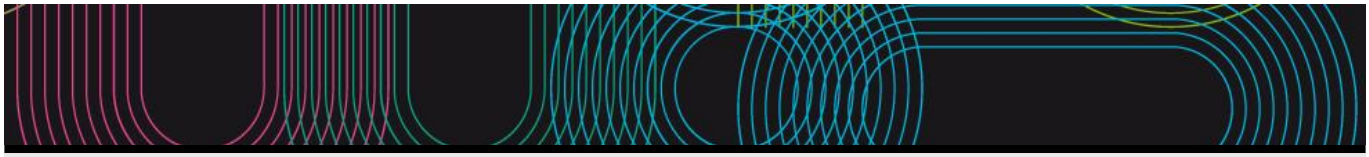

(*)Facultade de Ciencias do Mar

(*)Grao en Ciencias do Mar

Subjects			
Year 2nd			
Code	Name	Quadmester	Total Cr.
V10G061V01201	Biochemistry	1st	6
V10G061V01202	Marine botany	1st	6
V10G061V01203	Physics: Physics II	1st	6
V10G061V01204	Chemical oceanography I	1st	6
V10G061V01205	Sedimentology	1st	6
V10G061V01206	Marine Ecology	2nd	6
V10G061V01207	Coastal and marine sedimentary habitats	2nd	6
V10G061V01208	Principles of marine microbiology	2nd	6
V10G061V01209	Chemical oceanography II	2nd	6
V10G061V01210	Marine zoology	2nd	6

IDENTIFYING DATA

Biochemistry

Subject	Biochemistry			
Code	V10G061V01201			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	San Juan Serrano, María Fuencisla			
Lecturers	San Juan Serrano, María Fuencisla			
E-mail	fsanjuan@uvigo.es			
Web				
General description	Basic concepts on the structure and function of biomoléculas, integration and regulation of their metabolism and transmission and expression of the genetic information.			

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
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
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.
C9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
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			
Acquisition of basic concepts about biomolecules structure, metabolic reactions, the main processes of obtaining and utilisation of energy and transmission and expression of the genetic information.		B1 B3	C9	
Approach of the biological phenomena in molecular terms, relating the structure of each biomolecules family with the biological function that exert	A2 A3	B1	C9	
Acquisition and appropriate utilisation of concepts and biochemical terminology	A4	B1	C9 C11	
Resolution of questions of quantitative biochemistry	A2			D1 D2
Familiarisation with use of basic instrumental and equipment of a biochemical laboratory	A2	B3		
Knowledge and application of simple techniques of separation and quantification of biomolecules	A2	B3 B4		D1
Development of scientific thinking style	A2 A3 A4	B1		D1 D2

Contents

Topic	
Inorganic components from living organisms:	Importance of no covalent interactions. Role of the water in the biological processes. Interactions of the macromolecules in solution.
Nucleic acids	Composition of nucleosides and nucleotides. Deoxyribonucleic acid. Ribonucleic acids.

Amino acids and proteins:	Classification and properties of the amino acids. Peptidic bond Peptides and proteins: structure, function and classification.
Carbohydratess:	General characteristics and classification. Monosaccharides, oligosaccharides and polysaccharides. Structure, importance and function.
Lipids:	General characteristics and biological importance. Classification: fatty acids; simple lipids; complex lipids; isoprenoid lipids; eicosanoids.
Enzymes:	Concept, active site, and classification. Enzymatic catalysis. Kinetical enzymatic. allosteric Enzymes.
Introduction to Metabolism:	Metabolic pathways. Anabolism and catabolism. Energy from biological processes. Metabolism regulation.
Carbohydrate metabolism:	Anaerobic processes of energy generation. Oxidative processes: citric acid cycle and route of the pentose phosphate cycle. Biological oxidations: electron transport chain and oxidative phosphorylation. Carbohydrate biosynthesis.
Lipid metabolism:	Beta oxidation of fatty acids. Fatty acids biosynthesis. Regulation of fatty acids metabolism. Biosynthesis of triacylglycerols and phospholipids Membrane lipids, steroids, isoprenoids and eicosanoids.
Metabolism of nitrogenous compounds:	Proteolysis. Amino acid catabolism. Nitrogen excretion and urea cycle. Catabolism of carbon skeletons of amino acids. Amino acid byosinthesis. Regulation of amino acids metabolism. Nucleotide metabolism.
Transmission and expression of genetic information	DNA Replication. Information restructuring: restriction, repair and recombination. Information transfer: Transcription. Information decoding: Translation.
Practice: Enzymology	Preparation of enzyme extract. Measurement of enzyme activity. Kinetic characterisation.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	41.5	74.7	116.2
Seminars	4	9	13
Laboratory practical	6	1.5	7.5
Objective questions exam	3	0	3
Problem and/or exercise solving	0	8.3	8.3
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	The professor will give fundamental notions needed to understand and prepare the contents of the matter.
Seminars	The seminars will be carry out collaborative way. Students will prepare some of the contents of program and some related subject of interest.
Laboratory practical	The practices will familiarise students with some basic methods and techniques of extraction, separation and quantification of biomolecules, the measure of the enzyme activity and kinetical parameters.

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. Tutoring hours: Tuesday, Wednesday and Thursday from 13:00 to 14:00 p.m
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. Tutoring hours: Tuesday, Wednesday and Thursday from 13:00 to 14:00 p.m
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. Tutoring hours: Tuesday, Wednesday and Thursday from 13:00 to 14:00 p.m
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. Tutoring hours: Tuesday, Wednesday and Thursday from 13:00 to 14:00 p.m
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. Tutoring hours: Tuesday, Wednesday and Thursday from 13:00 to 14:00 p.m

Assessment

	Description	Qualification	Training and Learning Results
Lecturing	Assistance no avaliable	0	
Seminars	In the realization of the seminars values the capacity to relate and apply the concepts purchased, to identify and understand problems, the appropriate utilization of the terminoloxía biochemical, his capacity to transmit the information. How transversal competitions value the initiative, the capacity of autonomous learning, the work in team, the capacity of organization, the critical capacity and the skill in the research of information and handle of the computer.	20	A2 B1 C9 D1 A3 C11 D2 A4
Laboratory practical	To the finalizar the practices will realize an examination or will deliver a report to value the knowledge and handle of the technicians instrumentais used, the application of the theoretical knowledges to the practice, the capacity of analysis, procesamento and interpretation of the results obtained.	20	A2 B1 C9 D1 A3 B3 C11 D2 A4 B4
Objective questions exam	Test: It asses, in a general way, the knowledge acquired of the course program Short answer: It asses the knowledge acquired, the ability to relate them and the proper use of concepts and biochemical terminology.	50	A2 B1 C9 A3 A4
Problem and/or exercise solving	To the finalizar the theoretical exhibition of each subject or group of subjects related, the students will resolve of individual form the problems or exercises proposed pole professor.	10	A2 B1 C9 D1 A3 B4 C11 D2 A4

Other comments on the Evaluation

The student will have to cumplimentar a identification card in the platform FAITIC, attaching a recognizable photograph. This requirement is indispensable for the realization of the practices, seminars and different tests.

It is advised to the students use a e-mail adress of the University of Vigo to contact the professor by this way, identifying theirself (name and surnames, course and titulación) and indicating the subject.

It is advised the assistance to the professor lectures.

Resolution of problems and/or exercises: The average score of all problems/exercises must be equal or upper 5 (out of 10) to be taken into consideration in the final assessment.

Seminars: realization of the seminars is compulsory for passing the subject. The average score of seminars must be equal

or upper 5 (out of 10) to be taken into consideration in the final assessment.

Laboratory Practices: realization of the practices and the exam and/or report of them is mandatory for passing the subject. The average score of the practices must be equal or upper 5 (out of 10) to be taken into account in the final evaluation.

The final exam will consist of a test of true/false questions and several questions or problems about all topics of the subject. **The average score of the final exam must be equal or upper 5 (out of 10) to passing the subject.**

Students who do not pass the final exam and must attend the July call, will keep the score of the parts tests that they passed during the course.

Require of the alumnado that curse this subject a responsible behaviour and honesta. Consider inadmissible any form of fraud (copy or plaxio) encaminado to falsear the level of knowledges and destrezas achieved in all type of proof, report or work. The fraudulent behaviour pode involve suspend the subject a complete course. It will carry one internal register of these actuacions and, in case of reincidencia, it will ask the wool Reitoria to abertura of a file discipline .

Sources of information

Basic Bibliography

Feduchi E., Blasco I., Romero C.S. y Yáñez E., **Bioquímica. Conceptos esenciales**, 2ª Ed, 2015

Nelson D.L. and Cox M.M., **Lehninger. Principios de Bioquímica**, 7ª Edición, 2018

Tymoczko J.L., Berg J.M. y Stryer L., **Bioquímica. Curso básico**, 2ª Edicion, 2014

Voet D., Voet J.G. y Pratt C.W., **Fundamentos de Bioquímica. La vida a nivel molecular**, 4ª Edición, 2016

Complementary Bibliography

Blas PastorJ.R., **bqTest: 1000 preguntas tipo test de bioquímica para universitarios.**, 2013

Herrera E., **Bioquímica Básica**, 1ª Ed, 2014

Mathews C.K., Van Holde, K.E., Appling D.R. y Anthony-Cahill S.J., **Bioquímica**, 4ª Edición, 2013

McKee T. y McKee J.R., **Bioquímica. La base molecular de la vida**, 5ª Edición, 2015

Salway J.G., **Una ojeada al metabolismo**, 2ª Edición, 2002

Stryer L., Berg J.M. y Tymoczko J.L., **Bioquímica.**, 7ª Edicion, 2013

Recommendations

Subjects that continue the syllabus

Physiology of marine organisms/V10G060V01501

Subjects that it is recommended to have taken before

Chemistry applied to the marine environment I/V10G060V01505
Chemistry applied to the marine environment II/V10G060V01604
Biology: Biology I/V10G061V01101
Biology: Biology 2/V10G061V01106

Contingency plan

Description

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

=== ADAPTATION OF THE METHODOLOGIES ===
* educational Methodologies that keep : ALL

* educational Methodologies that modify : ANY

* no face-to-face Mechanism of attention to the students (*tutorías): *TUTORÍAS PERSONALISED IN "THE VIRTUAL DISPATCH OF THE PROFESSOR" OF THE REMOTE CAMPUS.

* Modifications (if they proceed) of the contents to give: it DOES not PROCEED

* additional Bibliography to facilitate the car-learning

* Other modifications

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

* Pending proofs that keep
Proof XX: [previous Weight 00%] [Weight Proposed 00%]
...

* Proofs that modify
[previous Proof] =&*gt; [new Proof]

* New test

* additional Information

1. BLENDED TEACHING
- The contents, methodologies, and tests of evaluation are maintained.
- Theory will be taught through through the Remote Campus. Laboratory Practices and Seminars will be conducted in person.
- In the planning of Laboratory Practices the in person teaching will be reduced to 3 h, increasing the hours of dedication of the student out of the classroom to 4.5 h.
- The Personalized assistance will be conducted through the Remote Campus, previous application of the student to the professor.
- The delivery of material for the subject, the communication of notices and the reception of works from the students will be carried out through the FAITIC platform.

2. REMOTE TEACHING
- The contents, methodologies, and tests of evaluation are maintained.
- All the teaching (Theory, Laboratory Practices and Seminars) will be taught through the Remote Campus.
- In the planning of the Laboratory Practices the in person teaching will be reduced to 3 h, increasing the hours of dedication of the student out of the classroom to 4.5 h.
- The Personalized assistance will be conducted through the Remote Campus, previous application of the student to the professor.
- The delivery of material for the subject, the communication of notices and the reception of works from the students will be carried out through the FAITIC platform.

IDENTIFYING DATA				
Marine botany				
Subject	Marine botany			
Code	V10G061V01202			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish Galician English			
Department				
Coordinator	Castro Cerceda, María Luísa			
Lecturers	Castro Cerceda, María Luísa Sánchez Fernández, José María			
E-mail	lcastro@uvigo.es			
Web				
General description	Study of the main marine plant groups, classification, life habits and interactions with other groups and the environment			

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
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C4	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.
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	
To know the origin and evolution of the marine plants and the features of the main groups	A2 A3 A4 A5	D3 D5
To acquire the skills to collect, prepare, analyze, identify and preserve plant samples	C4	D1 D2
To acquire the capacity to deepen in the autonomous learning on the problems related to the Marine Botany, and to communicate that knowledge in an efficient way	A3 A4 A5	D1 D2 D3 D5

Contents	
Topic	
1. Introduction to Botany	1.1. Definition of Botany 1.2. Groups of plants 1.3. Relationship with the degree
2. Plant reproduction	2.1. Asexual reproduction 2.2. Sexual reproduction
3. Procariotic algae	3.1. Main featuress of Cyanophyta 3.2. Main features of Prochlorophyta
4. Introduction to the eukaryotic algae	4.1. Origin of the main lines of photosynthetic organisms 4.2. Phylum Gaucophyta 4.3. Phylum Euglenophyta

5. Unicellular phyla; main features	5.1. Phylum Cryptophyta 5.2. Phylum Haptophyta 5.3. Phylum Pyrrophyta
6. Phylum Ochrophyta (Heterokontophyta) I	Main features
7. Phylum Ochrophyta (Heterokontophyta) II	7.1. Class Xantophyceae 7.2. Class Bacillariophyceae
8. Phylum Ochrophyta (Heterokontophyta) III	8.1. Class Phaeophyceae. Main features
9. Phylum Ochrophyta (Heterokontophyta) III	9.1. Main features of Bangiophyceae 9.2. Main features of Floridophyceae
10. Phylum Chlorophyta I	10.1. Main features of Prasinophyceae 10.2. Main features of Chlorophyceae 10.3. Main features of Bryopsidophyceae 10.4. Main features of Ulvophyceae 10.5. Main features of Zygnematophyceae
11. Ecology and ethnobotany of algae	11.1. Introduction to the study of the marine algae communities 11.2. Uses of the algae
12. Introduction to the flowering plants	12.1. Main features and life cycle 12.2. Adaptations to the coastal environment
13. Coastal vegetation	13.1. Introduction
14. Fungi and lichens	14.1. Main features

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	9	9	18
Field practice	4	10	14
Seminars	3	3	6
Mentored work	0	23	23
Lecturing	25	25	50
Essay	7	14	21
Report of practices, practicum and external practices	1	5	6
Problem and/or exercise solving	2	10	12

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

Methodologies

	Description
Laboratory practical	Study and identification of the main groups of algae
Field practice	"In situ" study of the main algal communities and coastal vegetation of the Atlantic Coast of Galicia
Seminars	Discussion of the work of each group; questions and doubt solution
Mentored work	Planification and elaboration of a bibliographic or experimental work by the students
Lecturing	Master class of each lesson of the theory program, supported on infographic materials

Personalized assistance

Methodologies	Description
Lecturing	Classroom lesson with support on audiovisual material, trying to make them as participatory as possible
Laboratory practical	Study of the morphology, systems of reproduction and identification of the main groups of seaweeds. Use of laboratory material, mainly optical equipment (stereo microscope and microscope)
Field practice	Study of the main communities of coastal plants, and their adaptations to live under marine influence
Seminars	By groups, work on two aspects related with the development of the course: in the first place how to develop a scientific/technical report, and second methods of phylogenetic reconstruction, which are used during all the course as a link that relates the biological groups. Students willin so will be able to solve doubts during OFFICE HOURS on Mondays and Tuesday at 10-13h; It is recommended to book an appointment by email beforehand.
Mentored work	Students will be guided by the professor during the development of the work

Assessment

	Description	Qualification	Training and Learning Results	
Essay	Public presentation of the groups' reports	15	A2 A3 A4 A5	D3 D5

Report of practices, practicum and external practices	Evaluation of the reports on the field and laboratory sessions	20	A5	C4	D3
Problem and/or exercise solving	assessment of the theoretical part of the course	65			

Other comments on the Evaluation

IT IS NECESSARY to reach half of the note in each one of the three evaluations in order to pass the course.

