



(*)Facultade de Ciencias do Mar

(*)Grao en Ciencias do Mar

Subjects

Year 3rd

Code	Name	Quadmester	Total Cr.
V10G061V01301	Biological oceanography I	1st	6
V10G061V01302	Physical oceanography I	1st	6
V10G061V01303	Geological oceanography I	1st	6
V10G061V01304	Chemistry applied to the marine environment I	1st	6
V10G061V01305	Physiology of marine organisms	1st	6
V10G061V01306	Biological oceanography II	2nd	6
V10G061V01307	Physical oceanography II	2nd	6
V10G061V01308	Geological oceanography II	2nd	6
V10G061V01309	Chemistry applied to the marine environment II	2nd	6
V10G061V01310	Aquaculture	2nd	6

IDENTIFYING DATA				
Biological oceanography I				
Subject	Biological oceanography I			
Code	V10G061V01301			
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	
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
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
B5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
C1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
C9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
C10	Know the biological diversity and functioning of marine ecosystems.
C11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
D3	Understanding the meaning and application of the gender perspective in different fields of knowledge and in professional practice with the aim of achieving a more just and equal society.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

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	A3	B2	C1	D2
interpret the operation of the coastal ecosystems (estuaries, beaches, coastal lagoons, etc), and	A4	B3	C9	D3
his interaction with the anthropic activities in the open ocean.	A5	B4	C10	D5
		B5	C11	

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 has 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	A3 B2 C1 D2 A4 B3 C9 D3 A5 B4 C10 D5 B5 C11
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 B2 C1 A4 B3 C9 A5 B4 C10 B5 C11
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	A3 B2 C1 D2 A4 B3 C9 D3 A5 B4 C10 D5 B5 C11

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

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

Hogarth Peter J., **The Biology of Mangroves**, First Edition, Oxford University Press, 1999

Kjerfve B., **Coastal Lagoon processes**, First Edition, Elsevier science B.V., 1994

Sorokin Y. I., **Coral Reef Ecology**, Springer, 1995

Barnes R.S.K., **An introduction to marine ecology**, Second edition, Blackwell Science, 1999

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	V10G061V01302			
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	
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
C3	Describe how works the global ocean circulation, its forcings and its climate implications.
C4	Know, analyze and interpret the physical properties of the ocean according to current theories, as well as to know the most relevant sampling tools and techniques.
C5	Formulate the mass, energy and moment conservation equations for geophysical fluids and solve them in basic oceanic processes.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.

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.	A5	B1	C3 C5	D1
Descriptive knowledge of the main physical processes in the ocean			C3 C4	D1
Descriptive knowledge of the oceanic circulatory systems.		B1	C3 C4 C5	D1

Contents	
Topic	
I. BASIC CLIMATOLOGY	<p>I.1. Description of the atmosphere: composition, temperature and density with height.</p> <p>I.2. Electromagnetic radiation. Black body emission. Characteristics of solar and terrestrial radiation.</p> <p>I.3. Radiative budget. Albedo and absorption. The greenhouse effect. Energetic latitudinal disequilibrium of the Earth. General movements of air masses, planetary convective cells.</p> <p>I.2. Fundaments of Meteorology: atmospheric pressure; vertical and horizontal structure. Surface maps: isobaric systems. Accelerations in isobaric systems; geostrophic equilibrium; horizontal and vertical circulation.</p>

II. HYDROGRPHY AND WATER MASSES

II.1. TEMPERATURE

II.1.1. Surface distribution.

II.1.2. Temperature of the water column. Differences among three regions: Mixing layer, seasonal thermocline, main thermocline, deep waters.

II.1.3. Upwelling. Ekman spiral. Ekman Transport. Types of upwelling. Downwelling.

II.2. SALINITY

II.2.1. Conservative and no conservative components. Absolute and practical salinity.

II.2.2. Surface distribution and 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, only via institutional account @alumnos.uvigo.es. 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, only via institutional account @alumnos.uvigo.es. 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, only via institutional account @alumnos.uvigo.es. 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, only via institutional account @alumnos.uvigo.es. 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, only via institutional account @alumnos.uvigo.es. 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, only via institutional account @alumnos.uvigo.es. Monday-Tuesday-Wednesday 10-12 h.

