



(*)Facultade de Ciencias do Mar

(*)Grao en Ciencias do Mar

Subjects

Year 1st

Code	Name	Quadmester	Total Cr.
V10G061V01101	Bioloxía: Bioloxía I	1st	6
V10G061V01102	Física: Física I	1st	6
V10G061V01103	Xeoloxía: Xeoloxía I	1st	6
V10G061V01104	Matemáticas: Matemáticas I	1st	6
V10G061V01105	Química: Química I	1st	6
V10G061V01106	Bioloxía: Bioloxía II	2nd	6
V10G061V01107	Estatística	2nd	6
V10G061V01108	Xeoloxía: Xeoloxía II	2nd	6
V10G061V01109	Matemáticas: Matemáticas II	2nd	6
V10G061V01110	Química: Química II	2nd	6

Year 2nd

Code	Name	Quadmester	Total Cr.
V10G061V01201	Bioquímica	1st	6
V10G061V01202	Botánica mariña	1st	6
V10G061V01203	Física: Física II	1st	6
V10G061V01204	Oceanografía química I	1st	6
V10G061V01205	Sedimentoloxía	1st	6
V10G061V01206	Ecoloxía mariña	2nd	6
V10G061V01207	Medios sedimentarios costeiros e mariños	2nd	6
V10G061V01208	Principios de microbioloxía mariña	2nd	6
V10G061V01209	Oceanografía química II	2nd	6
V10G061V01210	Zooloxía mariña	2nd	6

Year 3rd

Code	Name	Quadmester	Total Cr.
V10G061V01301	Oceanografía biolóxica I	1st	6
V10G061V01302	Oceanografía física I	1st	6
V10G061V01303	Oceanografía xeolóxica I	1st	6

V10G061V01304	Química aplicada ao medio mariño I	1st	6
V10G061V01305	Fisioloxía de organismos mariños	1st	6
V10G061V01306	Oceanografía biolóxica II	2nd	6
V10G061V01307	Oceanografía física II	2nd	6
V10G061V01308	Oceanografía xeolóxica II	2nd	6
V10G061V01309	Química aplicada ao medio mariño II	2nd	6
V10G061V01310	Acuicultura	2nd	6

IDENTIFYING DATA				
Biology: Biology I				
Subject	Biology: Biology I			
Code	V10G061V01101			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Pasantes Ludeña, Juan José Miguel Villegas, Encarnación de			
Lecturers	Miguel Villegas, Encarnación de Pasantes Ludeña, Juan José			
E-mail	pasantes@uvigo.es villegas@uvigo.es			
Web				
General description	Biology I is one of the mandatory subjects in the first semester of the first year of the Degree in Marine Sciences. The basic biological principles of cell biology and genetics are studied, mainly: 1) cell and tissue organisation. 2) development and cell differentiation. 3) transmission and characterization of hereditary material. 4) basic aspects of evolution and the origin of species. Theoretical and practical lessons are employed in the teaching program in order the students be familiar with 1) basic histological methods and microscopic identification 2) the solving of practical problems in genetics and cell biology. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Competencies	
Code	
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG2	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.
CG3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CG5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
CE9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
CE11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Learning outcomes	
Learning outcomes	Competences

1. Define, look for, organize and elaborate works with information of the subject	CG1	CE9	CT1
2. Cooperatively workout exercise resolution	CG2	CE11	CT2
3. Use of telematic tools and other sources for autonomous learning	CG3		
CELL BIOLOGY	CG4		
4. Recognize the diversity and organisation of cells and tissues	CG5		
5. Establish relations between cell compartments and cell functions			
6. Differentiate clearly vegetal and animal cell organisation			
7. Establish relationships between cell organisation and cell function			
8. Optical microscope utilization			
9. Knowing staining techniques			
10. Identification of cell organelles by electron microscopy and tissues by optical microscopy			
GENETICS			
11. Importance of DNA in biology			
12. Apply the scientific method and basic research technologies in Genetics			
13. Learn how to establish genetic hypotheses and strategies to refute them			
14. Manage the basic mechanisms for the transmission of the hereditary material			
15. Know the molecular structure, the regulation and the expression of the hereditary material			
16. Know the basic genomic principles and their biotechnological applications.			
17. Know the origin of the biological diversity and the evolutionary history of the species			

Contents

Topic	
Cell biology, 1st part. General organisation of the eukaryotic cell	Cell evolution. Endosymbiosis: Evolutionary importance. Similarities and differences of animal and plant cells. Cell membranes: composition. Functional properties. Plasma membrane and cell surface. Cell junctions and cell adhesion. Cell communication. Cytoplasm and cell organelles (I): Endoplasmic reticulum, Golgi and lysosomes. Vesicular traffic (II): peroxisomes, mitochondria and chloroplasts. Cytoskeleton and cell movement. The nucleus: chromatin and chromosomes. The nucleolus.
Cell biology, 2nd part. Bases of embryonic development	Cell cycle: interphase and M phase. Apoptosis. Gametogenesis. Fertilization and development of the zygote. Cell specialization.
Cell biology, 3rd part. Tissues	Animal tissues. Epithelium: General organisation and function. Connective tissue and derivatives. General organisation. Specialized connective tissues : general characteristics of cartilage, bone and blood. Muscular tissue. Nervous tissue. The plant cell.
Genetics	DNA structure, organisation, replication, alterations and expression. Mendelian heredity and its variations. Linkage and recombination. DNA technologies and their applications

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	39	39	78
Problem solving	6.5	6.5	13
Practices through ICT	6	6	12
Objective questions exam	2	14.5	16.5
Problem and/or exercise solving	0.5	30	30.5

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

Methodologies

	Description
Lecturing	Description, by the teaching staff, of the contents of the study subject, of the theoretical bases and/or the guidelines of the work, the exercise or the project to be developed by the students.
Problem solving	Resolution of genetic exercises
Practices through ICT	Application of the learned contents to specific situations and acquisition of basic skills and procedures related with the object of study in spaces with specialized equipment (laboratories, computing rooms, etc.).

Personalized assistance

Methodologies	Description
Practices through ICT	The teaching staff will continuously assess the participation of the students along the course
Lecturing	The teaching staff will continuously assess the participation of the students along the master sessions and their on-line activities

Problem solving	The teaching staff will continuous assess the participation of the students in exercise solving and in the quality of solved exercises
Tests	Description
Problem and/or exercise solving	he teaching staff will continuous assess the quality of the solved problems, questions and exercises for each student along the semester

Assessment						
	Description	Qualification	Evaluated Competences			
Lecturing	Final exam: the assesment of the subject Biology I will be performed by means of a written exam. In this exam the theoretical and practical contents will be evaluated by means of test of multiple answers, questions with specific short or long answers, identification and interpretation of figures / images as well as the resolution of genetic problems Final exam. Cellr biology 24 % Genetics 29 %	53	CG1 CG2 CG3 CG4 CG5	CE9 CE11	CT1 CT2	
Objective questions exam	Final exam	2	CG1 CG2 CG3 CG4 CG5	CE9 CE11	CT1 CT2	
Problem and/or exercise solving	Evaluation will be the result of: 1: The assesment of the quality of the resolution of the Genetic problems and exercises proposed along the course (20 %) 2: The marks obtained in Cell biology questionaries, exercises and identification of structures (25 %)	45	CG1 CG2 CG3 CG4 CG5	CE9 CE11	CT1 CT2	

Other comments on the Evaluation

The final qualification includes:

- a) The mark obtained in solving problems, exercise and questionaries along the course (45 %: Cell Biology 25 %, Genetics 20 %). This mark will be kept for the second opportunity
- b) The mark obtained in the first or second opportunity exam (55 %: Cell Biology 25 %, Genetics 30 %).