Those activities that were not evaluated during the regular course will have to be evaluated before the second final exam in july. The grades of those parts passed in june can be kept for the "second chance" in july, but NOT further.

The participation in any of the activities implies that the final qualification will be different from "not presented".

The dates of the exams are aproved by the Faculty (mar.uvigo.es/alumnado/examenes)

It is required that the students in this course behave in a responsible and honest way.

It is deemed inadmissible any form of fraud (i.e. copy and / or plagiarism) in any type of test or report designed to evaluate the level of knowledge or skill achieved by a student. Any fraud on the part of the student will result in failing the course; further fraud will lead to start disciplinary actions in front of the Rectorate

Sources of information

Basic Bibliography

Izco, J. (Ed.), **Botánica**, 2, McGraw-Hill/Interamericana,
Graham, J.E., Wilcox, L.W., Graham, L.E., **Algae**, 2, Benjamin Cummings,
Lee, R.E., **Phycology**, 4, Cambridge University Press,

Complementary Bibliography

van den Hoek, C., **Algae**, 1, Cambridge University Press,
Dawes, C.J., **Marine Botany**, 2, Wiley,
Varios, **Artículos en Revistas**,

Recommendations

Subjects that continue the syllabus

Marine and coastal management/V10G060V01704
Marine Ecology/V10G061V01206

Subjects that it is recommended to have taken before

Biology: Biology I/V10G061V01101
Biology: Biology 2/V10G061V01106

Contingency plan

Description

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

=== ADAPTATION OF THE METHODOLOGIES ===
* Teaching methodologies maintained
In case the academic authorities impose a BLENDED LEARNING system, assistance to laboratory classes and field trips will be maintained.

* Teaching methodologies modified
BLENDED LEARNING
The only modification will be in masterclasses, which will be imparted in remote, via Campus Remoto or FaiTIC, after the indications that the academic authorities consider fit.
FULL DISTANCE LEARNING
Theory lessons (masterclasses): will be imparted in remote, via Campus Remoto or FaiTIC. The presentation files and additional documents will be made available at FaiTIC for those students with any problem to connect live.

Practical lessons and Seminars: will be imparted in remote, via Campus Remoto or FaiTIC. The presentation files and additional documents will be made available at FaiTIC for those students with any problem to connect live. If the trip field (field classes) cannot be carried out, a remote presentation showing the main plant species and communities of the Corrubedo Natural Park will be presented via Campus Remoto, with additional material in FaiTIC.

* Non-attendance mechanisms for student attention (tutoring)
For both BLENDED or FULL DISTANCE LEARNING, tutoring will be attended in remote, using the institutional e-mail addresses, or via Campus Remoto at an hour and time previously accorded.

=== ADAPTATION OF THE TESTS ===
* Tests already carried out
In case the normal (assistance) course should be interrupted, the tests and exam already done at the time will keep the weight included in this Guide both for BLENDED and FULL DISTANCE LEARGING.

* Tests that are modified
In case the academic authorities impose a BLENDED or FULL DISTANCE LEARNING system, the grading percentages in this Guide will be maintained. In such a case, the percentage of the continuous assessment within the Problem and/or exercise solving will be increased up to a 25% maximum.

IDENTIFYING DATA				
Physics: Physics II				
Subject	Physics: Physics II			
Code	V10G061V01203			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	2nd	1st
Teaching language	Galician			
Department				
Coordinator	Lugo Latas, Luis			
Lecturers	Iglesias Prado, Jose Ignacio Lugo Latas, Luis			
E-mail	luis.lugo@uvigo.es			
Web				
General description	Physics, as a science, deals with the description of matter and its interactions, developing theories in accordance with empirical knowledge. From this definition one can study nature from the smallest scales (subatomic) to the macroscopic scale, hence the different branches of Physics. Physics is the base of an uncountable number of scientific and technological applications, and in particular for the Sea Sciences student it's a basic tool to understand other theories and subjects in the following years of the grade. The knowledge and application of laws and principles studied in Physics allows the interpretation of the marine enviroment and the development of models related with it. Furthermore, it is important to understand the fundamental physic concepts to understand how the instruments work and to know how to use and control them.			

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.
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
C1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
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.
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			
1.- Know the fundamental principles of the Themodynamic and know applied to realize global analyses of thermodunamic systems of interest in Sciences of the Sea. Comprise and know use the relations and *diagramas *termodinámicos that describe the different properties of the substances. Know the cycles *termodinámicos basic of thermal machine and *refrixeración and his main applications in Sciences of the Sea. Know collaborate in the work with other people of communicative and constructive form in the manufacture of experiments *termodinámicos.	A5	B1 B3	C1 C4 C5	D2
2.- Resolve problems of theory of fields and equations of the physical-mathematical chords with the paper of the fields in Sciences of the Sea. Argue the resolution of problems by means of it logical scientist and the scientific methodology.	A5	B1 B3	C1 C4 C5	D1 D2
4.- Identify the parameters that characterize a wave. Resolve problems envelope to *propagación of waves and his incidence envelope the means. Know resolve the implications of *emisores or receiving of wave in movement. Know collaborate in the work with other people of communicative and constructive form in the manufacture of one experience of waves.	A5	B1 B3	C1 C4 C5	D1 D2

5.- Determine the physical parameters that define the behaviour of the subject in witnesses of electric fields *y magnetic. Identify the #phenomenon of *inducción electromagnetic. Identify the understanding of the *electromagnetismo through the *invarianza of the *ecuaciones of Maxwell. Identify the parameters that characterize an electromagnetic wave. Resolve problems envelope to *propagación and radiation of electromagnetic waves in distinct means. Distinguish the *particularidades behavioural of the electromagnetic fields. Identify differentiate and basic similarities between electromagnetic wave and acoustic wave/mechanics.	A5	B1 B3	C1 C4 C5	D1 D2
6.- Know and identify the physical properties more *relevantes in the water of the sea so much from a fundamental point of view how to realize oceanographic studios. Be able of *recabar and #analyze the necessary information to carry out *tareas where the physical behaviour of the water of the sea was *relevante.	A5	B1 B3	C1 C4 C5	D1 D2

Contents

Topic	
1.- Thermodynamics	1.- Introduction. Extensive and intensive magnitudes. Definitions. 2.- Thermal balance and zeroth law of thermodynamics. 3.- Heat. capacity and specific heat. Phase change and latent heat. 4.- Thermal exchanges of energy: conduction, convection and radiation. 5.- First law. Internal energy. 6.- The ideal gase. 7.- Heat engine and refrigerator. 8.- Entropy.
2.- Elementary theory of fields	1.- Introduction and concept of field. Types of fields 2.- Gradient of a scalar field. 3.- Circulation of a vector field. 4.- Flow and divergence of a vector field. Gauss' theorem. Solenoidal fields. 5.- Curl of a vector field. Stokes' theorem. Conservative fields.
3.- Basic principles of fluid mechanics	1.- Fluid characterization. Pressure and density. 2.- Fluid statics. Archimedes' principle. 3.- The continuity equation. Bernoulli's equation. 4.- The viscous fluid. 5.- Navier-Stokes' equation. 6.- Energy equation.
4.- Waves	1.- Types of wave. Wave interference. Diffraction, reflection and refraction of waves. 2.- Wave phenomena. 3.- Doppler effect. 4.- Introduction to ocean waves.
5.- Basics of electromagnetism.	1.- Electric charge. Electric field. Magnetic field. Maxwell's laws. 2.- Electromagnetic waves 3.- The spectrum of electromagnetic radiation 4.- Interaction with matter. 5.- The black body radiation. Stefan-Boltzmann's law.
6.- Basic properties of the sea water.	1. Mechanical properties: density, viscosity, surface tension and compressibility. 2. Thermal properties: changes of phase, specific and latent heats, thermal conductivity and thermal dilatation. 3. Electromagnetic properties: conductivity and refraction index.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	15	15	30
Seminars	7	0	7
Lecturing	30	13	43
Problem and/or exercise solving	0	30	30
Report of practices, practicum and external practices	0	15	15
Portfolio / dossier	0	25	25

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

Methodologies

	Description

Laboratory practical	Realización de diversas prácticas de laboratorio en las que el alumnado adquirirá los conocimientos básicos del procedimiento experimental en física, así como el cálculo de incertidumbres en las variables físicas determinadas. La asistencia a las prácticas de laboratorio y la entrega, en tiempo y forma, de la memoria correspondiente es obligatoria para superar la materia en el año en curso
Seminars	Resolución de diversos ejercicios y problemas relacionados con lo analizado en las sesiones magistrales y que presenten más dudas o que sean de mayor dificultad. Organización del trabajo realizado en el e-portfolio. Se propondrán boletines de problemas que el alumno debe resolver por sí mismo
Lecturing	Exposición y explicación de los diversos conceptos físicos y de las distintas leyes con las que se relacionan, mostrando la manera de alcanzar los objetivos y haciendo hincapié en aquellos aspectos que resulten más problemáticos y dificultosos y resolviendo distintos ejemplos/problemas. Se propondrán distintas referencias bibliográficas.

Personalized assistance

Methodologies	Description
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.

Assessment

	Description	Qualification	Training and Learning Results
Problem and/or exercise solving	It Will evaluate the assimilation of knowledges of the students with a test based on problems related with the subject. The exam will be developed according to the official calendar: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3	40	A5 C1 D1 C4 D2 C5
Report of practices, practicum and external practices	It will qualify the realization of the laboratory experimets and the report in groups of two students.	25	A5 B1 C1 D2 B3 C4
Portfolio / dossier	Developing of a "porfolio" based on the subject in groups of two students.	35	A5 B1 C1 D1 B3 C4 D2

Other comments on the Evaluation

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

In July's test only a written proof will be made, corresponding to problem solving, with a weight of 40% of the final grade. 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

Young, Freedman, **Física Universitaria**, 978-6073244398, Pearson, 14ª ed., (2 vols.), 2018
R. A. Serway y J.W. Jewett, **Física para Ciencias e Ingeniería**, Thomson, 9ºEd., 2014

Complementary Bibliography

P.A. Tipler y G. Mosca, **Física para la Ciencia y la Tecnología**, Reverté, 6ª ed., (2 vols.), 2010
Jou, Llebot, Perez, **Física para ciencias de la vida**, McGraw-Hill, 2ª ed., 2008
R.A. Varela y G. Rosón, **Métodos en Oceanografía Física**, Edit. Anthias, 2008
W.E. Gettys, F.J. Keller y M.J. Skove, **Física clásica y moderna**, McGraw-Hill, 1992
A. H. Cromer, **Física para las ciencias de la vida**, Editorial Reverté, Barcelona., 1986

Recommendations

Subjects that continue the syllabus

Physical oceanography I/V10G060V01503
Physical oceanography II/V10G060V01602
Ocean Dynamics/V10G060V01702

Subjects that it is recommended to have taken before

Physics: Physics I/V10G061V01102

Other comments

The continued use of tutorials is recommended to solve any doubt about the subject, and also to help solve the problems.

Contingency plan

Description

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

=== ADAPTATION OF THE METHODOLOGIES ===
* Teaching methodologies maintained
The methodologies based on the master class, seminars and laboratory practices are maintained.

* Teaching methodologies modified
In the scenario 1) face-to-face teaching and face-to-face on line (mixed) or 2) online teaching (virtual) the referred methodologies will carry out by the Integra Campus and the Remote Campus, respectively.

* Non-attendance mechanisms for student attention (tutoring)
In the scenarios 1 and 2, student attention will be carried out through the Remote Campus in the virtual office of the teachers and/or the exchange of emails.

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

* Additional bibliography to facilitate self-learning
Not applicable.

* Other modifications
Not applicable.

=== ADAPTATION OF THE TESTS ===
If scenario 1 and /or 2 occurs, the assimilation of knowledge and competences by the students will be evaluated with the same evaluation systems, in terms of the final exam, it will be carried out through the Remote Campus.

IDENTIFYING DATA

Chemical oceanography I

Subject	Chemical oceanography I			
Code	V10G061V01204			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Prieto Jiménez, Inmaculada			
Lecturers	Otero Martínez, Nicolás Prieto Jiménez, Inmaculada Ramos Berdullas, Nicolás			
E-mail	iprieto@uvigo.es			
Web				
General description				

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
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.
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.
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			
Describe the composition and behavior of materials present in seawater.	A2 A4	B1	C6 C7	D1 D2
Explain the main properties of water, electrolyte solutions and seawater from a physicochemical point of view.	A2 A4 A5	B1	C6	D1 D2
Recognize and interpret the transport phenomena of solutes.	A2 A4 A5	B1	C6 C7	D1 D2
Distinguish the types of estuaries based on water circulation and identify their characteristics.	A2 A5	B1	C6 C7	D1 D2
Use quantitative models to study the water circulation and calculate residence times in estuaries.	A2 A5	B1 B4	C6 C7	D1 D2
Explain the characteristics of the air-sea interface, the processes that take place and the factors that control them.	A2 A4 A5	B1	C6 C7	D1 D2
Describe the gas solubility in the seawater and apply the models to estimate gas exchange across the air-sea interface.	A2 A4 A5	B1	C6 C7	D1 D2
Explain the characteristics of the seawater-solid interface, the processes that occur in it and identify the factors that determine them.	A2 A4 A5	B1 B3 B4	C6 C7	D1 D2

Interpret the properties and behavior of particulate matter and colloids present in seawater.	A2 A5	B1 B3 B4	C6 C7	D1 D2
Use appropriate experimental techniques to study the adsorption processes and apply the models at the solid-solution interface.	A2	B1 B3 B4	C7	D1 D2
Explain the characteristics and composition of interstitial waters.	A2 A4 A5	B1	C6 C7	D1 D2

Contents	
Topic	
1. Composition and physicochemical properties of seawater.	- Introduction. - Ion-solvent interactions. - Ion-ion interactions. - Physicochemical properties of seawater. - Salinity.
2. Transport phenomena.	- Non-ionic transport phenomena: Heat conductivity, viscosity and diffusion. - Advection-diffusion equation. - Electrical conductivity.
3. Mixing processes in coastal systems.	- Introduction. - Estuaries: Classification and types. Description. - Mixing processes in estuaries: Models. Quantitative models.
4. Liquid-gas interface.	- Interfacial thermodynamics: Surfaces and interfaces. Surface tension. Superficial excess. - Gas solubility in seawater. - Models for estimating gas exchange at the gas-liquid interface. - Nonconservative gases. - Oxygen in seawater. - Alkalinity of natural waters.
5. Solid-liquid interface	- Introduction. - Double layer. Models. - Adsorption at the solid-liquid interface: Physisorption and chemisorption. Adsorption isotherms. - Behavior of particulate and colloidal material in sea water. - Diagenesis and interstitial waters.
Laboratory experiment 1	Determination of physicochemical properties of water in the Vigo Estuary
Laboratory experiment 2	Determination of the surface tension of organic compounds and influence of related factors.
Laboratory experiment 3	Study of adsorption from solution at the solid-liquid interface.
Laboratory experiment 4	Study of properties of colloidal systems.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	23	35	58
Problem solving	14	28	42
Laboratory practical	15	20	35
Essay questions exam	3	12	15
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Classes in which the faculty gives a global vision of the contents of the subject, focusing in a special way on the most relevant aspects and that are more difficult to understand for the students. The material will be placed in Tema platform.
Problem solving	Activity where it is exposed some aspects related to the development of the topics covered in the subject, also solving problems, exercises and / or issues. In addition, the students must work on proposed exercises and issues, according to the guidelines established by the professor in the classes or seminars of the subject.