Assessment						
	Description	Qualification		Training and Learning Results		
Lecturing	Exams	0	A5		C5	D1
Seminars	Seminars	0		B1	C3	D1
					C4	
					C5	
Autonomous problem solving	Exam and seminars	0			C3	D1
					C4	
					C5	
Objective questions exam	Exam in a non specified date.	20			C3	
Problem and/or exercise solving	Deliverable questions in seminars	30		B1	C4	
Essay questions exam	Official exam	50	A5	B1	C5	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	V10G061V01303			
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 litoral areas, since sediments are the main geological feature of these region. The subject will cover the fundamental techniques to study the topography, structure, sedimentation, and associated geological processes of these areas to discover how they were formed and how ongoing processes (coastal dynamics, climate change, human impact...) may change them in the future. The subject will deal with the peculiarity of combining terrestrial and marine data to study litoral and coastal processes.			

Competencies

Code				
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			
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.			
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.			
B5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.			
C12	Acquire knowledge about processes and products related to internal and external geological cycles.			
C13	Acquire the basic sedimentological, geochemical and geophysical techniques and methodologies used in identification, use and sustainability of the natural resources of coastal and marine environments.			
C14	Know basic concepts and events of global change obtained from geological records.			
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.			
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.			
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.			

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	A5	B2	C13	D1 D5
3. Capacity to manage the basic techniques of sampling and surveying	A1 A5	B1	C12 C13	D1
4. Capacity to manage the basic techniques of sediment characterization and analyses	A2 A5	B2	C12 C14	D1
5. Geological mapping and representation skills	A1 A2 A5	B1 B2	C12 C13	D1 D2

6. Report elaboration and presentation skills	A2	B1	C12	D2
	A3		C13	
New	A3	B1	C14	D1
	A5	B5		

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	A1 A2 A3 A5	B1 B5	C12	D1 D2
Studies excursion	It comprises an individual brief written summary. It has to reflect the activities performed in the field trip.	10	A2 A5	B1		D1 D5

Case studies	Group report that comprise the practical activities, including objectives, methodology, results and conclusions	10 ó 20	A2 A3 A5	B1 B5	C13 C14	D1 D2
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	A1 A2 A3 A5	B1	C12 C13 C14	D1 D2
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	A3	B1	C12 C14	D1 D2

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/examen-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

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	V10G061V01304			
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 pbes@uvigo.es			
Web				
General description	This subject includes the study of elements, inorganic substances and organic substances that can reach and alter the marine environment, acting as pollutants. Behaviour, influence and prevention of the effects produced by these elements, inorganic substances and organic substances in the environment will be studied. Moreover, the study of marine natural products (classification, function, 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
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
C6	Acquire the fundamentals and terminology of chemical processes.
C7	Apply to the marine and coastal environment the principles and methods used in Chemistry.
C8	Know the main pollutants, their causes and effects in the marine and coastal environment.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

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 A2 A3 A5	B1	C6	D1
To define and to explain concepts, principles and sources related to chemical pollution.	A1 A2 A3 A5	B1	C6 C8	D1 D5

To describe the chemical composition and speciation in seawater and to determine the mechanisms and factors that regulate it.	A1 A2 A3 A5	B1	C6	D1
To determine the processes that regulate chemical species complexation.	A1 A2 A3 A5	B1	C6	D1
To identify the toxicity mechanisms of metal ions, as well as the factors that determine and control the biomethylation processes.	A1 A2 A3 A5	B1	C6 C7 C8	D1 D5
To identify the toxicity mechanisms of the major organic pollutants.	A1 A2 A3 A5	B1	C6 C7 C8	D1 D5
To identify the most important natural products in the marine environment.	A1 A2 A3 A5	B1	C6	D1 D5
To identify the main interactions between marine organisms.	A1 A2 A3 A5	B1	C6 C7	D1
To describe the main applications of marine natural products.	A1 A2 A3 A5	B1	C6 C7	D1 D5
To analyze the results obtained in the laboratory using the theoretical concepts.	A1 A2 A3 A5	B1 B2 B3 B4	C6	D1
To develop the necessary skills for the resolution of the applications related with the subject.	A1 A2 A3 A5	B1 B2 B3 B4	C7	D1 D5

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 A5	B1	C6 C7 C8	D1
Mentored work	Students will carry out a brief tutored work, evaluating the report presented and its presentation	20	A1 A2 A3 A5	B1	C6 C8	D1 D5
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 A5	B1	C6 C7 C8	D1

Report of practices, Students must present a report of the virtual practices carried out.	10	A1	B1	C6	D1
practicum and externalAttendance at the laboratory sessions as well as preparation of the		A2	B2	C7	D5
practices report is compulsory to get promoted.		A3	B3		
The attitude in the lab sessions, the skills and the understanding of		A5	B4		
the experimental techniques used will be evaluated.					