To pass the subject, a minimum of 2 points in each of the two blocks that compose the subject (Genetics and Cell Biology), and a minimum of 5 points in total, are required. It is also necessary to reach a minimum of 4 points from a total of 10 in the Genetics exam. If those minimums are not reached, the maximum numerical qualification to be reflected in the "acta" will be 4.5.

In case that the final calification do not reach the pass minimum (5 points), but are equal or higher than 2.5 in one of the two blocks (Genetics or Cell Biology), the mark will be kept for the "second edition" (July) if the student is explicitly in accordance with it.

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>

The students from previous courses will have to take part in all the programmed activities again.

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

Campbell N. A. & Reece J. B., **1. BIOLOGÍA**, 7ª ed, Panamericana, 2007

Pierce BA, **Genética. Un enfoque conceptual**, 978-1319050962, 5ª ed, Panamericana, 2015

Complementary Bibliography

Sadava / Heller / Orians / Purves / Hillis, **VIDA La Ciencia de la Biología**, 8ª ed, Panamericana, 2009

Recommendations

Subjects that continue the syllabus

Marine genetic resources/V10G060V01907

Other comments

The study of the subject in a continuous way will allow the students to take part in active form in the course syllabus. It is recommended to show a real interest in the course, showing a good attitude and demonstrating aptitude in the acquisition of knowledges. The knowing, comprehending, thinking and reasoning the basic notions of the subject will be indispensable to take part in the distinct activities proposed by the teaching staff and be evaluated positively.

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

* Teaching methodologies modified

None. All methodologies will be carried out telematically by means of the utilities accessible through the Remote Campus of the University of Vigo.

* Non-attendance mechanisms for student attention (tutoring)

Institutional e-mail

Applications available from Remote Campus of the University of Vigo

* Modifications (if applicable) of the contents

Not applicable

* Additional bibliography to facilitate self-learning

<https://www.ncbi.nlm.nih.gov/books?term=The+Cell%3A+a+molecular+approach+AND+cooper%5Bbook%5D>

<https://www.ncbi.nlm.nih.gov/books/NBK21054/?term=alberts%20molecular%20biology%20of%20the%20cell>

<https://www.ncbi.nlm.nih.gov/books/NBK9983/>

<https://www.lab.anhb.uwa.edu.au/mb140/>

<https://www.ncbi.nlm.nih.gov/books/NBK21766/?term=genetics>

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

No change

* Pending tests that are maintained

All

* Tests that are modified

None

* New tests

None

* Additional Information

Students will be visually monitored in telematic exams through Remote Campus. If there is any technical or personal problem, recorded oral exams will be performed. Exam revision sessions will also be recorded.

IDENTIFYING DATA				
Physics: Physics I				
Subject	Physics: Physics I			
Code	V10G061V01102			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish Galician English			
Department				
Coordinator	Mato Corzón, Marta María			
Lecturers	Mato Corzón, Marta María Souto Torres, Carlos Alberto Varela Benvenuto, Ramiro Alberto			
E-mail	fammmc@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 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 environment and the development of models related with it. Furthermore, it is important to understand the fundamental physics concepts to understand how the instruments work and to know how to use and control them.			

Competencies

Code	
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
CE4	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.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Learning outcomes

Learning outcomes	Competences			
1. Understand the need of a reference system to describe a movement. Understand the movement and his causes. Identify the different types of movements. Know how graph any observation to.	CB4 CB5	CG3	CE4	CT1 CT2
2. Identify the field of application of classical mechanics. Understand systems of particles and the rigid bodies. Solve mechanical problems using Newton's laws and conservation laws.	CB4 CB5	CG3	CE4	CT1 CT2
3. Understand and use in a quantitative way the concept of energy (non thermal). Recognize the transformations of energy to explain any daily phenomenon. Identify kinetic and potential energy in different situations. Explain and use the conservation of mechanical energy in simple situations. Understand work as a form of energy exchange. Solve problems related with work, power and conservation of mechanical energy. Evaluate the importance of energy saving.	CB4 CB5	CG3	CE4	CT1 CT2
4. Know and understand the basic equations of the kinematics and dynamics of a simple harmonic oscillator, damped harmonic oscillator and driven harmonic oscillator, and the phenomenon of resonance.	CB4 CB5	CG3	CE4	CT1 CT2
5. Know the evolution of the Universe along the history. Know Newton's law of Gravitation, and understand his application to celestial and terrestrial bodies' movements. Understand the relation between the properties of a planet and the weight of a body in his surface.	CB4 CB5	CG3	CE4	CT1 CT2
6. Understand the Earth as a reference system, his movement around the Sun, as well as those of the Moon. Apply that knowledge to explain phenomena like the tides, the different Moon phases, the calendar's stations, etc.	CB4 CB5	CG3	CE4	CT1 CT2
7. To know the basic characteristics of continuous bodies.	CB4 CB5	CG3	CE4	CT1 CT2

Contents

Topic	
-------	--

1. Kinematics of particles.	1.1. The position vector and the path. Celerity, velocity and acceleration (medium and instantaneous). 1.2. Intrinsic components of acceleration (normal and tangential) and his interpretation. 1.3. Movement of the particle in space. Analysis of different types of movements. 1.4. Change of the reference system. Relative movement. Translation and rotation of the reference axes. Drag velocity and relative velocity. Drag acceleration and relative acceleration
2. Newtonian dynamics.	2.1. Introduction: Dynamics as a part of physics. 2.2. Dynamics of the particle: Dynamic's principles or Newton's laws of motion. Linear momentum. Mechanical impulse. Linear momentum conservation theorem. Angular momentum and his conservation. Central forces. Dynamics of the circular movement. 2.3. Dynamics of systems of particles: Types of systems; internal and external forces. Centre of mass of a system of particles. Movement of a system of particles. Newton's second law for a system of particles. Linear momentum of a system of particles. Principle of conservation of linear momentum of a system of particles and applications. Angular momentum of a system of particles. Conservation of angular momentum in a system of particles. 2.4. Dynamics of the rigid solid: Dynamics of rotation. Momentum of inertia of rigid body. Calculation of momentums of inertia. Steiner's theorem. Kinetic momentum of rotation. Angular impulse. Conservation principle.
3. Work and energy	3.1. The different forms of energy. Definitions of work, power and energy. 3.2. Mechanical, kinetic and potential energy. Theorem of live forces. Conservation mechanical energy. 3.3. Mechanical, kinetic and potential energy of a system of particles. 3.4. Theorem of live forces and conservation of energy for a system of particles. 3.5. Kinetic rotational energy.
4. Simple harmonic motion.	4.1. The simple harmonic motion. Kinematics of the harmonic oscillator. Representation as rotating vectors. 4.2 Dynamics of the harmonic oscillator and his physical interpretation. Energy of a harmonic oscillator. 4.2. The simple pendulum. 4.3. Notion of forced oscillator. Resonance. 4.4. Fourier analysis of the periodic movement.
5. Gravitation. Applications to the Earth.	5.1. Historical evolution. 5.2. Newton's law of Gravitation. 5.3. Gravitational field and potential on Earth. The local gravitational field. 5.4. Movement of the planets and satellites
6. The Earth as a reference system.	6.1. The movements of the Earth in space. The stations. The phases of the Moon. 6.2. Dimensions and terrestrial coordinates. 6.3. The local reference system. Accelerations of inertia. 6.4. The Coriolis acceleration. 6.5. The centrifugal and terrestrial acceleration. The geopotential. 6.6. Newtonian theory of tides. The tidal ellipsoid.
7. Continuous media	7.1. Introduction, qualitative ranking of the material. 7.2. Elasticity and shear deformation. 7.3. The stress tensor.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	15	1	16
Lecturing	30	50	80
Seminars	7	25	32
Problem and/or exercise solving	0	15	15
Report of practices, practicum and external practices	0	7	7

*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	Realization of different laboratory experiments with which the students will get basic knowledge in the experimental procedure in physics, as well as in the calculation of the error of a measurement. The attendance to the laboratory and the delivery in time and form of the corresponding report is a must for this subject in the year in course.
Lecturing	Exhibition and explanation of the diverse physical concepts and his motivation, of the distinct laws with which relate, as well as the demonstration of the required theorems. Resolution of some practical examples to support the theoretical explanations.
Seminars	Resolution of different problems related with the theory, doubts and concepts of difficult understanding. Exercises that the student must solve autonomously will be proposed. The attendance at the seminars and the delivery of the proposed exercises, is mandatory to pass the subject in the current year.

