	Training and Learning Results
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	C29 D2 D11
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	Choose	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	<p>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.</p> <p>Microbiology will deal with aspects related to microbial contamination, the infectious pathology of marine organisms and the applications of marine microorganisms.</p>			

Competencies	
Code	
C11	To manage the use of littoral and coastal region and their resources in a sustainable way
C17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
C18	To transmit writing, verbal and graphical information for audiences of various types
C20	To find and evaluate marine resources of various kinds
C22	To control marine pollution problems
C23	To design, control and manage recovery centers for threatened marine species
C26	To plan, direct and write technical reports on marine issues
C27	To understand the operation details of enterprises linked to the marine environment, and to recognize their specific problems and solutions
C30	Identify and assess environmental impacts in the marine environment
C32	Quality control of seafood
C33	Fisheries control
C34	To design, control and manage aquaculture production plants
C35	Water quality control in water treatment plants
C36	aquariology
D8	Teamwork ability
D15	Ability to apply knowledge in practice

Learning outcomes		
Expected results from this subject	Training and Learning Results	
Acquire basic knowledge of Parasitology and identify the main pathogenic parasite groups of marine organisms.	C18	D8
	C22	D15
	C23	
	C26	
	C27	
	C30	
	C32	
	C33	
	C34	
	C35	
	C36	

Know and purchase skill in the technicians of diagnostic in Parasitology.	C11 C17 C22 C23 C26 C27 C30 C32 C33 C34 C36	D15
Understand the complexity of the biological cycles of the parasites of the half marine like key appearance for the control of the parasitic illnesses	C23 C26 C30 C32 C33 C34 C35 C36	D15
Know the importance and the possible applications of the main parasites of the half marine	C11 C22 C26 C30 C32 C33 C34 C35 C36	D8 D15
Know the main strategies of control of the parasitic illnesses	C22 C27 C32 C35	
To know the importance and the possible applications of the main parasites of the marine environment. Implications in public health and fisheries.	C18	
Know the microbial activities in relation with the half biotic and abiotic	C32 C34 C35	D8
To know the main infectious diseases by marine microorganisms.	C30 C32	
Know how to interpret the origin and consequences of polluting microorganisms in the marine environment.	C18 C22 C30	
Possess general notions on the interest applied of the microorganisms of the half marine	C11 C17 C18 C20 C22 C23 C26 C27 C30 C32 C34 C36	D8 D15

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. Amoeboae. 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	Training and Learning Results	
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	C17 C22 C26 C27 C30 C32 C33 C34 C35 C36	D8 D15
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	C18 C23 C26 C27	D8 D15
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	C11 C17 C18 C20 C22 C23 C26 C27 C30 C32 C33 C34 C35 C36	D8 D15
Problem and/or exercise solving	Resolution of problems and cases related with the contained of the Microbiology and Marine Parasitology.	20	C17 C22 C26 C27 C30 C32 C33 C34 C35 C36	D8 D15

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 Application**, 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	Choose	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	<p>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 producc��n (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.</p>			

Competencies	
Code	
A3	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
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C2	To know and understand the essential facts, concepts, principles and theories related to oceanography
C5	Basic knowledge of research methodology in oceanography
C6	Ability to identify and understand the problems in the field of oceanography
C8	To understanding the fundamentals of the laws that regulate the use of the marine environment and its resources
C10	To know the problems and the basic principles of sustainability in relation to the use and exploitation of the marine environment
C12	To be able to operate the instrumental techniques applied to sea
C14	To recognize and analyze new problems and to propose problem-solving strategies
C15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
C17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
C18	To transmit writing, verbal and graphical information for audiences of various types
C20	To find and evaluate marine resources of various kinds
C24	To participate and carry out training and outreach programs on the marine and coastal environments
C32	Quality control of seafood
C33	Fisheries control
C36	aquariology
D6	Problem management and solving skills
D11	Ability to learn independently and continuously

Learning outcomes	
Expected results from this subject	Training and Learning Results

To. Specific:	A5	C1	D6
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		C2	D11
		C5	
		C6	
		C8	
		C10	
		C12	
		C14	
		C15	
		C17	
		C18	
		C20	
		C24	
		C32	
		C33	
		C36	
To. Specific:	A3	C1	
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		C2	
		C10	
		C12	
		C17	
		C18	
		C20	
		C24	
		C32	
		C33	
		C36	
To. Specific:	A5	C20	D11
Actitudinales (be): Autonomous; Able to design experiments		C36	
B. Transversal/Generic:	A4		D6
- Personal: critical Reasoning; Work in team			D11
- Others: capacity to apply the theoretical knowledges in the practice; use of Internet like media and like source of information			

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 Amplification 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	Training and Learning Results	
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	C12 C18 C32 C33	D6 D11
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	C12 C18 C32 C33	D6 D11
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	A3 A4 A5 C8 C14 C32 C33 C36	D6 D11

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	C1 C2 C8 C14 C32 C33 C36	D6 D11
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	C1 C2 C8 C14 C32 C33 C36	D6 D11

Other comments on the Evaluation

The contents imparted, included 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 Publ./Science Publish, 2005

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

Complementary Bibliography

Avisé, J., **Molecular Markers: Natural History 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 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 *tutorías 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] => [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	Choose	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	
A1	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
A2	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
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C12	To be able to operate the instrumental techniques applied to sea
C18	To transmit writing, verbal and graphical information for audiences of various types
D4	Basic computing skills related to the field of study
D5	Information technology skills (search and data analysis)

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Know the physical principles of the Teledetection and applications in the field of the Oceanography	C12	D4	D5
Learn to use programs of Treatment of Images of Satellite in marine applications.	A1	C18	D4
	A2		
	A5		

Contents	
Topic	
1.-INTRODUCTION To THE Objective	1.1.- Teledetection in Oceanography 1.2.- Brief history of the space observation of the oceans
TELEDETECTION	1.3.- Possibilities for the oceanography 1.4.- Temporary and space scales of the phenomena of interest.
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.	
2.- PHYSICAL PRINCIPLES OF THE Objective	Contents
TELEDETECTION	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.
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.	2.5.1.- Absorption. 2.5.2.- Dispersion. 2.5.3.- Broadcast.

3.- ELEMENTS OF A SYSTEM OF Objective

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.

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 Objective

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.

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	Training and Learning Results
Practices through ICT	The methodology that uses in the practical is the one of study directed.	10-20	A1 C12 A2
Seminars	It will realise a follow-up *individualizado of technicians and contents for the development of the works scheduled	0-5	A1 D5 A2
Lecturing	The lesson *magistral is the method mainly employee, using in the measure of the possible the lesson had a conversation.	0	A1 A2
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	A1 D4 A2
Essay	*Seran Assigned subjects by groups of two students	10-60	A1 C12 D4 A2 D5
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	A1 C12 A2 A5

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/examen-es-3>

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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/examen-es-3>

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

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=== 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