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/examen-es-3>

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

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

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

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

Sources of information

Basic Bibliography

I. Bodek, W.J. Lyman, W.F. Reehl y D.H. Rosenblatt, **Environmental Inorganic Chemistry**, Pergamon Press, 1988
R.P. Schwarzenbach, P.M. Gschwend, D.M. Imboden, **Environmental Organic Chemistry**, 2, John Wiley & Sons Inc, 2003
R. Chang, **Química**, 11, Mc Graw Hill, 2013
P. Yurkanis Bruice, **Química Orgánica**, 5, Prentice Hall México, 2007

Complementary Bibliography

S. E. Manahan, **Environmental chemistry**, 9, CRC Press, 2009
H. G. Seiler, H. Sigel, A. Sigel, **Handbook on toxicity of inorganic compounds**, Marcel Dekker, 1988
J. W. Moore, **Inorganic Contaminants of Surface Water**, Springer, 1991
Paul M. Dewick, **Medicinal natural products: A biosynthetic approach**, 3, John Wiley & Sons Inc, 2009
J. B. McClintock, B.J. Baker, **Marine chemical ecology**, CRC Press, 2001
M.A. Martínez Grau, A.G. 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				
Physiology of marine organisms				
Subject	Physiology of marine organisms			
Code	V10G061V01305			
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
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
B5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
C1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
C5	Formulate the mass, energy and moment conservation equations for geophysical fluids and solve them in basic oceanic processes.
C6	Acquire the fundamentals and terminology of chemical processes.
C9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
C10	Know the biological diversity and functioning of marine ecosystems.
C11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
D3	Understanding the meaning and application of the gender perspective in different fields of knowledge and in professional practice with the aim of achieving a more just and equal society.
D4	Ability to communicate orally and in writing in Galician language.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes

Expected results from this subject	Training and Learning Results			
PLANT PHYSIOLOGY	A1	B1	C1	D2
1. To identify and understand key physiological processes in the development of photosynthetic marine organisms.	A2		C9	
	A3		C10	
			C11	

2. To know the relationships among the photosynthetic marine organisms and the marine environment by means of the study of changing physiological processes	A1 A2 A3 A5	B1	C1 C9 C10	D2 D5
3. To handle equipments and techniques to study plant physiology.	A2 A3 A5	B1 B4 B5	C11	D2 D3 D4 D5
4. To understand the scientific methodology and the technologies applied to plant physiology research.	A1 A3 A5		C1	D2 D3 D4 D5
5. To gain capacity of analysis and approaching to hypothesis in plant physiology.	A2 A3		C5 C6	D3
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).	A1 A2 A5	B1	C10	D4 D5
ANIMAL PHYSIOLOGY:	A2 A3 A5	B1	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	B1	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	B1	C1	
10. Knowing the corporal fluids and the functioning of cardiovascular systems.	A3	B1	C9	
11. To know the mechanisms of gas exchange between the animals and the water where they live.	A3	B1	C1	
12. To know the mechanisms for wastes elimination and of osmotic regulation in distinct groups of marine animals.	A3	B1	C1	
13. To know how animals obtain energy through food consumption, and how to use such energy as well.	A3 A5	B1	C1	D3 D5
15. To know the general and basic terminology in Animal Physiology.	A3	B1	C1	
16. To know and to understand the general functioning of different systems in animals addapted to different environmental conditions.	A2 A3	B1	C1	D5
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	B1	C1 C9 C10	D5
18. To understand basic aphysiology-related aspects, such as aquaculture.	A2 A3 A5	B1	C1 C11	D1 D5

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.
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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, chromatophora and bioluminescence
4. Sensory physiology in marine animals: mechanoreception, electroreception, magnetoreception, quimioreception, fotoreception and vision.
5. Physiology of the neuroendocrine and endocrine systems in marine animals
6. Circulatory fluids and operation of the cardiovascular systems in marine animals
7. Operation of the respiratory systems in marine animals
8. Physiology of excretion and osmoregulation in marine animals
9. Physiology of the digestive systems in marine animals