Laboratory practical	The students will perform different experiments in the laboratory over several sessions. In order to be able to have previous knowledge of the practices to be carried out, students will have the corresponding material on the Tema platform. After working in the laboratory, students must prepare a report, which must include the results obtained, discussion and conclusions related to the practice. Once it is finished, students will have to answer some questions related to the work developed.

Personalized assistance

Methodologies	Description
Lecturing	Sessions in which the faculty will resolve the questions and queries of the students related to the study and / or subjects related to the subject and the activities developed during the course. The students who want to be able to go to personalized tutorials, specially in the schedule indicated below. Hours: Tuesday, wednesday and thursday, from 15:30 to 17:30 h. This schedule may vary on time, depending on other teaching and / or research duties that the faculty must attend, so it would be convenient for the student to contact in advance.
Laboratory practical	Idem
Problem solving	Idem
Tests	**Description**
Essay questions exam	Idem

Assessment

	Description	Qualification	Training and Learning Results		
Problem solving	The problems, exercises and/or questions proposed will be evaluated, according to the guidelines established by the professor in the classes or in the seminars of the subject. Attendance at the seminars is mandatory. The student should achieve at least 40% of the maximun score to consider this section in the overall rating.	20	A2 A4	C6	D2
Laboratory practical	In this section will be valued: - The work carried out by the students in the laboratory. - The report on the laboratory experiments carried out by the students. - Test about the work developed. Attendance at laboratory experiments is mandatory. To overcome the subject the student should reach at least 50% of the maximum possible score for this activity.	20	A2 A4	C6	D2
Essay questions exam	Written tests to evaluate skills acquired throughout the course. It will be valued: - A midterm exam, no eliminatory (15%) - The final exam (45%) The qualification will be the ponderated sum of the obtained in the two exams. To pass the subject, a minimum grade of 3,5 points (of 10) must be achieved.	60	A2 A4 A5	C6	D2

Other comments on the Evaluation

The participation of students in any of the assessment activities of the subject will involve the assignment of a grade. Regarding this point, attendance at the laboratory sessions (two or more), realization of 20% of the exercises proposed by the professor and the realization of tests will be considered.

The final grade of the subject at the end of the semester will be the sum of all the sections that make up the evaluation, provided that the required minimums are exceeded. If this is not the case, the qualification will be that of "Question exam".

The final grade, if higher than 7 points, can be normalized so that the highest grade can be up to 10 points.

In July

In the call for the subject in July, the evaluation system will be similar, maintaining the grades obtained by the students through the problems and/or issues solving during the course and the laboratory experiments.

In July, students may retrieve the section corresponding to the written tests (60%). To pass the subject a minimum grade of 3.5 points (of 10) must be achieved.

The final grade will be the sum of all the sections, as long as the required minimums are exceeded. If it is not the case, the qualification that will appear in the record will be that of the weighted final test.

In the case that this qualification in the July is lower than that obtained in the evaluation at the end of the term, the qualification that will appear will be the latter.

Date, time and place of exams will be published in the official web of Marine Sciences Faculty: http://mar.uvigo.es/alumnado/examenes/

Finally, 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

P.W. ATKINS, **"Química Física"**, 8ª Ed., Editorial Médica Panamericana, 2008

S. M. LIBES, **"Introduction to Marine Biogeochemistry"**, 2ª Ed., Academic Press, 2009

Complementary Bibliography

I.N. LEVINE, **"Principios de Fisicoquímica"**, 6ª Ed., Mc Graw Hill Interamericana, 2014

F. J. MILLERO, M. L. SOHN, **"Chemical Oceanography"**, 4ª Ed., CRC Press, 2013

J. P. RILEY, R. CHESTER, **"Chemical Oceanography"**, Academic Press, 1989

Recommendations

Subjects that continue the syllabus

Chemical oceanography II/V10G061V01209

Subjects that it is recommended to have taken before

Chemistry: Chemistry I/V10G061V01105
Chemistry: Chemistry 2/V10G061V01110

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.

SEMIPRESENTIAL TEACHING

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

Master class (partially or completely virtual, through Remote Campus)

Seminars (in person)

Laboratory practices (in person)

* Teaching methodologies modified

None

* Non-attendance mechanisms for student attention (tutoring)

If possible, tutoring can be done both in person and online, via email, Campus Remoto and FAITiC with prior agreement.

* Modifications (if applicable) of the contents

None

* Additional bibliography to facilitate self-learning

None

* Other modifications

None

=== ADAPTATION OF THE EVALUATION ===

If it is not possible to take them in person, the exams with questions to develop may be replaced in whole or in part by tests through FAITIC and Remote Campus, maintaining the percentage of the grade.

Problem solving and / or exercises will be maintained with the same percentage in the final grade.

The evaluation of laboratory practices will maintain his contribution to the final qualification.

* Additional Information

None

ONLINE TEACHING

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

Master class (partial or totally virtual, through Remote Campus)

Seminars (partial or totally virtual, in Remote Campus)

* Teaching methodologies modified

Laboratory practices: they will be partial or totally substituted by videos and explanatory documents that allow the work on practices, and the presentation of a report of the same.

* Non-attendance mechanisms for student attention (tutoring)

Students tutoring will be realise by email, Remote Campus and FAITiC, under the modality of concertación previous.

* Modifications (if applicable) of the contents

None

* Additional bibliography to facilitate self-learning

None

* Other modifications

None

=== ADAPTATION OF THE EVALUATION ===

The exams will be substituted total or partially by test through FAITIC and Remote Campus, keeping the percentage of the qualification.

The resolution of problems and/or exercises will be supported by the same percentage.

In the practices, the evaluation of the laboratory work will substituted total or partially by reports of laboratory practices.

* Additional Information

None

IDENTIFYING DATA				
Sedimentology				
Subject	Sedimentology			
Code	V10G061V01205			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish Galician English			
Department				
Coordinator	Rey García, Daniel Marino , Gianluca			
Lecturers	Alejo Flores, Irene García Gil, María Soledad López Pérez, Ángel Enrique Marino , Gianluca Nombela Castaño, Miguel Angel Rey García, Daniel Santos López, Artai Antón			
E-mail	gianluca.marino@uvigo.es danirey@uvigo.es			
Web	http://193.146.32.240/tema1112/claroline/course/index.php			
General description	Sedimentology is a building block of Marine Geology. Studying this subject is essential to: (i) achieve a comprehensive understanding of how the marine (sedimentary) basins operate and evolve through time; and (ii) unravel the complex interactions between the sediments and the climatic and/or tectonic processes that contribute to shape the Earth's surface. Sedimentology pertains to the study of the marine sediments and of the processes that govern their formation, such as erosion, transport, deposition, and diagenesis. The course contributes essential insights into the methods and analytical technics that are most commonly used in the study and recognition of the different types of sediments and sedimentary rocks. These are key for the analysis of the sedimentary facies and sequences, for their paleoenvironmental interpretation (e.g., palaeoclimatology, palaeoceanography), and for deciphering the sedimentary record and help the prospection and exploration of natural resources (e.g., petroleum, ore deposits). The course also sheds light on the importance of the marine sediments and on their relationship with the physical, chemical, biological, and hydrodynamic processes that shape the Earth's surface and control the dynamics of the ocean basins on a range of timescales. It is therefore essential to identify those processes that arise from anthropogenic activity versus those that exclusively reflect natural processes. Through the knowledge of the sedimentary record, the sedimentology course contributes critical knowledge of the past processes, ongoing evolution, and expected future trends of the marine environment due to changes in the natural and/or anthropogenic forcing. This is central to the understanding and management of the environment that surrounds us, such as the marine and costal environments that are targeted by the courses of the following semester, as well as the Geological Oceanography I and II of the following year. This basic knowledge will be then expanded and applied in the optative course 'Basin Analysis' that students can choose in the following year.			

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.
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.
C1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
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 environmets.
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.

Learning outcomes				
Expected results from this subject	Training and Learning Results			
Recognise and identify the processes of physical and chemical weathering and their connection with sediment composition;	A5		C1 C12 C13	
2. Develop a basic knowledge of principles in sediment dynamics and master the concepts of erosion, transport, and deposition of (mostly siliciclastic) sediments;	A5		C1 C12 C13	
3. Characterise sediment□s texture and mineralogy;	A5		C1 C13	
4. Recognise and identify the most common sedimentary structures in (mostly) siliciclastic settings;	A5		C13	
5. Identify the relationship(s) between sedimentary structures and depositional processes;	A5		C12 C13	
6. Comprehend the relationship between chemical weathering and seawater chemistry and characterise the exchange of (geo)chemical properties between the land, the ocean, and sediments on the seafloor;	A5	B1	C1 C12 C13	
7. Understand carbonate minerals, the basic chemistry of the carbonate system, and the carbonate factory;	A5	B1	C1 C12 C13	
8. Identify post-depositional alterations, i.e., the diagenesis of (e.g., siliciclastic, carbonate) sediments and understand the tools available to decipher diagenetic processes;	A5		C1 C12 C13	
9. Recognise and identify the different types of sediments;	A5		C12 C13	D1
10. Interpret the sedimentological data and understand the difference between how siliciclastic sediments and carbonate sediments are formed;	A5		C1 C12 C13	D1
11. Develop an understanding of the factors that control sedimentation in the marine environment;	A5	B1	C1 C12 C13	D1
12. Comprehend the concepts of facies, depositional environment, and sedimentary sequence;	A5		C1 C12 C13	D1
13. Use the sedimentological analysis to decipher the dynamics and evolutive trends of the sedimentary environment(s);	A5		C1 C12 C13 C14	D1
14. Become skilled in applying the analytical and investigative methods to perform sedimentological work in the marine environment;	A5	B2 B3 B4	C13	D1 D2
15. Apply the knowledge developed during the course to address (sedimentological) problems in the marine environment.		B4	C13	D1 D2

Contents	
Topic	
Topic 0. Presentation of the subject	0.1. Aims of the course; 0.2. List of lectures and topics addressed by the course; 0.3. List of Laboratory seminars and practical; 0.4. Fieldwork; 0.5. Tests; 0.6. Tutorials; 0.7. Assessment; 0.8. Etiquette.
Topic 1. Basic concepts	1.1. Sediments and sedimentary rocks and their relevance to other disciplines; 1.2. The geological cycling of sediments and rocks; 1.3. Sediment source, routing, and sink; 1.4. Sediment residence time; 1.5. Interplay between tectonics, climate, biology, geochemistry, and the formation and deposition of sediments.

Topic 2. Methods	2.1. Overview of the methods used to collect sediment samples and investigate the formation, erosion, transport, deposition, and diagenesis of sediments in the marine realm and their lithification into sedimentary rocks; 2.2. Sampling campaigns: strategy and planning; 2.3. Characterization of sediments based on: (i) physical; (ii) chemical; and (iii) other properties; 2.4. Examples and case studies.
Topic 3. Rock weathering and the transport of solid and solute load into the ocean	3.1. Water-rock interaction: chemical and physical breakdown of rocks at the Earth's surface; 3.2. Mechanisms, rates, and extent of weathering and its interactions with climate and tectonics; 3.3. Weathering products and the transport of solid and solute load into the ocean; 3.3. Impacts of weathering on ocean chemistry.
Topic 4. Siliciclastic sediments I: general fluid flow characteristics	4.1. Transport environments; 4.2. Physical properties of fluids; 4.3. Relevant concepts of fluid dynamics, such as the laminar and turbulent flows, the boundary layer, and the bottom effects; 4.4. Types of flow: (i) unidirectional; (ii) oscillatory; (iii) gravitational; and (iv) liquefied.
Topic 5. Siliciclastic sediments II: sediment transport and bedforms	5.1. Forces acting on a sediment particle: the Bernoulli effect; 5.2. Sedimentologically significant types of flows: the Reynolds Number; 5.3. Entrainment and transport: shear stress; boundary layer; and viscous sublayer; 5.4. Deposition: the Stokes law. Transport modes: the Hjülstrom's and Shields' curves; 5.5. Bedforms under unidirectional flows: (i) terminology; (ii) sequence of formation; and (iii) stability; 5.6. Cross-stratification: (i) types; (ii) bedforms under oscillatory flows; (iii) stability; and (iv) relationships with the flow regime; 5.7. Other bedforms.
Topic 6. Siliciclastic sediments III: description and classification	6.1. Description: texture and structure; 6.2. Classification according to the grain size; 6.3. Shape; 6.4. Origin and composition; 6.5. Classification according to the sediment composition; 6.6. Concepts of textural and compositional maturity; 6.7. Diagenesis of siliciclastic sediments and lithification into siliciclastic sedimentary rocks.
Topic 7. Siliciclastic sediments IV: grain-size distribution and fabric of siliciclastic sediments	7.1. Grain-size analysis and statistics: theory and practical examples; 7.2. Fabric and texture; 7.3. Porosity and permeability; 7.4. Structures nonrelated to flows: biological; postsedmentaries; diagenetic; 7.5. Bedform interpretation: temporal and spatial scales of the siliciclastic sedimentary processes.
Topic 8. Chemical and biochemical sediments I: ocean chemistry and (bio)chemical sedimentation	8.1. Processes that control ocean chemistry and its evolution through time; 8.2. Relationship between (bio)chemical sediments, climate, and weathering; 8.3. Ocean carbonate chemistry: carbonate species and carbonate precipitation in seawater; 8.4. Carbonate minerals; 8.5. Carbonate saturation, lysocline, and carbonate compensation depth and their evolution through time in connection with weathering and sea-level changes.
Topic 9. Chemical and biochemical sediments II: description and classification of carbonate sediments	9.1. Allochemical carbonate constituents; 9.2. Orthochemical carbonate constituents; 9.3. Classification of carbonate sediments and rocks and their sedimentary environments; 9.4. Diagenesis of carbonate sediments and lithification into carbonate rocks.