Personalized assistance

Methodologies	Description
Seminars	The teacher will solve any doubts that are presented to the students in solving the problems. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated (Mondays and Tuesdays from 11:00 a.m. to 2:00 p.m.). To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Lecturing	The teacher will solve any doubts that are presented to the students in the lecturing. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated (Mondays and Tuesdays from 11:00 a.m. to 2:00 p.m.). To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Laboratory practical	The teacher will solve any doubts that are presented to the students in the laboratory about the material used, what is used and how is used correctly, the experimental procedure used, the analysis of results, the necessary computer tools, ... Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated (Mondays and Tuesdays from 11:00 a.m. to 2:00 p.m.). To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.

Assessment

	Description	Qualification	Evaluated Competences			
Seminars	It will be a test with problems similar to the ones solved during the seminars' sessions.	10	CB4	CE4	CT1	CT2
Problem and/or exercise solving	It will qualify the assimilation of knowledge of the students with a written proof with a diversity of problems related with the theory and seminars.	70	CB4	CE4	CT1	CT2
Report of practices, practicum and external practices	It will evaluate the students ability to implement the laboratory procedure, successfully finish the experiments, and elaborate a proper report with all the information required.	20	CB4	CG3	CE4	CT1
			CB5			CT2

Other comments on the Evaluation

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

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

Sources of information

Basic Bibliography

M. Alonso y E.J. Finn, **Física, Vol. 1**, Ed. Addison Wesley Iberoamericana, 2000
R. A. Serway y J. W. Jewett, **Física para Ciencias e Ingeniería**, Ed. Thomson, 2005
P. A. Tipler y G. Mosca, **Física para la Ciencia y la Tecnología, Vol. 1**, Ed. Reverté, 2006
S. Burbano de Ercilla, E. Burbano y C. Gracia, **Problemas de Física**, Ed. Tébar, 2006

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Physics: Physics II/V10G061V01203

Subjects that are recommended to be taken simultaneously

Statistics/V10G061V01107

Mathematics: Mathematics I/V10G061V01104

Other comments

It is recommended to attend and use the tutorial groups to resolve any questions related to the subject, to clarify the concepts of the theory and to help solving problems. The schedule will be Monday and Tuesday from 11:00 a.m. to 2:00 p.m.

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained: ALL

* Teaching methodologies modified: None. All methodologies will be given by telematic means through the use of the utilities integrated in the Remote Campus of the University of Vigo and the FAITIC platform as reinforcement, without prejudice to other measures that can be adopted to guarantee the accessibility of the students to the teaching content.

* Non-attendance mechanisms for student attention (tutoring): The tutoring sessions may be carried out by telematic means (institutional email of the teaching staff involved in the subject available on the website of the Faculty, videoconference using the telematic applications integrated in the Remote Campus of the University of Vigo, forums in FAITIC, ...) under the arrangement of prior appointment.

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

* Additional bibliography to facilitate self-learning: None.

* Other modifications: None.

=== ADAPTATION OF THE TESTS ===

* Tests already carried out: Percentages are maintained.

* Pending tests that are maintained: ALL

* Tests that are modified: NONE

* New tests: NONE

* Additional Information:

The telematic controls, tests and/or exams in the remote campus will be done with audiovisual monitoring of the students. If there are technical or personal impediments that prevent it, the tests will be oral. All tests will be recorded for documentary evidence. This will also happen with exam review sessions.

IDENTIFYING DATA				
Geology: Geology 1				
Subject	Geology: Geology 1			
Code	V10G061V01103			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Nombela Castaño, Miguel Angel			
Lecturers	Alejo Flores, Irene López Pérez, Ángel Enrique Nombela Castaño, Miguel Angel Pérez Arlucea, Marta María			
E-mail	mnombela@uvigo.es			
Web	http://webs.uvigo.es/c10/webc10/ficha.php?id=6			
General description	The Geology I (Internal Geology) pretends that the student purchase in the second semester of the 1st course of the Degree of Marine Sciences, the knowledges on the appearances related with the structure and internal composition of the Earth, as well as of the internal processes, with an approach from the field of the Plates Tectonics and the Marine Geology.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE12	Acquire knowledge about processes and products related to internal and external geological cycles.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes				
Learning outcomes	Competences			
New	CB2	CG1		
2. Know and relate the internal processes with the tectonic of plates.	CB1	CG4	CE12	
3. Recognize tectonic structures and the processes that generate them.	CB1	CG4	CE12	
4. Handle of deformation structures representation systems.		CG1		CT5
		CG4		
5. Interpretation of geological maps.	CB2	CG1		CT1
		CG4		CT5
6. Identify the main mineral and igneous and metamorphic rocks.	CB1		CE12	CT1
				CT5
7. Skill in the management of the geological information related with the internal geological processes, capacity of synthesis and to work in a team.	CB1	CG4	CE12	CT1
				CT5

Contents	
Topic	
Presentation Geology II	The sub-topics correspond with the topics.
Subject 1. Introduction	The subtemes correspond with the subjects.
Subject 2. Structure of the Earth and his materials: minerals and rocks	The sub-topics correspond with the topics.
Subject 3. Units of the Terrestrial Relief-Deep Ocean: types of margins	The sub-topics correspond with the topics.
Subject 4. Earth Surface Deformación: faults and folds	The sub-topics correspond with the topics.

Subject 5. Plate Tectonics: introduction and mechanisms	The sub-topics correspond with the topics.
Subject 7. Metamorphism, metasomatism, metamorphic rocks and Plates Tectonic	The sub-topics correspond with the topics.
Subject 8. Magmatism, Igneous rocks and Plates Tectonic	The sub-topics correspond with the topics.
Subject 9. Vulcanism and Plates Tectonic	The sub-topics correspond with the topics.
Subject 9. Seismicity and Tectonic of Plates	The sub-topics correspond with the topics.
Subject 10. Synthesis: Economic and environmental implications of the internal geological system.	The sub-topics correspond with the topics.

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0.75	1.75
Lecturing	18	36	54
Seminars	6	24	30
Laboratory practical	13	22.75	35.75
Studies excursion	4.5	9	13.5
Problem and/or exercise solving	1	4	5
Laboratory practice	2	3.5	5.5
Report of practices, practicum and external practices	0.5	1	1.5
Objective questions exam	1	2	3

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

Methodologies	
	Description
Introductory activities	It will present him to the student the way in which they will give the classes, the form of evaluation, the exits of field, the practical classes and the seminars. It will deliver the topics, as well as the necessary material for the practical classes and seminars.
Lecturing	They will expose him to the student the theoretical contents that they will be evaluated in a final examination.
Seminars	It will use the stereographic projection to represent data of geological structures. Practical works on faults. They will familiarise with the keys of identification of minerals.
Laboratory practical	They will learn to handle with topographical maps and to order in the time the rocks and geological processes from geological courts. Besides, the student will learn to recognise the minerals and the types of igneous and metamorphic rocks more common in the nature.
Studies excursion	The student will learn to handle the geological compass, recognise rocks and geological structures in the field, his implications in the internal processes, and his consequences applied.