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	28	70	98
Laboratory practical	10	4	14
Mentored work	0	6	6
Discussion Forum	0	2	2
Seminars	5	15	20
Objective questions exam	0.7	0	0.7
Essay questions exam	1	0	1
Problem and/or exercise solving	0.3	0	0.3
Essay	0	6	6
Debate	0	2	2

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

Methodologies

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

Personalized assistance

Methodologies	Description
Seminars	Resolution of doubts and difficulties to the groups or personal if necessary. During the seminar and in tutorials, monday and friday from 11:00 to 12:00.
Lecturing	Resolution of doubts and difficulties to the the group or personal if necessary. During the session and in tutorials, monday and friday from 11:00 to 12:00. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.

Laboratory practical	Resolution of doubts and difficulties to the groups or personal if necessary. During the practices and in tutorials, monday and friday from 11:00 to 12:00.
Mentored work	Resolution of doubts and difficulties to the groups the groups or personal if necessary. In the classroom and in tutorials, monday and friday from 11:00 to 12:00.
Discussion Forum	Feedback through the platform TEMA
Tests	Description
Essay	Resolution of doubts and difficulties to the groups or personal if necessary. In tutorials, monday and friday from 11:00 to 12:00.
Debate	Feedback through the platform TEMA

Assessment						
	Description	Qualification	Training and Learning Results			
Lecturing	Attendance will be valued	0	A1 A2 A3 A5	B1 B4 B5	C1 C5 C6	D3 D5
	By means of a final exam comprising the two modules. The weighting per module is 50%. It demands a minimum of 4 each in each module to pass the examination.					
	The final exam will consist on short answer tests, long answer tests, and resolution of exercises.					
Laboratory practical	In the module of Plant Physiology (5% of the qualification) the evaluation will be by attendance and questions in the final exam.	10	A1 A2 A3 A5	B1 B4 B5	C1 C5 C9 C10 C11	D1 D5
	In the module of Animal Physiology (5% of the qualification) the evaluation will be by attendance					
Mentored work	Voluntary for Plant Physiology	0	A1 A2 A3 A5	B1	C5 C6 C9 C10	D1 D2 D4 D5
Discussion Forum	Voluntary for Plant Physiology	0	A1 A2 A3 A5		C1 C6 C10 C11	D1 D2 D3 D4 D5
Seminars	It is compulsory the attendance to the seminars	10	A1 A2 A3 A5	B4 B5	C1 C6 C11	D1 D2 D3 D4 D5
	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.					
Objective questions exam	Mandatory	25	A1 A2	B1	C1 C9 C10 C11	D4
Essay questions exam	Mandatory	35	A1 A2 A5	B1 B5	C1 C9 C10	D4
Problem and/or exercise solving	Mandatory	10	A3	B4	C1 C10	D1 D4
Essay	Mandatory for Animal Physiology	10	A1 A2 A3 A5	B1 B5	C9 C10 C11	D1 D2 D4

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 II				
Subject	Biological oceanography II			
Code	V10G061V01306			
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
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
C10	Know the biological diversity and functioning of marine ecosystems.
C11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

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	B1	C10	
Ability to connect the different physical, chemical and biological processes that determine the role of the ocean within the Earth system.	A1	B1	C10	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		C10 C11	D1
Ability to interpret biological oceanography data.		B4	C10 C11	D1
Ability to use computing applications to run mathematical models of biogeochemical processes.		B4	C11	D2
Ability to use specialised bibliography				D1 D2

Contents

Topic	
Unit 1. Introduction	Distribution and abundance of chemical elements in the sea. Metabolic pathways and key plankton functional groups. Properties of element cycles.
Unit 2. Production of organic matter.	Variability and control of primary production. Stoichiometry of phytoplankton production. Dynamics of dissolved organic matter. New and regenerated production. Trophic organization and biogeochemical functioning of the ecosystem.