Topic 10. Chemical and biochemical sediments III: carbonate sedimentary environments	10.1. Carbonate production and factory; 10.2. Depositional systems: from shallow water settings to the deep ocean; 10.3. Physical processes that control carbonate production and facies distribution in the ocean; 10.4. Chemical processes that control carbonate production and facies distribution in the ocean; 10.5. Case studies from modern environments.
Topic 11. Chemical and biochemical sediments IV: siliceous, evaporitic, and other (bio)chemical sediments	11.1. Siliceous sediments; 11.2. Evaporitic sediments; 11.3. Other (bio)chemical sediments.
Topic 12. Sediment accumulation through space and time	12.1. The contribution of siliciclastic, carbonate, and other sediments to the sedimentary record and their relationship with the various oceanic, climatic, and tectonic settings; 12.2. How sediments fill a basin: basic concepts of sequence stratigraphy; 12.3. How sediment bodies are defined: basic concepts of sedimentary facies and facies types.
Seminars	Seminar 1. grain size and composition; Seminar 2. sediment transport; Seminar 3. Seawater chemistry and carbonate deposition.
Laboratory practical	Optical sedimentary petrology.
Fieldwork	Fieldtrip 1. Southern Margin of the Ría of Vigo; Fieldtrip 2. Galician beaches of Montalvo and Pociñas.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	25	44	69
Studies excursion	15	10	25
Laboratory practical	5	7	12
Mentored work	0	20	20
Seminars	7	17	24

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

Methodologies

	Description
Lecturing	Lectures on the 12 topics of the program. Coverage of the topics will be flexible to address questions and issues that may arise over the duration of the course.
Studies excursion	It includes the 2 fieldtrips of 7 hours each, which are aimed at carrying out direct observations on specific sedimentary environments and evaluate their main sedimentological features.
Laboratory practical	5 hours of laboratory practical, using a petrographic microscope as a fundamental tool to perform petrographic investigation of sediments and sedimentary rocks.
Mentored work	Reports to be presented after seminars, laboratory practicals, and fieldtrips.
Seminars	Seminars of 2:20 hours each in the laboratory, during which main analytical techniques and approaches are illustrated and applied.

Personalized assistance

Methodologies	Description
Lecturing	Questions and doubts that may arise during lectures will be addressed during tutorials. Tutorials will take place on Monday to Friday between 13:00 to 14:00, unless the professor has other commitments and duties that cannot be either cancelled or postponed. Students and/or group of students that are willing to attend the tutorials should contact the professor well in advance in order to efficiently schedule the tutorial.
Mentored work	Questions and doubts related to the mentored work will be addressed during tutorials. Tutorials will take place on Monday to Friday between 13:00 to 14:00, unless the professor has other commitments and duties that cannot be either cancelled or postponed. Students and/or group of students that are willing to attend the tutorials should contact the professor well in advance in order to efficiently schedule the tutorial.

Assessment

	Description	Qualification	Training and Learning Results

Lecturing	Written or oral exam that consists mostly of short questions and topical questionnaires. In addition, the exam may include questions that need to be developed more broadly, the resolution of a problem, and/or the interpretation of images and the construction of diagrams. Questionaries after main topics will also form part of the evaluation	70	A5	B1	C1 C12 C13 C14	D1 D2
Studies excursion	Reports and/or questionnaires related to the information acquired during the fieldtrips.	5	A5	B1	C1 C12 C13 C14	D1 D2
Laboratory practical	Questionnaires related to the information acquired during the practicals	5	A5	B1	C1 C12 C13 C14	D1 D2
Seminars	Reports and/or questionnaires related to the information acquired during the seminars.	20	A5	B1	C1 C12 C13 C14	D1 D2

Other comments on the Evaluation

CALCULATION OF THE FINAL GRADES

1. GRADING FROM CONTINUOUS ASSESSMENT (70%):

   a. Field trips (10%);

   b. Seminars (30%);

   c. Topical questionnaires (30%).

2. FINAL TEST NOTE: 30%

The average of each of these sections (1a, 1b, 1c) must be >/= 4.00.

The maximum grade in this section can only be = 5 if the students do not sit the final exam.

Final grade: continuous assessment mark (70%) + Final exam mark (20%)

Improvement on the final grade: students who achieve a FINAL NOTE >/= 8 will be allowed to access an oral test to improve their mark.

ATTENDANCE

Attendance at fieldtrips, seminars, and laboratory practicals is an essential requirement to be admitted to the final exam. Attendance at less than 80% of the lectures, and/or failing to take part to even one of the fieldtrips will preclude admission to the final exam.

Failing the final exam implies that none of the partial marks (i.e., those obtained for the seminar essays and fieldtrip reports) will be kept for the following academic year.

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

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

The students are strongly requested to have an honest and responsible conduct.

It is considered completely unacceptable any alteration or fraud (i.e., copy and/or plagiarism) that are aimed at modifying the level of knowledge and skills acquired during the course and that are evaluated during exams, essays, reports or any kind of work requested by the course□s lecturers. Fraudulent behaviour may result in failing the course for a whole academic year. An internal dossier of these activities will be made. In case of a repeat offence, the university rectorate will be asked to open a disciplinary file.

Sources of information

Basic Bibliography

Adams, A. E., **A Colour Atlas of Carbonate Sediments and Rocks Under the Microscope**, Manson, 1998

Allen, J.R.L., **Principles of Physical Sedimentology**, Netherlands: Springer, 1985

Arche, A, **Sedimentología**, Ed CSIC, 2010
MacKenzie, W. S. & Adams, A. E., **Rocks and Minerals in Thin Section: A Colour Atlas**, Manson, 1994
Schlager, W., **Carbonate Sedimentology and Sequence Stratigraphy.**, SEPM (Society for Sedimentary Geology), 2005
Tucker, M. E., **Sedimentary Petrology. An Introduction to the origin of sedimentary rocks.**, 3, Blackwell Science Ltd., 2001
Tucker, M. E., **Techniques in Sedimentology**, Blackwell Scientific Publications, 1988
Zeebe, R.E., Wolf-Gladrow, D.A., **CO2 in Seawater: Equilibrium, Kinetics, Isotopes.**, Amsterdam: Elsevier Oceanography Series, 2001

Complementary Bibliography

http://www.iasnet.org/,
http://clasticdetritus.com/, **clastic detritus**,
http://www.sedimentologists.org, **International Association of Sedimentologist**,
http://www.aapg.org/about/petroleum-geology/geology-and-petroleum/sedimentology-and-stratigraphy#424, **American Association of Petroleum Geologist (AAPG)**,

Recommendations

Subjects that continue the syllabus

Coastal and marine sedimentary habitats/V10G061V01207

Subjects that are recommended to be taken simultaneously

Mathematics: Mathematics II/V10G061V01109

Subjects that it is recommended to have taken before

Geology: Geology 1/V10G061V01103
Geology: Geology 2/V10G061V01108

Other comments

REMINDER: GRADING INSTRUCTIONS
It is emphasized that attendance at lectures, seminars, and laboratory practicals is mandatory. Should attendance to these activities be less than 80% the student will not be allowed to sit the final exam. Fieldwork activities are also mandatory and 100% attendance is in order.

Every student must reach at least 40% mark in each of the activities to be able to pass the exam.

None of the marks will be kept for the following academic year.

DELIVERY FORMATS
Unless otherwise stated, all submissions must be made electronically by uploading the documents in the form of PDFs to the TEMA platform. Accordingly, submissions by email and/or in paper will not be accepted or assessed.

DEADLINES
It is important to bear in mind that submission deadlines must be met by each of the students and for each of the activities of the course, and deadline extensions will not be allowed. Every submission must be made within one week of completion of the relevant activity. All deadlines expire at 23:59 of the day that is indicated in the TEMA platform. No submission will be accepted nor evaluated beyond the submission deadline.

AUTHORSHIP
Submission of any teamwork is responsibility of the student who has been designed as the coordinator of the team. The coordinator takes full responsibility of overseeing the number of co-authors (if a limit is set) of the essay, the contribution of each co-author (if any is repeated or missing) of the essay, and of ensuring that the deadline of submission of the essay is met.

No authors can be added after the essay has been submitted.

Authors that appear in more than one essay will not be accepted.

Plagiarized papers, either in full or in part, will not be accepted.

THE PLATFORM TEMA IS THE FORMAL METHOD OF COMMUNICATION

What is stated in the communications made via the TEMA platform will always prevail over any other form of communication.

HONORABILITY
It is expected that the students who attend this course will have a responsible and honest conduct.

It is deemed inadmissible any form of fraud (e.g., copy and/or plagiarism) aimed to alter the level of knowledge or skills achieved by a student in any type of test, essay, or report. This fraudulent conduct will be punished with firmness and rigor established in current regulations.

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===
Given the uncertain and unpredictable evolution of the health alert caused by COVID-19 pandemic, the University of Vigo establishes an extraordinary plan that will be activated when the the regional and national governments and of the university 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
Lecturing contents will stay the same as for campus-based lectures, while the lectures themselves will be entirely or partly moved online using CampusRemoto (https://campusremotouvigo.gal) and complemented where needed with additional literature material.

* Teaching methodologies modified
Fieldtrips will be replaced by videos y photographs of Galician beach environments to illustrate the sedimentary processes in coastal areas.

Microscope photographs of sediment samples and sedimentary rock thin sections will be used to illustrate the petrographic differences of different sediments and sedimentary rocks.

Videos will be used to illustrate the laboratory component of the seminars, while synthetic datasets will be used to calculate settling and deposition of siliciclastic sediments and chemical conditions for carbonate sediment deposition.

* Non-attendance mechanisms for student attention (tutoring)
Entirely or partly moved online using CampusRemoto.

* Modifications (if applicable) of the contents
Contents will stay the same as for campus-based teaching.

* Additional bibliography to facilitate self-learning
None.

* Other modifications
None.
=== ADAPTATION OF THE TESTS ===
* Tests already carried out
Topical questionnaires: [Previous Weight 30%] [Proposed Weight 30%]
Seminars: [Previous Weight 30%] [Proposed Weight 30%]
Field trips: [Previous Weight 10%] [Proposed Weight 10%]
Final Test: [Previous Weight 30%] [Proposed Weight 30%]

The grading process by continuous assessment will be the same as in the campus-based learning, regardless of whether teaching will be moved entirely online or partly campus-based, as stated in the contingency plan of the teaching subject guides DOCNET.

* Pending tests that are maintained
Topical questionnaires: [Previous Weight 30%] [Proposed Weight 30%]
Seminars: [Previous Weight 30%] [Proposed Weight 30%]

Field trips: [Previous Weight 10%] [Proposed Weight 10%]
Final Test: [Previous Weight 30%] [Proposed Weight 30%]

* Tests that are modified
[final exam] => [oral test]

The final exam will consist exclusively an oral test. It will be the only form of evaluation available to those who have not obtained a >/= 5 mark in the continuous assessment. The final grade will be based exclusively on this test.
Students who have obtained a mark >/= 5 in the continuous assessment, may take the oral exam to improve their grade: In this case the average of the continuous part would be done as long as the mark in the oral test >/= 4.

* New tests
Final oral test

* Additional Information
None

IDENTIFYING DATA				
Marine Ecology				
Subject	Marine Ecology			
Code	V10G061V01206			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish			
Department				
Coordinator	Fernández Suárez, Emilio Manuel			
Lecturers	Fernández Suárez, Emilio Manuel Justel Díez, Maider Martínez García, Sandra Olabarría Uzquiano, Celia			
E-mail	esuarez@uvigo.es			
Web				
General description	Marine ecology is the first subject entirely focussed on Ecology in the Marine Science studies at the University of Vigo. The subject describes the main metabolic pathways in the biosphere, analyze how energy flows drive cycles of matter, introduces models of population dynamics and the interactions between populations and finally assesses the factors controlling the structure and functioning of marine ecosystems. The effect of anthropogenic perturbations on the functioning of marine ecosystems is introduced horizontally in the different units.			

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
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.
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.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes				
Expected results from this subject	Training and Learning Results			
Capacity to understand and analyse the basic processes of the interactions between organisms.	A2 A3 A4 A5	B1	C10 C11	D1
Capacity to understand the bases of diversity and the the factors controlling organization and structure of the ecosystems	A2 A3 A4 A5	B1	C10 C11	D1 D5
To design, analyze, interpret and present experimental results	A2 A3 A4 A5	B1 B2 B4	C10 C11	D1 D2

To use software typically used in Marine Ecology	A2 A3 A4 A5	B2 B4	C11	D1 D2
To use the basic bibliography related to the ecological concepts	A2 A3 A4 A5	B1 B2	C10 C11	D1

Contents	
Topic	
Ecology and environmental crisis	Construction of the sociocultural human niche. The anthropocene. Planetary boundaries. Ecology in an anthropogenic biosphere. Presentation of the subject.
Biogeochemical reactions in the sea	Energy in the ecosystem. Cycles of matter and energy flows. Metabolic diversity of the biosphere. Compartments, mass balances and residence time. Oxygen: distribution and redox gradients. Reactions of the carbon cycle: acidification. Reactions of the nitrogen cycle: eutrophication. Reactions of the phosphorus cycle: dynamics in the water-sediment interphase.
Energy flows and biological production	Primary production. Magnitudes. Control of primary production: efficiency of the photosynthesis, irradiance and nutrients. Hydrodynamic control of primary production: Sverdrup model. spatial and temporal variability of primary production. Secondary production. Efficiencies. Organic matter decomposition and remineralization. Microbial heterotrophic production.
Dynamics of isolated populations	Concept of individual and population. Characteristics of populations. Evolutionary strategies. Fundamental equation of population growth. density independent growth: exponential model. Density independent growth in aged-structured populations: life tables, survival curves, Allen diagrams. Density dependent growth: logistical model. Variations of the logistical model: Time-lag, Allee effect, discrete growth. growth.
Interactions between species	Interspecific competition. Experimental evidences of competition. Competition and ecological niche. Lots and Volterra model of competition. Predation. Functional and numerical responses. Variations of the Lotka and Volterra predation model.
Community structure and function	Concept, assembling and filters. Specific diversity, biodiversity, specific wealth and functional diversity. Equitativity: Abundance distribution models. Diversity indexes. Relation diversity-ecosystem function Diversity in space: spectrums and gradients. Food web topology. Key species and trophic cascades. Top-down vs bottom-up control.
Ecological succession and stability	Temporal changes in the community: succession and fluctuation. Explanatory models of succession. Succession and diversity. Effect of physical perturbations: Intermediate perturbation hypothesis. Succession and energy flow. Diversity-stability hypothesis. Meanings of stability. Concept of resilience: principles for sustaining ecosystem services.
Ecosystem conservation and management	Socio-ecological systems. Ecosystem services: offer and demand. Analysis of interactions and identification of conflicts. Bases of conservation ecology. Resilience-based ecosystem management. Non linear responses and histeresis. Principles for the maintenance of the ecosystem services.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	30	60	90
Seminars	7	14	21
Laboratory practical	9	24	33
Problem and/or exercise solving	1	0	1
Project	3	0	3
Essay questions exam	2	0	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Lectures will be used to develop the fundamental contents of the matter

Seminars	They use the seminars to work of form more personalised some contents of more complex assimilation, that require the utilisation of computer programs and to supply capacities of analysis of data that will be used by the students in the experimental work The contents of these seminars will be: Seminar 1: experimental and technical Design of sampling. Put in common of the approach of the experimental work. Seminar 2: Analysis of data I: analysis of variance in Ecology. Examples. Seminar 3: Analysis of data II. Practical application of the analysis of variance. Seminar 4: Analysis of data III. Analysis *multivariante in Ecology: analysis of *similaridad, *MDS. Practical case. Presentation of scientific results.
Laboratory practical	The experimental work consists in the design, taking of samples, experimentation, processed of samples, analysis of data, preparation and discussion of results and, finally, presentation of the same by part of the students. They will develop , therefore, all the phases of an investigation. The experimental work will make of form in groups of 5 people that will work of autonomous form, *tutelados by the *profesorado. The results of the work will present in format poster. The phase of laboratory of the experimental work only will make between 1 March and on 15 April and will have approximate length of a week. The sessions of seminars will tackle the necessary practical contents for the preparation of the work. The students of each experimental group will have to his disposal the laboratory of practices of Ecology in the dates that signal . With the end to guarantee the suitable organisation and development of the experimental work, urges to respect of strict form the following recommendations: 1. All the members of each group of experimental work have to belong to the same group of seminars. 2. The work of laboratory has to be made by all the members of the group, by what his constitution has to take into account the schedules of his members. 3. In the *tutorías destined to make the design of the experiment as well as in the centred in the analysis and interpretation of results has to assist the whole of the members of the group.