Personalized assistance	
Methodologies	Description
Lecturing	The student will be able to be attended so much during Master sessionss, if it does not affect of sensitive way in the development of the same, and in the hours of tutorías (Monday, Tuesday and Wednesday of 12:00 to 14:00). To optimise the time, is necessary that the students contact with the professor with enough time.
Introductory activities	The student will be able to be attended during the introductory activities, if it does not affect of sensitive way in the development of the same, and in hours of tutorías (Monday, Tuesday and Wednesday of 12:00 to 14:00). To optimise the time, is necessary that the students contact with the professor with enough time.
Seminars	The student will be able to be attended so much during the seminars, if it does not affect of sensitive way in the development of the same, and in hours of tutorías (Monday, Tuesday and Wednesday of 12:00 to 14:00). To optimise the time, is necessary that the students contact with the professor with enough time.
Laboratory practical	The student will be able to be attended so much during Laboratory practises, if it does not affect of sensitive way in the development of the same, and in hours of tutorías (Monday, Tuesday and Wednesday of 12:00 to 14:00). To optimise the time, is necessary that the students contact with the professor with enough time.
Studies excursion	The student will be able to be attended so much during field practices, if it does not affect of sensitive way in the development of the same, how in hours of tutorías (Monday, Tuesday and Wednesday of 12:00 to 14:00). To optimize the time, is necessary that students contact with the professor with enough time.

Tests	Description
Problem and/or exercise solving	The student will be able to be attended so much during the seminars, if it does not affect of sensitive way in the development of the same, and in hours of tutorías (Monday, Tuesday and Wednesday of 12:00 to 14:00). To optimise the time, is necessary that the students contact with the professor with enough time.
Laboratory practice	The student will be able to be attended so much during Laboratory practises, if it does not affect of sensitive way in the development of the same, and in hours of tutorías (Monday, Tuesday and Wednesday of 12:00 to 14:00). To optimise the time, is necessary that the students contact with the professor with enough time.
Report of practices, practicum and external practices	The student will be able to be attended so much during field practices, if it does not affect of sensitive way in the development of the same, how in hours of tutorías (Monday, Tuesday and Wednesday of 12:00 to 14:00). To optimize the time, is necessary that students contact with the professor with enough time.
Objective questions exam	The student will be able to be attended so much during Master sessionss, if it does not affect of sensitive way in the development of the same, and in the hours of tutorías (Monday, Tuesday and Wednesday of 12:00 to 14:00). To optimise the time, is necessary that the students contact with the professor with enough time.

Assessment					
	Description	Qualification	Evaluated Competences		
Problem and/or exercise solving	The assistance to seminars is compulsory. It will evaluate so much the quality of the deliverables like the attitude (participation, implication, etc.)	8	CB1 CB2	CT1 CT5	
Laboratory practice	The assistance to laboratory practices is compulsory. It will evaluate so much the quality of the deliverables like the attitude (participation, implication, etc.)	15	CB2	CG1 CG4	CT1
Report of practices, practicum and external practices	The assistance to studies excursion is compulsory. It will evaluate so much the quality of the deliverables like the attitude (participation, implication, etc.)	7	CB2	CG1 CG4	CE12
Objective questions exam	They will evaluate the contents with short questions and/or ask false/true type. To be able to add the rest of proofd, in the exam has to have at least a 3.5/10	70	CB1	CG1 CG4	CE12 CT5

Other comments on the Evaluation

The students of the 3rd Age University Program that choose this subject inside the cycle of Integration to be able to it surpass will have to assist at least to 80% of the lectures as well as at least to 80% of the rest of the methodologies employed (seminars, practices of laboratory and field trip). On the other hand it will value the level of integration with the students of the degree.

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>

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

Tarback, E.J., Lutgens, F.K., **Ciencias de la Tierra. Una introducción a la Geología Física**, 10th Edition 2013,

Complementary Bibliography

Anguita, F., Moreno, F., **Procesos Geológicos Internos**, Editorial Rueda., 232 pp,

Azañón, J.M., Azor, A., Alonso, F.M., Orozco, M., **Geología Física**, Paraninfo & Thomson Learning, 302 pp,

Davies, G. H., Reynolds, S.J., **Structural Geology, of rocks and regions**, 3rd Edition. John Willey and Sons, Inc, New York, 776 pp,

Kearey, P., Vine, F., **Global Tectonics**, 3rd Edition. Blackwell Science, 333 pp,

Leeder, M.R., Pérez Arlucea, M., **Physical processes in Earth and Environmental Sciences**, Blackwell Publishing, 321 pp,

Monroe, J.S., Wicander, R., Pozo, M., **Geología.Dinámica y evolución de la Tierra.**, Ed. Paraninfo, Madrid,
 Tarbuck, E.J., Lutgens, F.K., **Ciencias de la Tierra. Una introducción a la Geología Física**, 10th Edition. Prentice Hall.
 Madrid. 710 pp.,
 Wicander, R., Monroe, J.S., **Historical Geology. Evolution of Earth and Life Through Time**, 7th Edition.
 Edit.Brooks/Cole, 580 pp,

Recommendations

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

- 1.- Mixed teaching: they keep
- 2.- Teaching no face-to-face: they will adapt to the available resources.

* Teaching methodologies modified

- 1.- Mixed teaching: they do not modify
- 2.- Teaching no face-to-face: the seminars, practices of laboratory and field excursions will treat of virtualize the most possible. Likewise it will propose activities that stimulate his self learning.

* Non-attendance mechanisms for student attention (tutoring)

- 1.- Mixed teaching: previous concertation by email, face-to-face and/or virtual through Remote Campus.
- 2.- Teaching no face-to-face: previous concertationn by email, virtual through Remote Campus

* Modifications (if applicable) of the contents

- 1.- Mixed teaching: it does not have intention to change the contents
- 2.- Teaching no face-to-face: it does not have intention to change the contained

* Additional bibliography to facilitate self-learning

Is not necessary

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

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

- 1.- Mixed teaching: they conserve the weights of the face-to-face situation.
- 2.- Teaching no face-to-face: Seminars (08%)/(15%); Practical Laboratory (15%)/(20%); Field excursion (07%)/(15%); Examan (70%)/(50%)

* Pending tests that are maintained

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

...

* Tests that are modified

[Previous test] => [New test]

- 1.- Mixed teaching: they do not modify
- 2.- Teaching no face-to-face: face-to-face examination ==> virtual examination with Faitic and Remote Campus.

* New tests

* Additional Information

During the no face-to-face teaching, requires of the students that, in these exceptional circumstances, face this matter with a responsible and honest behaviour. It will consider inadmissible any form of copy directed to false the level of knowledges and skills reached in the preparation of the homeworks, as well as during the virtual examination. If there is some suspicion of some type of fraudulent behaviour, will be able to subject to the students to an additional control to check his veracity.