Unit 3. Remineralization.	Distributions of nutrients and oxygen. Oxygen utilization rates. Stoichiometric relations. Heterotrophic processes: quantification and variability. Photosynthesis respiration balance. Balance between 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	B1 C10 D1 D2
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	B1 C10 D1 B4 C11 D2
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 B1 C10 B4 C11

Other comments on the Evaluation

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

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

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

Sources of information

Basic Bibliography

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

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

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

Complementary Bibliography

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

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

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

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

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

Recommendations

Subjects that are recommended to be taken simultaneously

Physical oceanography II/V10G060V01602

Subjects that it is recommended to have taken before

Biological oceanography I/V10G060V01502

Physical oceanography I/V10G060V01503

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

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

* Teaching methodologies modified

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

* Non-attendance mechanisms for student attention (tutoring)

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

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===

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

IDENTIFYING DATA				
Physical oceanography II				
Subject	Physical oceanography II			
Code	V10G061V01307			
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
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
C1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
C3	Describe how works the global ocean circulation, its forcings and its climate implications.
C4	Know, analyze and interpret the physical properties of the ocean according to current theories, as well as to know the most relevant sampling tools and techniques.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

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 A4	C1 C3 C4	D1 D2
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 A4	C3 C4	D1 D2
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 A4	C4	D1 D2
The student should understand and distinguish the advantages and disadvantages of the several wave and tide related energy systems available	A2 A3	C3 C4	D1 D2 D5
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.	A3 A4	C4	D1 D2

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, height 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 sea. Newton Equilibrium tide theory. Dynamic 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 be 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. Tutorial sessions will be also available by electronic means, videoconference or FAITIC forums if previously agreed
Seminars	At the beginning of every seminar, the teacher will describe the objectives and purpose of the seminar. The students will have a guide on the TEMA platform describing all the 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 test will be fulfilled.
Studies excursion	The teacher will describe the tasks to do, explain the different instruments and technique, and monitors the students' use of such instruments
Mentored work	The teacher presents several real problems to solve and offers guidance 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 exam 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 A4	C1 C3 C4	D5
Studies excursion	After the cruise a report is required.	5	A3	C1 C4	D1

Mentored work	After classroom work reports are required	5	A2 A3	C1 C3 C4	D1 D2
Objective questions exam	Multiple option test to validate the student's knowledge.	20		C1 C4	
Essay questions exam	A series of questions and problems presented to the students to judge its knowledge.	65	A2 A3	C1 C4	

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

Kirk, J.T.O., **Ligth and photosynthesis in aquatic ecosystems**, Cambridge Press, 2011

Varios autores, **Ocean circulation**, Open University Course Team, 1999

Varios autores, **Waves, tides and shallow-water processes**, 2, Open University Course Team, 1999

Pond, S y Pickard, GL, **Introductory Dynamicall oceanography**, 3, Pergamon Press, 1991

Pickard, GL y Emery, W, **Descriptive Physical oceanography**, 6, Pergamon Press, 2011

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 Fisica**, 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	V10G061V01308			
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	
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
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
B5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
C13	Acquire the basic sedimentological, geochemical and geophysical techniques and methodologies used in identification, use and sustainability of the natural resources of coastal and marine environments.
C14	Know basic concepts and events of global change obtained from geological records.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes

Expected results from this subject	Training and Learning Results			
1. Get skills to plan and carry out geological oceanography surveys	A3	B2	C13	D5
2. Get familiar with oceanographic databases in public repositories	A3	B4	C14	D1
3. To know the basic methods of geophysical exploration	A3	B2	C13	D5
		B4	C14	
4. To know the basic techniques of compositional analysis and physical properties of sedimentary cores	A2	B2	C13	D5
	A3	B4	C14	
5. To know and apply the techniques of geochemical characterization in sediments.	A2	B2	C13	D1
		B4	C14	D5
6. Get familiar with geophysical and geochemical data processing methods	A3	B4	C13	D1
	A4	B5		
7. Get skills to write and submit reports	A2	B4	C14	D1
	A3	B5		
	A4			