Personalized assistance

Methodologies	Description
Laboratory practical	All planned methodologies in this matter contemplates a personalised attention through voluntary tutorials. The schedule of personalized tutorials is the following: Monday, Wednesday and Thursday from 9 to 11 h. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Seminars	All planned methodologies in this matter contemplates a personalised attention through voluntary tutorials. The schedule of personalized tutorials is the following: Monday, Wednesday and Thursday from 9 to 11 h. 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	All planned methodologies in this matter contemplates a personalised attention through voluntary tutorials. The schedule of personalized tutorials is the following: Monday, Wednesday and Thursday from 9 to 11 h. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Tests	**Description**
Problem and/or exercise solving	In all the planned methodologies in this matter contemplates a personalised attention. In the case of the sessions *magistrales, these will develop through *tutorías voluntary. The schedule of *tutorías planned is the following: Monday, Wednesday and Thursday of 9 to 11 *h. The students that wish it will be able to attend to *tutorías personalised to resolve doubts, mainly in the schedules that indicate . To optimise the time, is necessary that the students contact with the professor with *antelación sufficient since this schedule can vary on time when the professor have other educational obligations, researchers or of management that attend.

Project	In all the planned methodologies in this matter contemplates a personalised attention. In the case of the sessions *magistrales, these will develop through *tutorías voluntary. The schedule of *tutorías planned is the following: Monday, Wednesday and Thursday of 9 to 11 *h. The students that wish it will be able to attend to *tutorías personalised to resolve doubts, mainly in the schedules that indicate . To optimise the time, is necessary that the students contact with the professor with *antelación sufficient since this schedule can vary on time when the professor have other educational obligations, researchers or of management that attend.
Essay questions exam	In all the planned methodologies in this matter contemplates a personalised attention. In the case of the sessions *magistrales, these will develop through *tutorías voluntary. The schedule of *tutorías planned is the following: Monday, Wednesday and Thursday of 9 to 11 *h. The students that wish it will be able to attend to *tutorías personalised to resolve doubts, mainly in the schedules that indicate . To optimise the time, is necessary that the students contact with the professor with *antelación sufficient since this schedule can vary on time when the professor have other educational obligations, researchers or of management that attend.

Assessment

	Description	Qualification	Training and Learning Results			
Problem and/or exercise solving	Seminars. They will be evaluated by means of a specific examination of the contents of the seminars. The qualification of this examination will represent 10% of the total qualification	15	A2 A3 A4 A5	B4		D1 D2
Project	The qualification of the experimental work will be based on the quality of the experimental design, and on the preparation and presentation of results. The professors will provide a document that will fix the criteria of evaluation. Each group will present the investigation in a poster and as an 10 minutes oral presentation in a public session. The qualifications assigned by the the students will allow to award prizes to the three best projects. The qualification of the experimental work will represent 25 % of the total qualification. The groups that obtain the first prize, second prize and third prize in accordance with the qualification issued by students, will increase the qualification by 10 %, 7 % and 5 %, respectively.	30	A2 A3 A4 A5	B1 B2 B4	C10 C11	D1 D2
Essay questions exam	Along the course, short exams will be carried out. They will represent 5% of the final qualification. At the end of the course a global exam of the subject will be performed that will represent 60 % of the total qualification. To pass the exam a minimum qualification of 4 points on 10 will be required in the global exam.	55	A2 A3 A4 A5		C10 C11	D1 D2 D5

Other comments on the Evaluation

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

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

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

Sources of information

Basic Bibliography

Rodríguez, J, **Ecología**, Pirámide, 2016

Begon, M, **Ecology**, Blackwell, 2006

Krebs, C.J, **Ecology**, 6ª, International Rev. Collins, 2013

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Biological oceanography I/V10G060V01502
Biological oceanography II/V10G060V01601
Marine contamination/V10G060V01701
Fishing/V10G060V01703

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 ===

WAY NO FACE-TO-FACE

Theoretical Teaching

 The classes will give through the Remote Campus
 Evaluation: The number of short proofs will become of 5. These will purchase a weight of 10% of the final qualification, happening the final examination of the subject purchase a weight of 45% of the total qualification.

Seminars

 The classes of seminars will give through the Remote Campus unfolding in two each group of seminars.
 The realisation of the seminars will require the use of the software *R and *Rstudio, that will have to install in the personal computers of the *estudiantado.
 The evaluation does not suffer modifications regarding the foreseen in the way of face-to-face teaching.

Experimental work

 The phase of design of the experiment will make keeping the same aims that in the way of face-to-face teaching, but will make the *tutorías through the Remote Campus.
 In the case that the experimental phase have not been able to make in the laboratory, this will substitute by the analysis and interpretation of a proportionate database by the *profesorado, that will contain the relative information to the experiment designed previously. The *tutorización will make by means of the Remote Campus.
 The evaluation will make of agreement to the described in the model of face-to-face teaching, but in this case each group will defend his work of oral form in front of the *profesorado of seminars of the subject through the Remote Campus.

MIXED MODEL (*SEMIPRESENCIAL)

Theoretical Teaching

 Except in the case that it can give the theoretical teaching of form totally face-to-face, will opt for making the teaching in way totally on-line through the Remote Campus. It poses the possibility to make two groups of theory if this allowed the *presencialidad total.
 The evaluation will make depending on the possibility to reach the *presencialidad total, in whose case will apply the exposed for the case of the face-to-face way or, in the case of not being possible to reach the *presencialidad total, the evaluation will abide by the described for the model of teaching no face-to-face.

Seminars

 The seminars will be totally face-to-face and, if it was the case, said seminars will be able to unfold in two groups.
 Evaluation: it will make an examination of seminars that will require the use of *R and *Rstudio and will carry out a proof *evaluable during the development of the seminars. The relative contribution of both proofs to the final qualification will be of 15% (10% the final examination and 5% the proof *evaluable).

Experimental work

 The phase of design of the experiment will make with the same aims that in the face-to-face way, but will make the *tutorías through the Remote Campus.

 It will make the experimental work in face-to-face way in the laboratory. The *tutorías of follow-up of this experimental phase will make through the Remote Campus.
 The evaluation will make of agreement to the described in the model of face-to-face teaching, but in this case each group will defend his work of oral form in front of the

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

Remote Campus *Uvigo

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

does not proceed

* additional Bibliography to facilitate the car-learning

does not proceed

* Other modifications

=== ADAPTATION OF THE EVALUATION ===
do not contemplate modifications in the evaluation

IDENTIFYING DATA

Coastal and marine sedimentary habitats

Subject	Coastal and marine sedimentary habitats			
Code	V10G061V01207			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish			
Department				
Coordinator	García Gil, María Soledad			
Lecturers	Francés Pedraz, Guillermo García Gil, María Soledad Pérez Arlucea, Marta María			
E-mail	sgil@uvigo.es			
Web	http://http://webs.uvigo.es/c10/webc10/ficha.php?id=4			
General description	This subject is directed to the acquisition of knowledge and competences on the marine sedimentary environments, from the coastal to the oceanic basins. It includes morphological features and classification of sedimentary environments and processes. It also considers aspects of environmental and economic management. It has a theoretical character-practical including two field trips for the observation and analysis of sedimentary environments.			

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
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.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
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 environmets.
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			
Elaborate and interpret stratigraphic sections and perform correlations	A3	B2 B4	C13	D1
Distinguish the different types of deep sediments		B4	C13	D1
Relate the ressedimentation processes with the turbiditic systems	A3	B1 B4	C12 C13	D1
Understand the sedimentary effects of the deep oceanic circulation	A2 A4	B1 B4	C12 C13	D5
Understand the pelagic sediments as the result of a global biogeochemical system.	A2 A3 A4	B2 B4	C12 C13	D1 D5
Identify the different types of coastal sedimentary environments in function of their sedimentary record.	A3	B1 B4	C13	D1 D5
Understand the coastal and marine environments space-temporal evolution	A2 A3 A4	B1 B4	C13	D1 D5

Contents

Topic	
Subject 1. Introduction to the sedimentary environments	Introduction to the Stratigraphy and the sedimentary environmnts Evolution of the sedimentary environments in the context of the sequential Stratigraphy
Subject 2. Sedimentary processes in marine environments.	Control factors in marine sedimentary environments. Classification of coasts and main processes. Coastal landforms. Coastal evolution: changes in sea level
Subject 3. Beaches and barrier island-lagoon systems	Control factors of coastal morphology Coastal zones. Erosion, transport and sedimentation processes on beaches and barrier island-lagoon systems Beaches: types, sub-environments and dynamics. Coastal barriers: types and morphology Coastal dunes.
Subject 4. Deltas	Concept of delta. Deltaic processes: constructive and destructive Delta zones. Classification of deltas and sedimentary sub-environments. Architecture of deltas. Temporal and spatial variability of deltaic systems.
Subject 5. Estuaries and rias.	Definitions and related coastal forms. Origin and evolution of today estuaries and rias. Estuary classifications: According to their morphology. According to the internal circulation regime. According to the dominant processes and the resulting sediments (facies)
Subject 6. Muddy coasts.	Tidal plains. Marshes. Mangroves. Cheniers. Sedimentary processes in tidal plains. Sedimentary sub-environments in a tidal plain and sedimentary facies.
Subject 7. Continental shelves.	Definition, characteristics and types. Parts of the platform. Hydraulic processes in the platforms. Sedimentation: Controlling factors. Types of "marine" and platform sediments. Siliciclastic platforms: Classification according to hydraulic regime. Carbonate platforms: Characteristics and types.
Subject 8. Continental margins: the slope and the continental glacis.	Main sedimentary processes. Mass transport, dense flows and turbidity currents. Types of deposits, classifications and morphologies. Deep Sea Fans: Turbidity Systems. Types and Deposits.
Subject 9. Contourites and depositional contourite systems	Nomenclature and factors that define a contourite system. Deep oceanic circulation. Erosional and depositional contouritic features. . Economic interest of the contouritic deposits.
Subject 10. Deep sea sediments.	Deep and mid-oceanic ridge basins Pelagic sediments: Biogenic calcareous and siliceous muds (oozes). Abyssal clays. Autigenic sediments: phosphates (upper slope), manganese. Terrigenous and hemipelagic sediments: Turbidites in the abyssal plains and volcanogenic sediments. Lithothermal: deep sea reefs.
Subject 11. Deep and mid-oceanic ridge basins.	Deep-sea geomorphology: canyons, seamounts and oceanic plateaus. Distribution of pelagic and hemipelagic sediments on the ocean floor. Hydrothermal processes: fumaroles. Deep mineral deposits. Gas hydrates.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	25	62.5	87.5
Case studies	4	3.5	7.5
Studies excursion	16	16	32
Seminars	7	14	21
Objective questions exam	2	0	2

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

Methodologies	
	Description
Lecturing	Theoretical 50 minutes lessons
Case studies	It comprises the cartography and evolution of sedimentary environments explored from the Google Earth
Studies excursion	It comprises two field-trips: 1. Arousa Island 2. Corrubedo
Seminars	Seminar 1. Sedimentary structures. Seminar 2. Representation of sedimentary logs Seminar 3. Video of marine sedimentary environments.

Personalized assistance	
Methodologies	**Description**
Lecturing	Individual or in group titorial according to the teacher schedule: Monday, Wednesday and Friday: 12:00-14:00h , that will be able to be modified in function of the educational needs.
Studies excursion	Students that wish it will be able to attend to personalized tutorials to resolve doubts, mainly in the indicated schedules. To optimize time, it is necessary that the student to contact with the lecturer previously. The tutorials will be able to be individual or in group in accordance with the schedules of the lecturer: Prof. Soledad García Gil (Tuesday, Wednesday and Thursday: 12:00-14:00 h) that would be modified according to educational needs.
Case studies	Students that wish it will be able to attend to personalized tutorials to resolve doubts, mainly in the indicated schedules. To optimize time, it is necessary that the student to contact with the lecturer previously. The tutorials will be able to be individual or in group in accordance with the schedules of the lecturer: Prof. Soledad García Gil (Tuesday, Wednesday and Thursday: 12:00-14:00 h) that would be modified according to educational needs.
Seminars	Students that wish it will be able to attend to personalized tutorials to resolve doubts, mainly in the indicated schedules. To optimize time, it is necessary that the student to contact with the lecturer previously. The tutorials will be able to be individual or in group in accordance with the schedules of the lecturer: Prof. Soledad García Gil (Tuesday, Wednesday and Thursday: 12:00-14:00 h) that would be modified according to educational needs.