IDENTIFYING DATA				
Mathematics: Mathematics I				
Subject	Mathematics: Mathematics I			
Code	V10G061V01104			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Galician			
Department				
Coordinator	García Cutrín, Francisco Javier Besada Morais, Manuel			
Lecturers	Besada Morais, Manuel García Cutrín, Francisco Javier Vázquez Pampín, Carmen			
E-mail	fjgarcia@uvigo.es mbesada@uvigo.gal			
Web	http://fatic.uvigo.es			
General description	Mathematics I, in the degree of Grao in Sciences of the Sea, has as primary function to provide students with language, skills and basic mathematical techniques that will require both training and non-professional.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
CE2	Acquire basic knowledge of mathematics (differential and integral calculation) and statistics.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
CT3	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.
CT4	Ability to communicate orally and in writing in Galician language.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes			
Learning outcomes	Competences		
To use with ease techniques of calculation of eigenvalues of a square matrix and of determination of the sign of a quadratic form. Solve problems in which you need to apply the techniques above.	CB1	CE1	CT1
	CB2	CE2	CT2
	CB3		CT3
	CB4		CT4
	CB5		CT5
Understand some basic concepts of differential calculus: partial derivatives, continuously differentiable function, chain rule, implicitly defined function, end / optimum of scalar functions.	CB1	CE1	CT1
	CB2	CE2	CT2
	CB3		CT3
	CB4		CT4
	CB5		CT5
Use the mechanics of calculation of partial derivatives of any order, of application of the chain rule, derivation of implicitly defined functions, as well as the techniques of calculating optimal / extreme with and without equality constraints. Apply the previous techniques to solving optimization problems.	CB1	CE1	CT1
	CB2	CE2	CT2
	CB3		CT3
	CB4		CT4
	CB5		CT5

To know the primitives of elementary functions and the main techniques of calculation of these. Understand the mechanics of calculating double integrals.	CB1	CE1	CT1
	CB2	CE2	CT2
	CB3		CT3
	CB4		CT4
	CB5		CT5
Use the mechanics of calculating primitives and double integrals with simple functions. Know how to apply the integral calculation to the determination of areas, volumes, centers of gravity, moments of inertia, etc.	CB1	CE1	CT1
	CB2	CE2	CT2
	CB3		CT3
	CB4		CT4
	CB5		CT5
Use a computer program, of symbolic calculation, for the resolution of problems related to the subject.	CB1		CT1
	CB2		CT2
	CB3		CT3
	CB4		CT4
	CB5		CT5

Contents

Topic	
Linear algebra.	Operations with vectors in the plane and in space. The vector space R^n . Matrices and determinants. Basic operations with matrices and determinants. Discussion and resolution of systems of linear equations. Eigenvalues.
Calculation in several variables.	Introduction to the functions of several variables. Differentiable functions. Chain rule. Implicit derivation. Derivatives of higher order.
Optimization.	Maximum and minimum of scalar functions. Calculation of maxima and minima.
Integration of functions.	Integral of Riemann. The fundamental theorem of integral calculus. Calculation of primitives. Application to the calculation of areas. Integrals improper.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	13	20	33
Problem solving	13	20	33
Seminars	18	24	42
Practices through ICT	8	8	16
Problem and/or exercise solving	4	9	13
Essay questions exam	3	10	13

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

Methodologies

	Description
Lecturing	Exposition of the theoretical bases and orientation, on the part of the teachers, on the contents of the subject.
Problem solving	Activities focused on the work on a specific topic, which allow to deepen or expand the contents of the discipline. They will be used as a complement to the theoretical classes.
Seminars	The students solve exercises in the classroom, in small groups, under the guidelines and supervision of the faculty and make an exposition of the solution of the same in front of fellow students.
Practices through ICT	Use of a scientific calculator to help solve the exercises proposed in seminars and master sessions. They take place in computer classrooms.

Personalized assistance

Methodologies	Description
Seminars	The students will demand from the faculty the clarifications that they deem opportune to better understand the subject and to develop successfully the proposed tasks. The individual work of the student will also be monitored.
Practices through ICT	The students will demand from the faculty the clarifications that they deem opportune to better understand the subject and to develop successfully the proposed tasks. The individual work of the student will also be monitored.

Assessment

Description		Qualification	Evaluated Competences		
Seminars	The degree of consolidation of the competences analyzed in each session will be assessed. The students will deliver a series of exercises under the conditions and time established by the teaching staff.	25	CB1 CB2 CB3 CB4 CB5	CE1 CE2	CT1 CT2 CT3 CT4 CT5
Practices through ICT	Proof that the student must solve some exercises using the computer program used in the classroom.	5	CB5		CT1
Problem and/or exercise solving	Tests, to evaluate the acquired competences, which consist of a questionnaire with test questions and short answer questions. There will be four such tests during the course (20% of the final grade). In addition, as part of a final test that will take place at the end of the course, another test will be done on the whole subject, which will also consist of test questions and questions of Short answer (20% of the final grade).	45	CB1 CB2 CB3 CB4 CB5	CE1 CE2	CT1 CT2 CT3 CT4 CT5
Essay questions exam	Proof that will consist of theoretical questions and exercises that the student will respond by organizing and presenting, in an extensive way, the knowledge that has on the subject.	25	CB1 CB2 CB3 CB4 CB5	CE1 CE2	CT1 CT2 CT3 CT4 CT5
A test of this type will be done at the end of the course.					

Other comments on the Evaluation

Any student who, during the course, participates in tests of evaluation of two or more subjects of the program can not, in any case, obtain the qualification of NOT PRESENTED.

The students and students who do not exceed the subject in the ordinary call, and intend to do so in the extraordinary call, will keep the grades obtained during the course in each of the evaluation tests carried out, except the scores of the practical test of Matlab and the Two tests at the end of the course, which will be evaluated in the corresponding exam. Likewise, the grade of the solved exercises delivered during the course may be modified through a work supervised by the teaching staff (in this case, it will be necessary to contact the teaching staff well in advance).

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

Besada, M.; García, F.J.; Mirás, M.A.; Quinteiro, C.; Vázquez, C., **Un mar de matemáticas**, 2016

Larson, R.; Hostetler, R. e Edwards, B. H., **Cálculo (volumes I e II)**, MacGraw Hill, 2000

Complementary Bibliography

Adams, R.A., **Cálculo**, Pearson, 2009

Besada, M.; García, J.; Mirás, M.; Quinteiro, C. e Vázquez, C., **Matlab: todo un mundo**, 2007

Besada, M.; García, J.; Mirás, M. e Vázquez, C., **Cálculo diferencial en varias variables**, Garceta, 2011

Besada, M.; García, J.; Mirás, M.; Quinteiro, C. e Vázquez, C., **Matemáticas para Química**, 2008

Recommendations

Subjects that continue the syllabus

Mathematics: Mathematics II/V10G061V01109

Other comments

*Tutorías *individualizadas: The Mondays and Tuesday of 9:30 to 11:00 in the dispatch 28 of the first flat of the faculty of Sciences of the Sea. For *concertar another schedule of *tutoria, speak with the professor.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

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

=== ADAPTATION OF The METHODOLOGIES ===

* teaching Methodologies that keep : Any

* teaching Methodologies that modify : The theoretical kinds the Seminars *realizaránse in the Virtual dispatch of the professor. The Practices with support of the TIC disappear.

* Mechanism no *presencial of attention to the students (*titorías): virtual Dispatch of the professor, previous petition by *mail to mbesada@uvigo.gal

* Modifications (proceed) of the contained to impart: No they modify

* additional Bibliography to facilitate to car-learning: Without variation

* Other modifications

=== ADAPTATION OF The EVALUATION ===

* Proofs already realized

Seminars : [previous Weight 25%] [Weight Proposed 30%]

* pending Proofs that keep : All

* Proofs that modify [Practical with support of the TIC] => [disappear]

* New proofs: None

IDENTIFYING DATA				
Chemistry: Chemistry I				
Subject	Chemistry: Chemistry I			
Code	V10G061V01105			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Mosquera Castro, Ricardo Antonio			
Lecturers	Carreira Casais, Anxo Gómez Graña, Sergio Lorenzo Fernández, Paula Mosquera Castro, Ricardo Antonio Otero Martínez, Nicolás			
E-mail	mosquera@uvigo.es			
Web				
General description	The subject Chemical I enters the students of first course of the Degree in Marine Sciences in the basic concepts of the intermolecular interactions, the chemical thermodynamics, the chemical equilibria, the chemical kinetics and a introduction to the chemical reactivity and to the organic chemistry.			