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 diferents equipment and collected records
THEMATIC UNIT V-: MARINE GRAVIMETRY SURVEYING	THEME 7.- Gravimetry surveying and its application to marine research.
THEMATIC UNIT -VI-: MARINE MAGNETIC SURVEYING	THEME 8.- Magnetic surveying and its application to marine research.
THEMATIC UNIT-VII-: MARINE GEOTHERMAL FLOW	THEME 9.- Geothermal flow and its application to marine research.
THEMATIC UNIT -VIII: ELECTROMAGNETIC AND RADIOMETRIC SURVEYING IN MARINE ENVIRONMENTS	THEME 10.- 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 TECHNIQS	THEME 11.- Sampler methods for Particulate Suspended Matter and bottom sediment samples at deep environments. THEME 12.- Deep sea coring technics. methods. Ocean Drilling Projects. THEME 13.- 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 aswell 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 include the theoretical contents about all methods used in Oceanography Geology surveys, including selected aplicated examples. The student will be evaluated about this content in a final exam.
Laboratory practical	Laboratory practices consist of three sessions: 1- Corer description and interpretation. 2- Introduction to the interpretation of seismic records: reflection and refraction systems. 3- Data processing for the elaboration of bathymetric maps (the computer classroom will be used). Attendance is MANDATORY.
Mentored work	In groups of two or three students, the students will choose a applied scientific study on the subject for an oral presentations. The student will show there ability to work as a team and his ability to make an oral presentation on a scientific topic. In the ensuing discussion, the capacity for synthesis and understanding of the proposed topic will be evaluated. The activity is MANDATORY.

Seminars	<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 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. 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	A2 A3 A4	B2 B4 C13 C14	D1
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	A2 A3 A4	B5 C13 C14	D1
Seminars	Seminar attendance is MANDATORY. The correct implementation of the exercises proposed in these seminars will be evaluated.	5	A2 A3 A4	B2 B4 C13 C14	D1
Studies excursion	Attendance at the sea survey is MANDATORY. The correct implementation of the exercises proposed in these practices will be evaluated.	10	A2 A3 A4	B2 B4 B5 C13 C14	D5
Objective questions exam	Questions and exercises to assess understanding, analytical capacity and synthesis of acquired knowledge.	55	A2 A3 A4	B2 B4 B5 C13 C14	D1 D5

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 approve the subject matter.

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

Hüneke, H., Mulder, T., **Deep-Sea Sediments (Developments in Sedimentology)**, Elsevier Science, 750 pp.,

Jones, E.J.W., **Marine Geophysics**, John Wiley & Sons, LTD. Chichester. 466 pp.,

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

Lowrie, W., **Fundamentals of Geophysics. Second Edition.**, Cambridge University Press, 354 pp.,

Mudroch, A. y Azcue, J.M., **Handbook of Techniques for Aquatic Sediments Sampling. Second Edition.**, Lewis Publishers. London. 256 pp.,

Musset, A.E., Aftab, M., **Looking into the earth. An Introduction to Geological Geophysics.**, Cambridge University Press. 470 pp.,

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Complementary Bibliography

Flor, Germán, **Geología Marina**, Librería Servitec,

Kennet, J., **Marine geology**, Prentice-Hall, inc., 813 pp,

Lillie, R.J., **Whole Earth Geophysicist. An introductory textbook for Geologist & Geophysicists.**, Prentice Hall, Inc. 361 pp.,

Lozano, L., **Introducción a la Geofísica.**, Ed. Paraninfo, Madrid.,

McQuilling, R., Ardu, D.A., **Exploring the Geology of Shelf Seas.**, Graham &amp; trotman limited. Gulf Publishing Company, 234 pp.,

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

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

Reynolds, J.M., **An Introduction to Applied and Environmental Geophysics.**, John Wiley, Chichester.,

Seibold, E. y Berger, W.H., **The Sea Floor. An Introduction to Marine geology. 3rd edition.**, Springer Verlag, 369 pp.,

Shanmugam, G., **Deep-Water Processes and Facies Models: Implications for Sandstone Petroleum Reservoirs: 5 (Handbook of Petroleum Exploration and Production).**, Elsevier Science, 496 pp.,

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

Sheriff, R.E., **Geophysical Methods**, Prentice Hall. Englewood Cliffs, New York,

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: se conservan los pesos de la situación presencial.

2.- Non-face-to-face teaching: se conservan los pesos de la situación presencial.