Assessment						
	Description	Qualification	Training and Learning Results			
Case studies	Report (memory) of the results obtained in the classroom of computing.	5	A2	B4	C12 C13	D1 D5
Studies excursion	Reports of the exits of field. It will evaluate the assistance to the field.	10	A3 A4	B2 B4	C12 C13	D1 D5
Seminars	Preparation of a work of synthesis and results for each one of the seminars	15	A4	B4	C12 C13	D1 D5
Objective questions exam	Exam with a short answer on the subject matter developed during master classes, practical, fiel-trips and seminars.	70	A3 A4	B1	C12	D1 D5

Other comments on the Evaluation

To surpass the matter, will be necessary to surpass 40% of all the proofs and have an average of approved (50%). The assistance to the theoretical, practical and seminars, as well as the exits to the field are compulsory and they will consider in the percentage of qualification. It will be allowed 20% of absence, but justified. The final examination in any one of the announcements will include any theoretical or practical appearance that have exposed during the course, including the field-trips. The students that do not assist to the seminars or to the practices will not be able to present the corresponding reports, what supposes a fail in the first announcement. To surpass the matter in the second announcement the students will have to do an examination of each one of the parts of the matter that had not surpassed. 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 It is required a responsible and honest behavior from students. It is inadmissible any form of fraud (copy and/or plagiarism) directed to adulterate the level of knowledge or skill reached by the student in any type of proof, report or work designed with this purpose. The fraudulent behaviors will suppose to fail the matter during a complete course. An internal register of this behavior will be carried, in case of repetition, a request to the rector to open a disciplinary record will be submitted.

Sources of information

Basic Bibliography

Arche, A. (Ed), **Sedimentología. Del proceso físico a la cuenca sedimentaria**, 3rd, CSIC, Madrid, 2010

Davidson-Arnott, R., **Introduction to coastal processes and geomorphology**, 2nd, Cambridge, 2010

Davis, R.A. Jr. y Fitzgerald, D.M., **Beaches and Coasts**, 1st, Blackwell Publishing, 2004

Hüneke, H., Mulder, T. (Eds)., **Deep-Sea sediments. Developments in Sedimentology, 63**, 1st, Elsevier, 2011

Nichols, G., **Sedimentology and Stratigraphy**, 2nd, Wiley-Blackwell, 2009

Pickering, K.T.; Hiscott, R.N. y Hein, F.J., **Deep Marine Systems: Processes, Deposits, Environments, Tectonics and Sedimentation**, 1st, Unwin Hyman Ltd, 2016

Reading, H. G., **Sedimentary Environments**, 3rd, Blackwell Science, 1996

Stow, D.A.V., Pudsey, C.J., Howe, J.A., Faugères, J.C., Viana, A.R, **Deep-Water Contourite Systems: Modern Drifts and Ancient Series, Seismic and Sedimentary Characteristics**, 1st, Geological Society of London, Memoirs, 2002

Complementary Bibliography

Bird, E., **Coastal Geomorphology: An Introduction**, 2nd, Wiley, 2008

Scholle, P.A. y Ulmer-Scholle, D.S., **A color Guide to the Petrography of Carbonate Rocks: Grains, textures, porosity, diagenesis**, 1st, AAPG Memoir 77; AAPG, 2003

Recommendations

Subjects that continue the syllabus

Basin Analysis/V10G060V01901
Geological oceanography I/V10G060V01504
Geological oceanography II/V10G060V01603
Applied marine geology/V10G060V01909

Subjects that it is recommended to have taken before

(*)/

Contingency plan

Description

=== EXCEPTIONAL PLANNED MEASURES ===
Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University has established an extraordinary planning that will be activated when the administrations and the institution itself determine it in accordance with the criteria of safety, health and responsibility, and guaranteeing teaching in a non-face-to-face or totally non-face-to-face scenario. These already planned measures guarantee, when required, the development of teaching in a more agile and effective way so that students and teachers know them in advance (or well in advance) through the standardized and institutionalized tool of the DOCNET teaching guides.
=== ADAPTATION OF METHODOLOGIES ===
* Teaching methodologies that are maintained
1.- Mixed education: maintained
2.- Non-attendance teaching: they will be adapted to the available resources.
* Teaching methodologies that change
1.- Mixed education: do not change
2.- Non-attendance teaching: they will be adapted to the available resources.
* Non-attendance mechanism for the attention of students (* tutorials)
1.- Mixed teaching: prior agreement by email, face-to-face and/or virtual through Remote Campus.
2.- Non-attendance teaching: previous agreement by e-mail, virtual through Remote Campus
* Modifications (if applicable) of the contents to be taught
1.- Mixed education: no intention to change the contents
2.- Non-attendance teaching: no intention of changing the content
* Additional bibliography to facilitate self-learning
It's not necessary.
* Other modifications

=== ADAPTATION OF THE EVALUATION ===
* Tests already carried out
1.- Mixed education: the weights of the face-to-face situation are kept.
2.- Non-contact teaching: the weights of the face-to-face situation are preserved.

During non-contact teaching, students, in these exceptional circumstances, should address this issue with responsible and honest behavior. Any form of copying intended to falsify the level of knowledge and skills attained in the preparation of the deliverables, as well as during the virtual examination, will be considered inadmissible. If there is any suspicion of fraudulent conduct, students may be subject to additional verification to verify its accuracy.

IDENTIFYING DATA				
Principles of marine microbiology				
Subject	Principles of marine microbiology			
Code	V10G061V01208			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish			
Department				
Coordinator	Longo González, Elisa			
Lecturers	Combarro Combarro, María del Pilar Longo González, Elisa			
E-mail	elongo@uvigo.es			
Web				
General description	Basic introduction to marine microorganisms and their place in the living world. We study the used methods in marine microbiology, especially those based on molecular biology . The subjet explores the major metabolic pathways by which microbes obtain energy and carbon for celular growth, with especial attention to physiology and diversity of bacteria and arqueas. Their role in diverse hábitats and in ocean processes are included			

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
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.
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.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes				
Expected results from this subject	Training and Learning Results			
(*)Comprender o concepto de microorganismo, as súas características estruturais e a súa posición na escala biolóxica	A4	B1 B4	C9	D1
(*)Comprender e saber aplicar as diferentes técnicas de estudo da microbiota mariña	A2 A3	B4	C11	D1 D5
(*)Coñecer a diversidade da microbiota mariña e saber interpretar o seu papel nos ecosistemas mariños en relación á cadea trófica e ciclos dos elementos.	A4	B1	C10 C11	
New	A2 A3 A4	B1	C11	D2

Contents	
Topic	
Lesson 1. Microorganisms on the marine ambient	1.1. Purpose and field of study of marine microbiology 1.2. Microorganisms on the biological scale. 1.3. Role of microbiota in marine ecosystems. 1.4. Perspectives of marine microbiology
Lesson 2. Structure and function of prokaryotic microorganisms and acellular agents	2.1. Structure and function of prokaryotic microorganisms 2.2. Structure and function of acellular agents

Lesson 3. Microbial phisiology	3.1. Microbial growth in the laboratory: mathematical expression 3.2. Microbial growth in the marine environment: effect of environmental factors 3.3. Cooperative and multicellular processes 3.4. Asexual reproduction in bacteria
Lesson 4.- Methods of study of marine microbiota: culture-dependent techniques	4.1. Concepts of asepsis and sterilisation 4.2. Sampling techniques. 4.3. Isolation, cultivation and conservation techniques .4.4. Techniques of cuantification. 4.5. Techniques for the characterisation of pure cultures.
Lesson 5.- Methods of study of marine microbiota: non-cultivation dependent techniques	5.1. U.V. light microscopy: unespeciphic fluorescence . 5.2. Flow Cytometry 5.3. In Situ Hybridization Techniques 5.4. Selective Amplification and sequencing: PCR; DGGE; NGS sequencing techniques 5.5. Principles of Metagenomic Analysis
Lessons 6. Diversity of marine microbiota.	6.1. Relevant species in the Bacteria, Archaea and Eucarya domains. Position in the phylogenetic tree. 6.2. Microorganisms in the trophic chain. 6.3. Microorganisms in the element cycles 6.4 Symbiotic associations with animals and plants 6.5. Diversity of Viruses and Bacteriophages Role in marine microbial ecosystems
LABORATORY PRACTICAL	1. Preparation of culture media 2. Sampling of environmental samples 3. Isolation and preservation of pure cultures 4. Cuantification of microorganisms 5. Tests of bacterial identification.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	29	26	55
Laboratory practical	17.8	9	26.8
Collaborative Learning	1.8	0	1.8
Seminars	1.9	0	1.9
Essay questions exam	0.15	20	20.15
Objective questions exam	0.75	27	27.75
Problem and/or exercise solving	0.1	12	12.1
Objective questions exam	0.2	4	4.2
Objective questions exam	0.2	0	0.2
Essay	0.1	0	0.1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	The teacher structures and/or explains the objectives and contents of each topic and responds to the questions posed by the students. At final for each topic, the students will have at their disposal at Faitic the presentations discussed in the classroom, demonstration videos and links to free access texts. During the semester the teacher will evaluate the students by means of five tests of a maximum of 20 minutes each, with developmental and objective questions and exercises. Any tests that are missed or not taken may be made up in the exam final of the first and/or second call.
Laboratory practical	The teacher explains the fundamentals and protocols of the practice, supervises its execution and solves the doubts of the students. The students will have a Practice Guide with the protocols and fundamentals of each practice. The teacher will evaluate the students at the end to the week by means of a single test of objective questions, which, in case of failure, can be recovered in the final exam of the first and/or second call.
Collaborative Learning	The teacher organizes, advises and supervises the integrated collaborative learning activities to be developed in groups of three or four students and examines the contents worked on through a test of objective questions.
Seminars	The students, organized in groups, will make a work to the computer that they will have to deliver at the end of the seminar for its evaluation. The teacher explains the procedure to follow and advises on the development of the work. The work will be handed in at the end of the seminar and will be used by grade the student.

Personalized assistance	
Methodologies	**Description**
Laboratory practical	The students will be able to solve doubts with the teacher, during the practices or once finished, making an appointment by e-mail within their tutorial schedule
Seminars	The students will be able to solve doubts with the professor during the development of the seminar.
Lecturing	The students can solve doubts with the teacher, during the classes or out of them, making an appointment by e-mail within their tutorial schedule

Collaborative Learning	The students will be able to solve doubts with the professor during the development of the seminar.

Assessment					
	Description	Qualification	Training and Learning Results		
Essay questions exam	MASTER CLASS. The contents exposed in the classroom will be evaluated with five partial tests of eliminatory character, with the same relative weight in the final mark of the student. 10% of the student's final mark will come from development questions included in these tests.	10	A2 A3 A4	C9 C10	D5
Objective questions exam	MASTER CLASS. 35% of the student's final mark will come from the objective questions that are part of the five partial tests mentioned above.	35	A2 A3 A4	C9 C10	D5
Problem and/or exercise solving	MASTER CLASS. 10% of the student's final marks will come from the resolution of exercises and problems included in one of these partial tests.	10	A2	B4	
Objective questions exam	LABORATORY PRACTICAL. The contents worked on in practical classes will be evaluated by means of a test of objective questions, which will take place on the last day of the week.	33			
Objective questions exam	SEMINAR I. Collaborative Learning. The contents worked on will be evaluated in the last part of the seminar by means of a single test of objective questions.	6	A2	B1	D1 D2
Essay	SEMINAR II. The contents worked on will be evaluated through group work, to be carried out during the seminar.	6	A3 A4		D2

Other comments on the Evaluation

- In order to pass the course, the students will have to :

1) Attend Seminars and Laboratory Practice. One time only attendance is allowed, justifiy an abscense.
2) Pass, with at least 5 points out of 10, each of the five partial tests (four of Theory and one of Practice) taken during the semester. If this is not the case, only the failed partial tests can be recovered in the exam final (first and/or second call), keeping the grades of those passed during the semester. If the minimum mark is not reached in any of the partial exams, the calificación in certificate will always be the average mark of the failed exams.

- Any student has the right to take the full course only in the exam final. Students who pass the six partial tests of the semester may expressly waive the calificación obtained, if they wish to take the final exam of the complete subject, in order to improve their grade.
- Those students who have failed any of the partial tests of the semester and do not take the final exam (June and/or July) will be considered as "Not Submitted". Likewise, students who, having waived their grades during the semester, do not take the final exam (June and/or July) to improve their grades will be listed as calificados with No Submission.
- In the event of not passing the subject in the second call (July), the student will have to take the failed part (practice or FULL theory) in the following oficial calls.

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

Josep M. Gasol J.M., David L. Kirchman, **Microbial Ecology of the Oceans,**, 3th ed, Wiley Blackwell, 2.18

MUNN, C.B.., **Marine Microbiology : Ecology and Applications**, 2nd ed., Garlan science, 2011

Madigan, M.T. , K. S. Bender, D. H. Buckley, W.M. Sattley, D. A. Stahl., **Brock Biology of Microorganisms**, 16th ed., Pearson Education, 2020

Complementary Bibliography

Madigan, M. Martinko, J. M., Bender,K. y otros, **Brock Biology of Microorganisms**, 14th ed, Pearson Education, 2015

Willey, J.M., Sherwood, L. M. & otros, **Prescott Microbiology.**, 10 th ed., Mcgraw-Hill Education, 2017

Johnson, T. R. & otros, **Laboratory Experiments in Microbiology.**, 11th ed, Pearson, 2016

Recommendations

Subjects that continue the syllabus

Marine microbiology and parasitology/V10G060V01906

Subjects that it is recommended to have taken before

Biology: Biology I/V10G061V01101
Biology: Biology 2/V10G061V01106

Contingency plan

Description

MIXED TEACHING MODALITY

- MODIFICATIONS IN THEORY LESSONS: a) The lectures will be given synchronously in the classroom and in the Remote Campus. The Deanship will distribute the students into two groups, which will follow the classes in one or the other modality, respectively. b) The program of contents will be maintained, but the depth of the topics will be reduced if the rhythm of progress is altered by incidents of a technical nature. c) The evaluation tests will take place online, from Faitic (or Moodle) and Remote Campus, simultaneously.
2. MODIFICATIONS IN PRACTICAL AND SEMINARS: the both activities will be face-to-face. There are no modifications on seminars. In Laboratory Practical the following are established: a) Part of the contents will be treated by means of virtual laboratory videos. b) The students will dedicate part of the daily time of the practical to the disinfection of their work stations and the equipment and utensils they have used.
3. OTHER COMMENTS ON THE EVALUATION: The description in the section of the same name in this Teaching Guide is maintained (Step 7).
4. MODIFICATIONS IN TUTORIALS: during tutorial hours, students may use e-mail to express doubts about theoretical or practical classes. The attention to the students is reinforced by enabling the Faitic Forum (or Moodle).

ON LINE TEACHING MODALITY

1. MODIFICATIONS IN THEORY CLASSES: the exhibition sessions will take place in Remote Campus for the total number of students.
2. MODIFICATIONS IN PRACTICES AND SEMINARS: the practical classes will be given from the Remote Campus, by means of presentations by the professor, demonstrative videos and resolution of questionnaires, exercises and practical cases. With respect to the Seminars, the Collaborative Learning sessions described in this Teaching Guide (Step 5) will be replaced by the preparation of individual or group deliverables.
3. OTHER COMMENTS ON EVALUATION: what is described in the section of the same name in this Teaching Guide (Step 7) is maintained, with a modification: the minimum mark required in the tests, both theory and practice, in order to add up the percentage marks will be 4 points out of 10.
4. SOURCES OF INFORMATION: the students will have at their disposal in Faitic the resources mentioned in this Teaching Guide (steps 5 and 8), in addition to all the didactic material used in the non-presential classes of the Practices.
5. MODIFICATIONS IN TUTORIALS: during tutorial hours, students may use e-mail to express doubts about theoretical or practical classes. The attention to the students is reinforced by enabling the Faitic Forum (or Moodle).