Competencies				
Code				
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study			
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy			
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.			
CE1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.			
CE6	Acquire the fundamentals and terminology of chemical processes.			
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.			
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.			

Learning outcomes				
Learning outcomes	Competences			
- Chemical Nomenclature.	CB1 CB5	CG4	CE1 CE6	CT1 CT2
- Calculation of concentrations of solutions.	CB1 CB5			
- Identify chemical reactions of interest in the marine medium.	CB1 CB5			
- To predict the properties of substances in function of the present intermolecular forces.	CB1 CB5			
- Definition of concepts such enthalpy, standard enthalpy, calorimetry, heat of dissolution and heat of reaction, and their calculation.	CB1 CB5			
- Know how to use the expressions of the chemical balances to calculate the distribution of the substances involved in them. Know the factors that affect the balance and use the Le Chatelier principle.	CB1 CB5			
- Definition of pH and pOH, acidity/basicity constant, constants, hidrólisis constnt, and their calculatión.	CB1 CB5			
- Learn about buffer solutions and the different types of acid-base reactions and know how to use them.	CB1 CB5			
- Definition of concepts such solubility and product of solubility, and know as if they calculate.	CB1 CB5			
- To know what a oxidation-reduction process is, to define REDOX potential, standard potentials, and to know how they are calculated.	CB1 CB5			
- Understand the principles of operation of an electrochemical cell and predict the products of a electrochemical.	CB1 CB5			
- To define reaction rate and rate equation, and know how to use.	CB1 CB5			

- Learn and know how to use the main methods of analysis of kinetic data.	CB1 CB5
- To calculate the effect of the temperature in the reaction rate.	CB1 CB5
- To know the general characteristics of catalysis and their types.	CB1 CB5
- Differentiate between chemically-controlled reactions and diffusion-controlled reactions.	CB1 CB5
- Know the functional groups describing the structure of the organic molecules and their reactivity.	CB1 CB5

Contents

Topic	
Intermolecular Forces	Molecular geometry and polarity. Types of intermolecular forces: Electrostatic forces, inductive forces, dispersion forces, hydrogen bonding. Some properties of liquids.
Thermochemistry	Internal energy. Heat, work and first principle of thermodynamics. Enthalpy, standard enthalpy. Measure of heats of reaction: Calorimetry.
Chemical Equilibrium in Gas Systems	Chemical equilibrium. Equilibrium constant. Temperature dependence of equilibrium constant. Altering equilibrium: Le Châtelier principle.
Solubility Equilibrium	Solubility and solubility product constant. Altering solubility equilibrium: Common-ion effect. Equilibria involving complex ions.
Acid- Base Equilibrium	Theories of acids and bases. Scale of pH. Strong and weak acids and bases. Acid-base Equilibrium. Reactions of hydrolisis. Buffer solutions. Acid-Base reactions. Acid-Base titrations.
Redox Processes	Adjustment of redox equations. Redox Equilibrium. Thermodynamics of redox reactions: The Nernst equation. Standard electrode potentials. Galvanic cells. Electrolytic cells
Chemical Kinetics	Reaction rate. Rate equation. Analysis of kinetic data. The effect of the temperature on reaction rates. Catalysis.
Introduction to Organic Chemistry	Functional groups. Structure and reactivity. Basic stereochemistry: chirality and configurational stereochemistry.
Laboratory Practices	Application of the experimental techniques related to the subject. Implementation in the laboratory of the knowledge acquired in themes of thermochemistry, chemical equilibrium and chemical kinetics.

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	14	0	14
Laboratory practical	12	12	24
Lecturing	26	44	70
Autonomous problem solving	0	20	20
Essay questions exam	7	0	7
Report of practices, practicum and external practices	0	5	5
Problem and/or exercise solving	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
Seminars	The seminars will be mainly autonomous work of the student, under the supervision of the professor, and will employed fundamentally for: - Resolution of problems, both, in individual way and in group. - When the student have worked the basic aspects, to stress about contents with more complexity.
Laboratory practical	Realization under the supervision of Professor (but of autonomous way) of laboratory practises related with the matter.
Lecturing	Theoretical lessons imparted under the basis of material the disposal of the students in the platform TEMA (schemes, exercises bulletins, etc). The teaching language will be Spanish
Autonomous problem solving	After each subject or group of topics the teacher will propose some "Assesable Exercises" that the students will have to solve and return to the teacher within the fixed period.

Personalized assistance

Methodologies	Description
---------------	-------------

Lecturing	Those doubts/questions of the students that may arise along the course concerning the classes of theory will be solved in the tutoring schedule. The preferential modality for tutoring will be the no face-to-face concerted one. The student will have to make an appointment with the professor that have given the corresponding content. Because of the predictable circumstances for this course, tutoring will be preferably no face-to-face using remote campus or exchange of electronic messages.
Seminars	Those doubts/questions of the students that may arise along the course concerning the seminars will be solved in the tutoring schedule. The preferential modality for tutoring will be the no face-to-face concerted one. The student will have to make an appointment with the professor that had taught the corresponding exercise. Because of the predictable circumstances for this course, tutoring will be preferably no face-to-face using remote campus or exchange of electronic messages.
Laboratory practical	Those doubts/questions of the students that may arise along the course concerning the laboratory practices or the preparation of the corresponding reports will be solved in the tutoring schedule. The preferential modality for tutoring will be the no face-to-face concerted. The student will have to make an appointment with his lab professor. Given the predictable circumstances for this course, tutoring will be preferably no face-to-face using remote campus or exchange of electronic messages.
Autonomous problem solving	Those doubts/questions of the students that may arise along the course concerning the resolution of exercises, and/or other autonomous activities to be carried out, will be solved in the tutoring schedule. The preferential modality for tutoring will be the no face-to-face concerted one. The student will have to make an appointment with the professor that had proposed the corresponding activity. Because of the predictable circumstances for this course, tutoring will be preferably no face-to-face using remote campus or exchange of electronic messages. , will be resolved individually in the teacher tutoring schedule. In the present academic year schedule of tutorials will be Wednesdays and Thursdays at 9:00 to 12:00 hours and at 14:00 to 15:00. This schedule may vary promptly, when the teacher has other teaching, research or administrative obligations to meet. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.

Assessment

	Description	Qualification	Evaluated Competences			
Laboratory practical	It is scored here along with the effort and the attitude, the skills and the competences developed by the student during the accomplishment of the different practices. Attendance at practice sessions is mandatory and, therefore, it is not possible to pass the subject in case it has not taken place. Learning outcomes: - Definition of concepts such enthalpy, standard enthalpy, calorimetry, heat of dissolution and heat of reaction, and their calculation. - Definition of pH and pOH, acidity/basicity constant, constants, hidrólisis constnt, and their calculation. - Learn about buffer solutions and the different types of acid-base reactions and know how to use them. - To define reaction rate and rate equation, and know how to use. - Learn and know how to use the main methods of analysis of kinetic data. - To calculate the effect of the temperature in the reaction rate.	15	CB1 CB5	CG4 CE1 CE6	CT1 CT2	
Essay questions exam	Completion of a written exam at the end of the semester, on the date fixed by the Xunta de Facultade. In addition, during the semester, on the date previously set by the teacher, an optional partial and releasing exam of topics I, II and III will be carried out. Students who achieve a grade of 4.0 or higher in the partial exam (which will have a weight of 28% in that case) will not have to be examined (if they wish) of that part of the Subject to the overall exam, only performing on that date an examination of the second partial (which will then have, in this case, a weight of 37%). Learning outcomes: - All included in the subject.	65	CB1 CB5	CE1 CE6	CT1 CT2	

Report of practices, practicum and external practices	The formal aspects related to the organization, correct use of the units, correct preparation of the graphs and presentation of the results will be taken into account. Critical analysis of these and conclusions will also be assessed. Learning outcomes: - Definition of concepts such enthalpy, standard enthalpy, calorimetry, heat of dissolution and heat of reaction, and their calculation. - Definition of pH and pOH, acidity/basicity constant, constants, hidrólisis constnt, and their calculation. - Learn about buffer solutions and the different types of acid-base reactions and know how to use them. - To define reaction rate and rate equation, and know how to use. - Learn and know how to use the main methods of analysis of kinetic data. - To calculate the effect of the temperature in the reaction rate.	5	CB1 CB5	CG4	CE1 CE6	CT1 CT2
Problem and/or exercise solving	In addition to problem bulletins, at the end of each topic (or group of topics), we will propose "Assesable Exercises" that the students must solve autonomously and deliver to the teacher within the term that is fixed. Learning outcomes: - All included in the subject.	15	CB1 CB5		CE1 CE6	CT1 CT2

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.