* 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	V10G061V01309			
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
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
C6	Acquire the fundamentals and terminology of chemical processes.
C7	Apply to the marine and coastal environment the principles and methods used in Chemistry.
C8	Know the main pollutants, their causes and effects in the marine and coastal environment.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

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	B1	C6
	A2		C8
	A3		
Knowing the main technologies used for wastewater treatment and choosing the suitable one depending on the wastewater properties.	A1	B1	C6
	A2		C7
	A3		

Elaborate scientific documents with own data obtained by means of a simulation software	A1 A2 A3 A4 A5	B1 B4	C6 C7 C8	D1 D2
Recognise the main methodologies of sea water desalination	A1 A3 A4 A5	B1	C6 C7 C8	D5
Knowing the potential of the marine environment as a source of marketable products by means of biotechnological processes	A1 A2 A3 A4 A5		C6	
Enumerate the most important points regarding the setup of a control plan about marine pollution.	A2 A4 A5	B1 B4	C6 C8	D2 D5
Choose and use the suitable material for sediments sampling. Choose the most important sentinel organisms for studying marine pollution.	A3 A4 A5		C6 C7 C8	
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	B1 B4	C6 C7 C8	D1
Being able to determine the concentration of a chemical compound in the marine environment depending on the analytical technique employed.	A2 A3 A4 A5	B4	C6 C7 C8	D1 D2
Apply the fundamental concepts of quality control in an analytical laboratory.	A2 A3 A5	B4	C7	D1

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	
	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
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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	A5	B4	D2	
Studies excursion	The students will visit a wastewater treatment facility. After that, a brief questionnaire must be answer.	5	A3 A4		C6	
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	B1		D2
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	A1 A3 A5	B1	C6 C7 C8	
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	B4	C7	D1
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	B1 B4	C6 C7 C8	D1
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		C6 C7 C8	D1 D2
Essay questions exam	When finalising lessons 1 to 3, as well as in the final examination (for these lessons), some questions should be answered by the students. This exam will count for 10% of the final qualification. At the end of the subject, some questions about the methodologies used in chemical analysis will be aswered. It will count for 12,5% of the final qualification.	22.5	A1 A2 A4	B1	C6 C7 C8	D5

Other comments on the Evaluation

Date, time and place of exams will be published in the official web of Marien Ciencias 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

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K. Grasshoff, K. Kremling, M. Ehrhardt, **Methods of Seawater Analysis**, 3, Wiley-VCH, 1999

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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 Faitic, etc. The office hours will be previously booked.

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

The contents will not suffer modifications.

* Additional bibliography to facilitate the 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				
Aquaculture				
Subject	Aquaculture			
Code	V10G061V01310			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Rocha Valdes, Francisco Javier			
Lecturers	Paredes Rosendo, Estefanía Rocha Valdes, Francisco Javier			
E-mail	frocha@uvigo.es			
Web				
General description	This course aims to provide to the students with the knowledge, skills and abilities that enable their to conceive, design and carry out research projects in the field of aquaculture. At the same time, this matter allows the student to design, manage and control aquaculture farming facilities on land and sea.			

Competencies	
Code	
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
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
C11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes				
Expected results from this subject	Training and Learning Results			
Knowing the potentially cultivable marine species in the world	A2 A3	C11	D1 D5	
Know the aquaculture installations in land and sea	A2	B3		
Dominate the aquaculture auxiliary techniques (phytoplankton and zooplankton) and the culture technics of the main species that are cultivate now in Europe	A2	B3 B4		
Know the treatments for the water in the culture systems	A3		D1 D5	
Recognise and analyse problems and propose solution strategies	A2 A3	B3 B4	C11	D1 D5
Identify and control problems of environmental impact and marine pollution caused by marine aquaculture	A2			D5
Design, control and management of culture centres and recovery of marine endangered Species		B3 B4		D5
Known the operational details of marine companies, recognise specific problems and propose solutions	A3			D5
Design, control and manage culture production plants	A2			D1 D5
Aquariology	A2	B4		D1

Contents	
Topic	
INTRODUCTION	Aquaculture objectives. Current situation and prospects in the world and Spain. History. Types of aquaculture.
WATER QUALITY AND ITS CONTROL	Seawater as culture medium. Undergoes changes in water cultivation. Biological filtration. Mechanical filtration. Physical absorption. Disinfection. Decantation. Aeration. Water quality criteria for aquaculture.