IDENTIFYING DATA				
Chemical oceanography II				
Subject	Chemical oceanography II			
Code	V10G061V01209			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish			
Department				
Coordinator	Nieto Palmeiro, Óscar			
Lecturers	Calle González, Inmaculada de la Leao Martins, Jose Manuel Nieto Palmeiro, Óscar			
E-mail	palmeiro@uvigo.es			
Web	http://http://depc07.webs.uvigo.es/			
General description	In this matter presents the chemical methodology applied to the determination of the compounds of greater interest in the Chemical Oceanography, from the taking of sample until the obtaining of the final result.			

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
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
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.
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			
Describe the foundations and the applications of the technicians of chemical analysis more usually used in the laboratory.	A2 A4	B1 B2 B3	C6 C7	D1
Know choose and use the material for the taking of sample of the water of mar.	A2 A4	B1 B2 B3	C6 C7	D1 D2
Apply the technicians of chemical analysis to the compounds of greater interest in the Chemical Oceanography.	A2 A4	B1 B2 B3 B4	C6 C7	D1 D2
Apply the experimental conditions more adapted for the determination of a chemical compound in function of the chemical reactivity.	A2 A4	B1 B2 B3 B4	C6 C7	D1 D2
Know realise all the necessary calculations to determine the final concentration of a compound in the water of sea in function of the analytical technician used.	A2 A4	B1 B2 B3 B4	C6 C7	D1 D2
Prepare the reagents and the necessary material to carry out an oceanographic campaign.	A2 A4	B1 B2 B3	C6 C7	D1 D2

Contents	
Topic	
Analytical methodology (I): previous operations	Sampling. Preparation of the sample. Measurement and analytical chemistry references. Analytical measurment techniques.
Analytical methodology (II): measurement techniques.	Gravimetric and volumetric methods. Instrumental techniques of analysis.
Analytical methodology (III): measure and chemical references-analytical.	Accuracy and precision. Limits of confidence. Quality assurance in the analytical measurement.
Determination of salinity in seawater other major compounds	Determination of the salinity: chlorinity and chlorosity. Determination of major anions and cations.
Alcalinity of seawater	Buffering capacity and alcalinity. Determination of the total alcalinity in seawater.
Dissolved oxygen	Determination of dissolved oxygen in seawater. Relation between dissolved oxygen and other physico-chemical parameters.
Nutrients: species of N, P, Si	Determination of nitrates, nitrites and ammonium in the half marine. Methods of determination of phosphates: relation of the concentrations N/P. Determination of the concentration of silicate.
Organic matter in the oceans	Determination of humic substances and photosynthetic pigments.
Trace metals	Total determination of trace elements in the marine environment.

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	0.5	0.5	1
Lecturing	20.5	46	66.5
Problem solving	9	20.5	29.5
Laboratory practical	18	0	18
Mentored work	3.5	0	3.5
Presentation	0.5	0	0.5
Essay questions exam	1.5	0	1.5
Problem and/or exercise solving	1.5	0	1.5
Report of practices, practicum and external practices	0	18	18
Essay	0	10	10
*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	In this activity will present them to the students the syllabus to develop during the semester, as well as the aims, competitions and criteria of evaluation. Likewise it will explain them the form to develop the subject along the semester, will create the groups that will make the integrated methodologies.
Lecturing	During the teaching of each subject, the students will have in the platform TEMA, before the session of classroom, of ones aim on the syllabus to treat in the session of classroom. The professor will expose the syllabus in the classroom and will make a series of questions to promote the critical thought during the session of classroom. You aim them they will leave to be available in the platform TEMA a week after having finalised the teaching of the matter.
Problem solving	During the sessions in the classroom devoted to "Resolution of problems", the students will learn to calculate concentrations of compounds of oceanographic interest in seawater from data that obtained usually at the laboratory. The billed of these problems will find in the platform TEMA with some possible answers that will help to the students to autoevaluate.
Laboratory practical	The students will make practices of laboratory on determinations of characteristic chemical parameters of the water of sea as well as of compound chemists of interest in chemical oceanography. The reports of practical have to be delivered in the time stipulated, be original and will be evaluated by the professor of agreement to some criteria of evaluation published in the platform TEMA. They do not have obligation to make these practices those students that made them during the course 2018-19 and obtained an upper qualification to 5 points.
Mentored work	The students will make an original project related with an exit in ship to make a study of chemical oceanography. The project will be evaluated by the professor of agreement to some criteria of evaluation published in the platform TEMA. They do not have obligation to make this work those students that made it during the course 2018-19 and obtained an upper qualification to 5 points.

Presentation	The students will do a brief presentation in public on the project made in the Supervised Work which will be evaluated by the professor and his mates of agreement to some criteria of evaluation published in the platform TEMA. They do not have obligation to make this presentation those students that made it during the course 2018-19 and obtained an upper qualification to 5 points.

Personalized assistance

Methodologies	Description
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. Any doubt that arise to the student can consult any doubt through the forums enabled for this purpose in the platform TEMA.
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. Any doubt that arise to the student can consult any doubt through the forums enabled for this purpose in the platform TEMA.
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. Any doubt that arise to the student can consult any doubt through the forums enabled for this purpose in the platform TEMA.
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. Any doubt that arise to the student can consult any doubt through the forums enabled for this purpose in the platform TEMA.
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. Any doubt that arise to the student can consult any doubt through the forums enabled for this purpose in the platform TEMA.
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. Any doubt that arise to the student can consult any doubt through the forums enabled for this purpose in the platform TEMA.

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical	The practices of laboratory are compulsory for all the students and will evaluate in accordance with the work realised during the sessions of laboratory and the memory of practices realised of agreement to some criteria of quality published in the platform TEMA.	5	A2 B1 C6 D1 A4 B2 C7 D2 B3 B4
Presentation	The presentation of the project realised during the tutored works will be evaluated by the professor of agreement to some criteria established previously published in the platform TEMA.	7.5	A2 B1 C6 D1 A4 B2 C7 D2 B4
Essay questions exam	In the final examinations, the pupils will have to answer to a series of questions where the aptitude to summarize will be evaluated, outlining and describing in a succinct way the analytical procedures for the determination of the compounds of major interest for the accomplishment of an oceanographic study or some analytical process. The examination will consist of 5 questions of this type.	25	A2 B1 C6 D1 A4 B2 C7 D2 B3
Problem and/or exercise solving	When finalising each block of subjects, will realise an examination written with an exercise on the calculation of the concentration using a method of chemical analysis. It will evaluate the result obtained, as well as the clarity and the reasoning used to arrive to this. The final examination will consist in the resolution of three problems of this type.	25	A2 B1 C6 D1 A4 B2 C7 D2 B3 B4
Report of practices, practicum and external practices	The work of laboratory and the memory of practices will be evaluated by the professor according to some previously established criteria published in the platform TEMA. The final note of the Practices of Laboratory will obtain from the geometrical average of the qualifications obtained in each one of the laboratory practices. In case that the work was not original (was copy of another work or of the network), the professor will not evaluate said work.	20	A2 B1 C6 D1 A4 B2 C7 D2 B3 B4

Essay	The reports presented in the Tutorized Works will be evaluated by the professor according to some previously established criteria published in the platform TEMA. The final note of the Tutorized Works (seminars) will be obtained from the geometrical average of the qualifications obtained in each one of the reports made. In case that the work was not original (was copy of another work or of the network), the professor will not evaluate said work.	17.5	A2 B1 C6 D1 A4 B2 C7 D2 B3 B4

Other comments on the Evaluation

The date, hour and place to carry out the exams will be published in the official web of the Faculty of Marine Sciences:http://mar.uvigo.es/index.php/es/alumnado-actual/examenes

The subject consists of four big main blocks and the qualification of each one of them will be considered with 25% on the final note:

1.- Theoretical Questions (Proofs of development, 25%). To consider surpassed this exam, the students should obtain a qualification of equal or upper to 5 points.

2.- Problems and/or exercises solving. To consider surpassed this proof, the students shlould obtain a qualification of equal or upper to 5 points.

3.- Works of seminars . This incudes the Essay (17,5%) and the Presentation (7,5%) following some criteria that will be published in the platform TEMA. To consider surpassed this proof, the students shlould obtain a qualification of equal or upper to 5 points.

4.- Laboratory Practices. This includes the work made at the laboratory (5%) and the corresponding report of practices (20%) following some criteria that will be published in the platform TEMA. The mean value of this qualification will be calculated as the geometrical average of the qualifications obtained in each one of the practices. To consider surpassed this proof, the students should that obtain a qualification of equal or upper to 5 points.

To approve the subject, it will be necessary to surpass with a minimum qualification of 5 points on 10 in all and each one of these blocks.

In case of not reaching the minimum qualification in the blocks 1.- And/or 2.-, the students will make again the part of the no surpassed examination in the announcement of 2nd opportunity.

In case of not reaching the minimum qualification in the blocks 3.- And/or 4.-, the students will send again the works with the pertinent corrections in the terms and date estimated by the corresponding professor.

When a student the student carries out any proof of which show in the previous table, this will be taken into account immediately for the final qualification and stated in the record like student presented in the corresponding announcement.

Any injustified absence to one of the sessions of seminars and/or laboratory practices, blocks 3.- And 4.-, supposes the no evaluation of the corresponding block and will be repeated in the following course.

It requires that the students curse this matter a responsible and honest behaviour.

It considers inadmissible any form of fraud (i.e. copies and/or plagiarism) directed to fake the level of knowledge or skill reached by a/to student/to in any type of proof, report or work designed with this purpose. This fraudulent behaviour will be sanctioned with the firmness and rigour that establishes the valid rule.

In case of not surpassing the matter, the qualifications that will be conserved, in the caso of being surpassed, for the following curse will be the following:

- Presentations/exhibitions

- Laboratory

- Inform/memories of practices

- Works and projects

Sources of information

Basic Bibliography

Grasshof K., Kremling K., Ehrhardt M. (Eds.), **Methods of Seawater Analysis**, 3, Wiley,

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

Harris D.C., **Análisis Químico Cuantitativo**, Reverté,

Millero F.J., Sohn M.L., **Chemical Oceanography**, CRC Press,

Complementary Bibliography

Aminot A., Chaussepied M. (Eds.), **Manuel des Analyses Chimiques en Milieu Marin**, CNEXO,
Parsons T.R., Maita Y., Lalli C.M., **A Manual of Chemical and Biological Methods of Seawater Analysis**, Pergamon Press,
Skoog D.A., West D.M., Holler F.J., (Crouch S.R.), **Fundamentos de Química Analítica**, McGraw-Hill o Reverté,
Beiras R., Pérez S. (Eds.), **Manual de métodos básicos en contaminación acuática**, Universidade de Vigo,
Gianguzza A, **Marine chemistry: an environmental analytical chemistry approach**, Springer,
Chester R., **Marine Geochemistry**, 2, Blackwell Science,
Bearmean G. (ed.), **Sewater: its composition, properties and behaviour**, 2, The Open University. Pergamon Press,
Horwitz W., Latimer G.W., **Official methods of analysis of AOAC International**, 18, AOAC International, cop.,
Miller J.N., Miller J.C., **Estadística y Quimiometría para Química Analítica**, Prentice-Hall,
Burriel F., Lucena F., Arribas S., Hernández J., **Química Analítica Cualitativa**, 14, Paraninfo,

Recommendations

Subjects that continue the syllabus

Chemistry applied to the marine environment II/V10G060V01604

Subjects that it is recommended to have taken before

Chemistry: Chemistry I/V10G061V01105
Chemistry: Chemistry 2/V10G061V01110
Chemical oceanography I/V10G061V01204

Other comments

It is assumed that the students, before the beginning of the subject, have a good knowledge on the following concepts of chemistry:

- formulation and chemical nomenclature
- calculation of concentrations
- balance of basical chemical reactions and calculation of stoichiometric ratios

Likewise, it is also assumed that the students have capabiliity to learn by themselves to handle a scientific calculator, especially regarding the calculation of basic statistical parameters and the adjust of a linear plot by least squares.

Contingency plan

Description

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

Two different possibilities are envisaged , given the possibility of a complication of the epidemic

- A teaching scenario , semi face-to-face' (remote theory, practices and face-to-face seminars)
- Teaching not in person (all in remote)

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

Those that already have been made.

* educational Methodologies that modify

- Practical of laboratory
The practices of laboratory that can not do in face-to-face way will make in shape of simulation through the virtual classroom (Remote Campus) that the University of Vigo has the disposal of the professors and of the students. After the session of virtual classroom, will have to present the corresponding report of agreement to the criteria and indications of the professors of practices.

- Introductory Activities:
- Magistral Lesson:
- Resolution of problems:
- Supervised Works:
- Presentation of works:
The sessions of these activities that cannot make presentially, will make through the virtual classroom that the University of Vigo has the disposal of the professors and of the students.

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

Will be able to make personal tutories, previous appointment by email, in the virtual office of the professors:
Óscar Nieto: Sala 1752
José Manuel Leao: Room 1362
Inmaculada de la Calle: Room 356

In the platform TEMA is enabled the section of Forums, where will be opened a forum for each subject of classroom given, as well as several forums for the practices of laboratory, classes of problems and seminars. Of this way, the students will be able to do the questions that will be able to be answered so much by the professors as by the/the mates/the ones of class.

* Modifications (proceeds) of the contents to give

Does not proceed

* additional Bibliography to facilitate to car-learning

Will employ web pages and videos related to complement the training of the students. This information will be available in the platform TEMA.

* Other modifications

Does not proceed

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

Does not proceed

* pending Proofs that keep

- Resolution of problems and/or exercises: through the tool of Moodle: previous Weight 25,0%; Weight proposed 20,0%

- Report of practices: (in those that give by virtual teaching): previous Weight 20,0%; Weight proposed 30,0%

- Work of Seminars: previous Weight 17,5%; Weight proposed 20,0%

- Presentation of the Work of Seminars: previous Weight 7,5%; Weight proposed 10%

* Proofs that modify

- Examination of questions of development: previous Weight 25%. It would change by an Examination of objective questions through the tool of*Moodle. His weighting would be of 20% in the new final

* note test

* additional Information

IDENTIFYING DATA				
Marine zoology				
Subject	Marine zoology			
Code	V10G061V01210			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Ramil Blanco, Francisco José			
Lecturers	Paredes Rosendo, Estefanía Pereira Pinto, Estefanía Ramil Blanco, Francisco José Vázquez Otero, María Elsa			
E-mail	framil@uvigo.es			
Web				
General description	With this subject intends to give to the student a basic knowledge in Marine Zoology, through the study of the different filos that integrate the marine fauna. It will study, in each case, the general plan of organisation, the external morphology, the internal anatomy, the reproduction and the embryonic development and the ranking. Likewise they will include notions envelope his vital activity, habitat and distribution.			