In order to pass the subject, it is essential to reach a minimum of 4.0 points over 10 in the long exam (or in the global evaluation of the partial exams, each one with its percentage). In case of not achieving this score, the grade that will be reflected in the record will be only the grade of this exam (or the global evaluation of the partial exams), not taking account any of the other sections.

In order to pass the subject it is necessary to achieve **a minimum grade of 5.0 in the overall grade** (weighted sum of the long or partial exams (65%), laboratory practices (15%), practice reports The "Assesable Exercises" (15%)).

The performance of the partial exam, or the long exam, will imply the condition of "presented" and, therefore, the assignment of a grade in accordance with the included in this teaching guide.

Second Call:

For the evaluation in the second call, the grades and percentages of laboratory practices, practice reports and "Assesable Exercises" will be maintained.

In order to know exam dates: <http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3>

Sources of information

Basic Bibliography

CHANG, R., GOLDSBY, K. A., "Química", (12ª edición), Ed. McGraw-Hill, 2016

ROSENBERG, J.L., "Química (serie Schaum)", (10ª edición), Ed. McGraw Hill, 2014

LÓPEZ CANCIO, J.A., "Problemas de Química: Cuestiones y Ejercicios", (1ª edición), Ed. Prentice-Hall, 2000

Complementary Bibliography

PETRUCCI R.H., "Química General", (11ª edición), Ed. Pearson Educación, 2017

ATKINS, P.W., "Química: los caminos del descubrimiento", (5ª edición), Ed. Médica Panamericana, 2012

BROWN, T., LEMAY, E., "Química. La Ciencia Central", (12ª edición), Ed. Pearson Educación, 2013

REBOIRAS, M.D., "Química. La ciencia básica", Ed. Thomsom, 2006

LONG, G.G., HENTZ, F.C., "Química General: Problemas y Ejercicios", (3ª edición), Ed. Addison-Wesley Iberoamericana, 1991

WILLIS, C.J., "Resolución de Problemas de Química General", Ed. Reverté, 1980

LOGAN S. R., "Fundamentos de Cinética Química", Ed. Addison Wesley Iberoamericana, 2000

Recommendations

Subjects that continue the syllabus

Chemistry: Chemistry 2/V10G061V01110

Subjects that are recommended to be taken simultaneously

Physics: Physics I/V10G061V01102

Mathematics: Mathematics I/V10G061V01104

Other comments

Stoichiometry, basic laws, different forms to express the concentration and basic chemical nomenclature will be used very often resolving numerical problems and can be considered fundamental tools in this subject.

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 by the students and professors through the tool normalised and institutionalised of the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===

* educational Methodologies that keep

The masterclasses and part of the ones of seminar will give through the remote campus or like recordings with link in "Tema" platform.

* Educational methodologies that modify

Part of the classes of seminar will be able to substitute by material deposited in "Tema" platform.

If they could not make the practices of laboratory would be substituted by videos, virtual practices, exercises or memories to elaborate. In this case, the students would be provided with the experimental data in order they write the corresponding report.

* Tutoring Mechanism no face-to-face of attention to the students

This attention was preferably no face-to-face.

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

We will try not modifying the contents.

* Additional bibliography to facilitate the learning

It foresees that the student can use the texts recommended like basic to purchase all the knowledges given.

=== ADAPTATION OF THE EVALUATION ===

If only the short proof could be carried out in class, its weight would increase to 35% (in place of 28% foreseen in the guide).

If it was not possible to make the first proof in class, it would be suppressed and it would be exclusively a final examination (was this face-to-face or no face-to-face).

In case that the practices of laboratory could not be carried out, its weight would reduce to one half of the planned in the guide. The rest would increase the weight of the exercises proposed and other autonomous activities.

IDENTIFYING DATA				
Biology: Biology 2				
Subject	Biology: Biology 2			
Code	V10G061V01106			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Souza Troncoso, Jesús			
Lecturers	Heres Gozalbes, Pablo López Pérez, Jesús Souza Troncoso, Jesús			
E-mail	troncoso@uvigo.es			
Web				
General description	It is the first approach of the student to the Zoology and Ecology.			

Competencies

Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CE9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
CE10	Know the biological diversity and functioning of marine ecosystems.
CE11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Learning outcomes

Learning outcomes	Competences		
1. Know, comprise, measure and value the importance of the biodiversity of the organisms in the half marine.	CB1	CE9 CE10 CE11	CT1 CT2
2. Comprise the bases of the diversity and the evolutionary history of the animal species.	CB1	CE9 CE10 CE11	CT1 CT2
3. Know the basic terminology of the zoological science.	CB1	CE9 CE10 CE11	CT1 CT2
5. Know the situation of the *filos zoological in the marine ecosystems (*zooplancton, *necton, *bentos).	CB1	CE9 CE10 CE11	CT1 CT2
6. Know the adaptations *morfolóxicas that condition the situation of the zoological groups in the marine ecosystems coastlines, *neríticos and deep.	CB1	CE9 CE10 CE11	CT1 CT2
7. Know recognize the main *filos zoological belonging to the half marine.	CB1	CE9 CE10 CE11	CT1 CT2
8. Know recognize the offshore species more common.	CB1	CE9 CE10 CE11	CT1 CT2
9. Know and comprise the basic ecological principles that determine the structure and the operation of the marine ecosystems.	CB1	CE9 CE10 CE11	CT1 CT2
10. *Autoecoloxía. Adjustment go in the organisms and the environment. Environmental factors. Analysis of the effects and answers of the organisms the distinct Factors. Conditions and resources.	CB1	CE9 CE10 CE11	CT1 CT2
11. Purchase the capacity to relate processes *abióticos and *bióticos in the half marine.	CB1	CE9 CE10 CE11	CT1 CT2

12. Purchase skill in the analysis and interpretation of data.	CB1	CE9 CE10 CE11	CT1 CT2
13. Purchase the skill to transmit information of form written, verbal and graphic.	CB1	CE9 CE10 CE11	CT1 CT2

Contents

Topic

□ The diversity of the marine organisms. The tree of life. The zoological Topic coincides with Sub-topics.

□ The five kingdoms. Unicellular and multicellular organisms. idem

□ The multicellular organisms: the animal kingdom. idem

□ Origin of metazoas, levels of organisation. Analogy and homology. The symmetry. Classifying animals. The biological nomenclature. Systematics. Filogeny. idem

□ Introduction to the Phyla on marine environment. idem

□ The invertebrates protostomes. Lophotrochozoa and ecdysozoa. idem

□ The invertebrates deuterostomes: xenoturbellida, equinodermata and hemichordata. idem

Introduction to the Phylum chordata. Characteristics of the subphyla urochordata and cephalochordata. idem

The subphylum Craniata (vertebrates). Agnatha and gnathostomata. idem

Marine condrichthyes, osteichthyes, birds and mammalia. idem

- Vertebrates with accidental presence on marine environment: amphibia and reptilia. idem

- Field of study of the ecology: The biological macroscopic systems: The ecology how science of synthesis; historical review. Levels of organisation; hierarchy and emergent properties. General theory of systems. System to level supra organismic. The ecosystem. The parts (diversity) and it all (energetic). The ecological topics coincides with Sub-topics.