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

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	30	45	75
Seminars	7	14	21
Laboratory practical	15	15	30
Seminars	2	0	2
Studies excursion	7	0	7
Essay questions exam	3	7.5	10.5
Objective questions exam	1	1.5	2.5
Report of practices, practicum and external practices	0	2	2

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

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

Personalized assistance

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

Assessment

	Description	Qualification	Training and Learning Results
Seminars	Following the completion of the seminars, each student group must submit a summary report of the subject matter, which will be evaluated. A minimum of 5 will be required to approve.	10	A2 B4 D1 A3 D5
Laboratory practical	Laboratory practices are considered an essential part of the subject. Practices will be evaluated by the attendance and assistance of students to them.	5	B3 B4
Essay questions exam	There will be a long written test on the official date will be assessed on the knowledge gained throughout the course. This test will assess all the knowledge acquired in the course of the subject. The minimum grade to pass the exam will be 5	40	A2 C11 D5 A3

Objective questions exam	There will be several quizzes, multiple choice, during the course of lectures. Since the objective of these tests is that students prepare in advance the subjects to be discussed, questions of each test will cover the topics that are being treated that week (including topics to be covered in that class or the next if they are part of issue). The minimum grade to pass the test will be 5.	15	A2 B3	D1
Report of practices, practicum and external practices	For the evaluation of practices each student must prepare a written report on the implementation and results of laboratory practices, which will be evaluated. The minimum grade to approve the report will be 5.	30	B4	D1 D5

Other comments on the Evaluation

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

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

The official calendar of the evaluation will be published in:

<http://mar.uvigo.es/index.php/en/alumnado-actual-2/examen-es-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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 Stead, S. M. y L. Laird, **Handbook of Salmon farming**, 2001,
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Recommendations

Subjects that are recommended to be taken simultaneously

Marine and coastal management/V10G060V01704

Subjects that it is recommended to have taken before

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

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

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

* Teaching methodologies modified

In the event that teaching must be done in a mixed way, with face-to-face and virtual classes, or exclusively virtual, the same teaching will be carried out in both cases. To this end, classes will be videotaped and made available to students for viewing. The resolution of doubts can be done at the same time of the class, either in the same classroom (face-to-face), through chat or requesting audio during the class (mixed or virtual teaching). Additionally, the FAITIC teledoaching platform will be enabled for the resolution of doubts and the students will be able to send emails to the teacher for the resolution of specific doubts.

In the case of teledoaching, classes will preferably take place through the Remote Campus of the University. If the type of internet connection at home, both for the students and the teacher, prevents the use of the remote campus, other video conferencing systems that work under those technological limitations will be sought, such as Skype or Zoom. Similarly, if the recorded class videos cannot be distributed to students from FAITIC, external cloud storage systems will be sought to store and download the videos.

In the case of the confinement, limitations to the displacement or in the number of people affect the accomplishment of the laboratory practices and the exits, several possible alternatives are contemplated. If possible, both the laboratory practices and the exits will be postponed to a date in which they can be carried out, this conditioned to the limitations of the teaching calendar and always within the current academic year. In the event that it is not possible to carry out one of these activities, priority will be given to carrying out laboratory practices. If it is impossible to carry out these activities in person, then the laboratory practices will be carried out virtually using real databases from previous practices.

* Non-attendance mechanisms for student attention (tutoring)

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

* Modifications (if applicable) of the contents

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

* Additional bibliography to facilitate self-learning

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

* Other modifications

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

=== ADAPTATION OF THE TESTS ===

* Tests already carried out and pending

Given that the subject of Aquaculture is evaluated through various types of tests that allow a continuous evaluation and

without the excessive preponderance of any of them, it is not considered necessary to change the weight of the evaluation to be carried out, which would be:

Written Test: [Previous Weight 40%] [Proposed Weight 40%]

Test type tests: [Previous weight 15%] [Proposed Weight 15%]

Seminars: [Previous weight 10%] [Proposed Weight 10%]

Laboratory Practices: [Previous Weight 35%] [Proposed Weight 35%]

*** Tests that are modified**

Written Test: In the event that this test must be performed virtually and not in person, it will be done through the FAITIC Platform and Moodle. Its structure will change, giving greater importance to alternative or short answer answers instead of long development answers.

Test type tests: In the event that the type tests already carried out exceed 60% of the possible tests, these tests will be considered as completed. In the event that they could not be carried out in person, or if those carried out were less than 60%, these will be carried out through weekly questionnaires of alternatives in FAITIC.

*** Additional Information**

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