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
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.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
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.
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			
Handle vocabulary, codes and inherent concepts to the marine zoology	A2		C1	
Know and comprise the essential facts, concepts, principles and theories related with the marine zoology.	A2			
Know the basic techniques of sampling of the fauna in the column of water, and diverse types of fund	A2 A5			
Basic knowledge of the methodology of investigation in marine zoology	A2	B1 B2		
Capacity to identify and understand the problems related with the marine zoology	A3	B1	C1 C9	D1
Know work in campaigns and in laboratory of responsible way and sure, promoting the tasks in team	A2	B2		D1 D2
Transmit information of form written, verbal and graphic for audiences of diverse types	A2 A4			
Capacity of analysis and synthesis	A2 A3	B4		D1

Capacity of organisation and planning		B2 B4		D1 D2
Oral communication and writing in the official tongues of the University	A4			
Capacity to work in one instrument	A5			D2
Capacity to learn of autonomous and continuous form	A5			D2
Capacity to apply the knowledges in practice	A2 A4	B4		D1
Skills of investigation	A2 A3 A4 A5	B1 B2 B4	C1 C9 C10	D1 D2

Contents	
Topic	
LESSON 1: INTRODUCTION	Definition and objectives of the subject. General characteristics of the metazoa: definition and models of organisation
LESSON 2: PHYLUM PORIFERA. PHYLUM PLACOZOA.	PORIFERA: general characteristics, cell types and skeleton. Types of organisation. Reproduction and development. Systematic summary. PLACOZOA: Form and function.
LESSON 3: PHYLUM CNIDARIA	General characteristics. Polymorphism: The polyp and the medusa. Cell types. Reproduction. Systematic summary. Hydrozoa, Scyphozoa, Staurozoa, Cubozoa and Anthozoa: form and function.
LESSON 4: PHYLUM CTENOPHORA	General characteristics. (Corporal organisation) Form and function. Reproduction. Systematic summary
LESSON 5: The BILATERIA: INTRODUCTION. PHYLA ACOELOMORPHA, PLATYHELMINTHES, MESOZOA and NEMERTEA	Introduction to Bilateria. Phylum Acoelomorpha: Form and function. Phylum Platyhelminthes: General characteristics and classification; Turbellaria: form and function. Phylum Mesozoa: General characteristics and classification. Phylum Nemertea: General characteristics; (corporal organisation) form and function; reproduction and development; systematic summary.
LESSON 6. LOPHOTROCHOZOOA: THE LOWER PHYLA	Phyla Gnathostomulida, Rotifera, Acanthocephala, Cycliophora, Gastrotricha and Entoprocta: form and function.
LESSON 7: The LOPHOPHORATES.	General characteristics. Phylum Bryozoa: Form and function; reproduction and development; systematic summary. Phylum Brachiopoda: Form and function; reproduction and development; systematic summary. Phylum Phoronida: Form and function; reproduction and development.
LESSON 8: PHYLUM MOLLUSCA (I)	General characteristics. (Corporal organisation) Form and function. Classification. Synopses of the lower class (Caudofoveata, Solenogastra, Polyplacophora, Monoplacophora and Scaphopoda)
LESSON 9: PHYLUM MOLLUSCA (II)	Class Gastropoda: general characteristics; coiling; torsion; (corporal organisation) form and function; reproduction and development; systematic summary
LESSON 10: PHYLUM MOLLUSCA (III)	Class Bivalvia: general characteristics; (corporal organisation): form and function; reproduction and development; systematic summary
LESSON 11: PHYLUM MOLLUSCA (IV)	Class Cephalopoda: general characteristics; (corporal organisation): form and function; reproduction and development; systematic summary
LESSON 12: PHYLUM ANNELIDA (I)	General characteristics; metamerism; classification. Class Polychaeta: general characteristics; (corporal organisation): form and function; reproduction and development.
LESSON 13: PHYLUM ANNELIDA (II): The SIBOGLINIDAE. PHYLA ECHIURA and SIPUNCULA	The Siboglinidae: general characteristics; form and function; reproduction and development. Phylun Echiura: Form and function. Phylum Sipuncula: Form and function.
LESSON 14: ECDISOZOA: INTRODUCTION and LOWER PHYLA	Definition and systematic summary . Phyla Nematoda, Kinorhyncha, Priapulida, Loricifera and Tardigrada: form and function.
LESSON 15: PHYLUM ARTHROPODA	General characteristics. (Corporal organisation) Form and function. Classification. Subphylum Cheliceriformes: General characteristics; Classification. Merostomata and Pycnogonida: form and function.
LESSON 16: PHYLUM ARTHROPODA: SUBPHYLUM CRUSTACEA (I)	General characteristics. Classification. Class Malacostraca: (corporal organisation) form and function, life forms and classification (Phyllocarida, Hoplocarida and Eumalacostraca).

LESSON 17: PHYLUM ARTHROPODA: SUBPHYLUM CRUSTACEA (II)	Class Remipedia, Cephalocarida, Branchiopoda and Ostracoda: external anatomy and life forms.
LESSON 19: THE DEUTEROSTOMES. PHYLUM CHAETOGNATHA. PHYLUM ECHINODERMATA	Phylum Chaetognatha: General characteristics. Form and function. Reproduction and development. Phylum Echinodermata: General characteristics. (Corporal organisation) Form and function. Endoskeleton. Water vascular system.
LESSON 18: PHYLUM ARTHROPODA: SUBPHYLUM CRUSTACEA (III)	Class Maxillopoda: General characteristics and classification; Mistacocarida, Copepoda, Tantulocarida and Branchiura: a external anatomy and life forms; Cirripedia: general characteristics; form and function; classification.
LESSON 20: PHYLUM ECHINODERMATA (II)	Class Crinoidea, Asteroidea and Ophiuroidea: General characteristics; (corporal organisation:) form and function; reproduction and development. Systematic summary
LESSON 21: PHYLUM ECHINODERMATA (III)	Class Echinoidea and Holothuroidea: General characteristics; (corporal organisation:) form and function; reproduction and development. Systematic summary
LESSON 22: PHYLUM HEMICHORDATA	General characteristics and classification. Class Enteropneusta and Pterobranchia: general characteristics; form and function; reproduction and development.
LESSON 23: PHYLUM CHORDATA (I)	General characteristics and classification. Subphyla Tunicata and Cephalochordata: general characteristics; form and function; reproduction and development.
LESSON 24: PHYLUM CHORDATA (II)	The Agnatha: general characteristics and classification. Class Myxini and Cephalaspidomorphi: form and function. The Chondrichthyes: general characteristics; (corporal organisation:) form and function; reproduction and development; systematic summary.
LESSON 25: PHYLUM CHORDATA (III)	The Osteichthyes: general characteristics; (corporal organisation:) form and function; functional adaptations; migrations; reproduction and development; systematic summary.
LESSON 26: PHYLUM CHORDATA (IV)	The Marine Tetrapoda: main groups; adaptations of the reptilia, birds and mammalian to the marine environment; systematic summary and general characteristics of the orders
PRACTICAL LESSONS	Lesson 1.- PORIFERA. The skeleton of Sponges: methods of extraction and preparation of spicules; microscopical study. Lesson 2.- CNIDARIA. The polyp and the medusa: morphology. Observation of representatives of Hydrozoa, Scyphozoa and Anthozoa. Lesson 3.-. MOLLUSCA I. External morphology of the main groups: Polyplacophora, Scaphopoda, Bivalvia, Gastropoda and Cephalopoda; identification with keys of several species. Lesson 4.- MOLLUSCA II. Internal anatomie: disection of a Bivalvia: Mytilus galloprovincialis. Lesson 5.- POLYCHAETA. External morphology: Errantia and Sedentaria polychaetes; identification with keys of some species. Lesson 6.- ARTHROPODA I. Crustacea: External morphology; internal anatomie: and disection of a Malacostraca: Nephrops norvegicus; observation and identification of brachiurans. Lesson 7.- ARTHROPODA II. Crustacea: observation of Amphipoda, Isopoda, Cirripedia and Copepoda; identification with keys of some species. Pycnogonida And Xiphosura: observation of some exemplars. Lesson 8.- ECHINODERMATA I. External morphology of the main groups. Identification with keys of several species. Lesson 8.- ECHINODERMATA II. External morphology and internal anatomie: disection of a Echinoidea: Paracentrotus lividus. Lesson 10.- Chordata. Observation of Tunicata and Cephalochordata; external morphology, identification and disection of a Osteichthyes.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	20	20	40
Seminars	2	2	4
Collaborative Learning	3	30	33
Lecturing	27	40.5	67.5
Objective questions exam	0.5	0	0.5
Problem and/or exercise solving	2	0	2
Laboratory practice	1	0	1
Essay	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
Laboratory practical	Study of the external and internal anatomy of the main groups using common microscopical techniques in Zoology
Seminars	During the first seminar there will be an exposition of a topic considered of relevance in the training in Marine Zoology and directly related to the practical work that must be done. Also, the methodology to do the collaborative work will be explained. Possible doubts will be solved. In the second seminar, the students will present the results achieved in the collaborative work.
Collaborative Learning	Collavorative learning through a mainly practical work in small groups. The works will include the following phases: sampling through photographic transects, identification of the fauna in the photographs and their adaptations to their habitat, and writing the results.
Lecturing	This method refers to the explanation of the topics to the students. The teacher clarifies the syllabus content to the students. Although teachers are more active than students the teacher will asks questions to keep the students attentive. Also, kahoots at the end of each topic will be carried out by the students with the most important contents.

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

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical	The attendance and the work done by the students during the realization of the practices in the laboratory (1 point) A practical exam in the laboratory at the end of the course (1,5 points). To pass this methodology, students have to get a minimum mark of 0,6 points in the practical exam.	25	A2 B1 C9 D1 A5 C10
Seminars	Assistance and participation of the students in the two seminars and the presentation of the works done by students will be evaluated. Also their participation in the subsequent discussion will be evaluated.	5	A2 B1 D1 A3 B2 D2 A4 B4 A5
Collaborative Learning	The ability to work together autonomously as well as the contribution of each student to the final work will be evaluated by the cualification of the rest of the students of the group with a rubric (0,5 points). The writing document of the results obtained in the laboratory will be also evaluated (1,5 point).	20	A2 B1 D1 A3 B2 D2 A4 B4 A5

Lecturing	Four mid term multiple choice tests (10 minutes) will be done during the semester. These tests will not get rid of themes. Each one will be score up to 0.5 points (2 points in total) A major written exam will be done with multiple choice questions and short answer questions (3 points) Both results will be added. To pass this methodology, students have to get a minimum mark of 2 points.	50	A2 A5	B1	C1 C9 C10

Other comments on the Evaluation

The update oficial calendar of the final exams can be found at: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

The final qualification of the subject is the sum of the mark obtained in each of the proposed methodologies, provided that the rating of each one of them exceed 40% of the mark.

In the July session the student must present only those methodologies not passed.

NOT EVALUATED qualification will be applicated to students who will not present or the final exam of theory or the practical exam.

The marks obtained in seminars and tutorized works will be kept for the next course.

Students are strongly requested to fulfill 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

HICKMAN, C. P.; ROBERTS, L. S., KEEN, S. L., LARSON, A., l□ANSON, H. & EISENHOUR, D. J., **PRINCIPIOS INTEGRALES DE ZOOLOGIA.**, 14ª EDICION, INTERAMERICANA - McGRAW HILL, 2009

BRUSCA, R. C. Y BRUSCA, G. J., **INVERTEBRADOS.**, 2ª EDICIÓN, McGRAW HILL-INTERAMERICANA, 2005

BARNES, RUPPERT, E. E. Y BARNES, R. D., **ZOOLOGIA DE LOS INVERTEBRADOS.**, 6ª EDICION, INTERAMERICANA - McGRAW HILL, 1996

DE LA FUENTE, J. A., **ZOOLOGIA DE ARTROPODOS.**, 1ª EDICION, INTERAMERICANA - McGRAW HILL, 1994

HELFMAN, G.S.; COLLETTE, B.B.; FACEY, D.E.; BOWEN, B.W., **THE DIVERSITY OF FISHES: BIOLOGY, EVOLUTION AND ECOLOGY**, 2ª EDICIÓN, WILEY-BLACKWELL, 2009

KARDONG, K. V., **VERTEBRADOS. ANATOMÍA COMPARADA, FUNCIÓN, EVOLUCIÓN.**, 3ª EDICION, McGRAW HILL-INTERAMERICANA, 2007

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Fish and shellfish biology/V10G060V01902

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

-For blended and virtual modality:

Lectures will be taught through the Virtual Classrooms of the Remote Campus, following the official syllabus of the subject. The didactic materials will be adapted by complementing them with clarification documents that will be uploaded to TEMA, whenever necessary. Discussion forums for each thematic blocks will also be enabled through the TEMA platform. In addition, any question or doubt can be posed and solved by e-mail or by personalized assistance through the Virtual Office. Lectures will be recorded to facilitate the teaching of students that could have connectivity problems.

Seminars will be taught through the Virtual Classrooms of the Remote Campus, following the official syllabus of the subject.

Discussion forums for two seminars will also be enabled through the TEMA platform. In addition, any question or doubt can be posed and solved by e-mail or by personalized assistance through the Virtual Office. Seminars will be recorded to facilitate the teaching of students that could have connectivity problems.

* Teaching methodologies modified
LABORATORY PRACTICAL
- For a blended modality:
If the totality of practical courses can not be taught due to limitations of capacity, dissections will be carried out in the laboratory while the remaining practices, focused on the identification of different zoological groups, will be replaced by field work.
- For a virtual modality:
If laboratory practical can´t be run in the laboratory, they will be taught through the Virtual Classrooms at the scheduled times, using adapted teaching materials (infographics, photographs and videos). As in the laboratory, record of the attendance will be done. The practices will be recorded to facilitate to facilitate the teaching of students that could have connectivity problems.

COLLABORATIVE LEARNING
- For a blended modality:
Field photographic transect in a rocky intertidal will be done by students. Then virtual groups will be created to work that material to carry out the collaborative work.
- For a virtual modality:
If the field work can´t be done, a virtual photographical transect will be provided to carry outh the collaborative learning.

* Non-attendance mechanisms for student attention (tutoring)
If presonolized assistance is not possible, it will be carried out by email or by using the virtual offices. Also, discussion forums will be created for each thematic block to pose doubts or questions.

* Modifications (if applicable) of the contents
Already explained above

=== ADAPTATION OF THE TESTS ===
The percentages of each methodology will be maintained in both blended and virtual modalities. A modification of the type of test can be done.
Four mid term multiple choice tests (10 minutes) will be done using the Moodle platform. For the final assessment a written test of test responses will be carried out through Moodle.
For a final assessment of the practicals if it cannot be carried out in a laboratory, a series of exercises that the student must solve using Moodle will be proposed.