- The paper of the environment in the evolution of the organisms: Adaptation; concept and critical. Biological efficacy. Natural selection and genetic drift. Speciation. Convergences and parallelisms. Ecotypes and genetic polymorphisms. idem

- Decomposition of the environment factors: conditions and resources. Limiting factors. Limits of tolerance and optimal physiological. Ecological indicators. Ecological niche. Ecological profiles. idem

- Environmental factors: The space, Temperature, Salinity, luminous Radiation, Nutrients, Gases dissolved, others. idem

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	29	58	87
Seminars	7	15	22
Laboratory practical	5	10	15
Studies excursion	10	15	25
Objective questions exam	0.5	0	0.5
Essay questions exam	0.5	0	0.5

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

Methodologies	
	Description
Lecturing	Explain to the students the theoretical contents that will be evaluated in a final examination.
Seminars	By means of the preparation of oral exhibitions on scientific texts selected, the students will show his skills, the team work, oral exhibition regard a scientific subject. After the exposure we will open a debate to evaluate the capacity of synthesis and the understanding of the subject proposed.
Laboratory practical	Recognize the answers of the organisms to the environmental factors. Besides to recognize the most commons marine organisms on our coasts.
Studies excursion	The students will learn to recognize the marine organisms more common of the European coasts.

Personalized assistance

Methodologies	Description
Lecturing	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Seminars	It Will do a continuous assessment of the academic performance of the student during the Seminars by means of the observation of the his active participation, so much during the phase of preparation, manufacture, exhibition, back debate as well as the resources to bibliography used.
Laboratory practical	The professors of the subject will realize a continuous assessment of the performance of the student, in base to the participation in the practices and to the intervention in the distinct activities offered.
Studies excursion	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.

Assessment

	Description	Qualification	Evaluated Competences	
Lecturing	They Will evaluate the contents with questions type test and/or short questions.	69	CB1	CE9 CT1 CE10 CT2 CE11
Seminars	It Will qualify the preparation of the subject and his exhibition. It will evaluate the participation debate us of all the Seminars.	10	CB1	CE9 CT1 CE10 CT2 CE11
Laboratory practical	It Will value the realization and participation in the practical.	15	CB1	CE9 CT1 CE10 CT2 CE11
Studies excursion	It Will evaluate the realization and the participation in the exits.	5	CB1	CE9 CT1 CE10 CT2 CE11
Objective questions exam	It will qualify the basic concepts in Zoology and Ecology.	0.5	CB1	CE9 CT1 CE10 CT2 CE11
Essay questions exam	It will qualify the basic concepts in Zoology and Ecology.	0.5	CB1	CE9 CT1 CE10 CT2 CE11

Other comments on the Evaluation

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

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

Sources of information

Basic Bibliography

Susan Keen, Jr. Hickman, Cleveland, Allan Larson, David Eisenhour, Helen I'Anson, **Integrated Principles of Zoology**, 16, McGraw-Hill Education, 2015
 Richard C. Brusca, **Invertebrates**, Sinauer, 2016
 Peter Castro, Michael Huber, **Marine Biology**, 9, McGraw-Hill Higher Education, 2012

Recommendations

Other comments

The key to success is to take part in all activities.

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 same methodologies are maintained.

* Teaching methodologies modified

The methodologies have not been modified.

* Non-attendance mechanisms for student attention (tutoring)

Students will be attended by the teachers in their virtual offices by appointment request by e-mail.

* Modifications (if applicable) of the contents

The contents are not modified.

* Additional bibliography to facilitate self-learning

There are no changes.

* Other modifications

Not apply

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

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

There are no pending tests.

* Pending tests that are maintained

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

There are no pending tests.

* Tests that are modified

[Previous test] => [New test]

They are not modified.

* New tests

We do not create new tests.

* Additional Information

If the state of alarm persists next year, the necessary measures will be adopted for the successful completion of the academic year.

IDENTIFYING DATA				
Statistics				
Subject	Statistics			
Code	V10G061V01107			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	de Uña Álvarez, Jacobo			
Lecturers	de Uña Álvarez, Jacobo			
E-mail	jacobos@uvigo.es			
Web				
General description	Subject destined to the knowledge and use of the fundamental statistical techniques for the treatment of and analysis of experimental data.			

Competencies	
Code	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG2	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.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE2	Acquire basic knowledge of mathematics (differential and integral calculation) and statistics.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.

Learning outcomes				
Learning outcomes	Competences			
Know the importance of information and be able to assess and classify it in each decision area.	CB2	CG2	CE2	CT1
Know how to correctly apply and interpret the basic descriptive techniques for the analysis of unidimensional and bidimensional variables.	CB3	CG4		
	CB4			
	CB5			
Understand the concept of hypothesis testing.	CB3		CE2	CT1
	CB5			
Understand the principles of multivariate analysis.	CB3		CE2	CT1
	CB5			
Effectively solve problems and issues of each of the lessons using the appropriate quantitative method.	CB5	CG2		CT1
Introduce the students in the manage of computer packages related to statistics: excel, R. And so favor a positive attitude towards the quantitative methods, in general, and statistics, in particular, as well as their computer manipulation.	CB3	CG2		CT1
	CB5	CG4		
Understand the importance of statistical analysis when taking decisions and learn when to apply each technique and interpret the results obtained.	CB3	CG2		CT1
	CB4			
To awaken the taste for the use and study of statistics, seeing it as a tool that allows us to learn more about our own field of knowledge and to start carrying out our own research.	CB3			CT1
	CB5			

Contents	
Topic	
1. Exploratory data analysis	Measures of central tendency, dispersion and form. Graphic representations. Linear and non-linear transformations. Atypical data and their detection.
	Mean and variance in subpopulations. Descriptive introduction to the ANOVA.

2. Calculation of probabilities and main distributions of probability	Random experiment. Rule of addition. Conditioned probability. Main probability theorems. Independence of events. Diagnostic tests. Discrete and continuous variables. Mean and variance. Discrete models: binomial, multinomial, hypergeometric and poisson. Continuous models: normal, log-normal, exponential, chi-square, t-Student and F-Snedecor.
3. Introduction to hypothesis testing. Tables of frequencies: measures and tests.	Definition of a test. Type I and type II errors, level of significance, p-value, power and sample size. Types of tests. Normality test. Frequency tables. Association measures for nominal, ordinal and quantitative variables. Measures of prediction and agreement. Chi-square test of goodness of fit, independence and homogeneity.
4. Regression	The simple linear model. Scatter plot. Line of regression. Correlation coefficient and goodness of fit. ANOVA of the regression and residue analysis. Non-linear regression: logarithmic, potential and exponential models. Introduction to multiple linear regression.
5. Statistical inference techniques for comparison of groups	Comparisons between 2 independent or related groups. Previous variance test: F test. Tests to compare two means: t tests. Comparison of more than 2 groups: ANOVA and multiple comparison test. Study of the assumptions of alternative nonparametric techniques.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	15	7.5	22.5
Autonomous problem solving	0	27.5	27.5
Lecturing	30	30	60
Seminars	7	14	21
Problem and/or exercise solving	2	2	4
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
Laboratory practical	Data processing using the free software R.
Autonomous problem solving	Resolution of exercises in the problem sets.
Lecturing	Exposition of the main statistical techniques described in the syllabus of the subject.
Seminars	Resolution of practical exercises of the subjects. In some cases, Excel will be used.

Personalized assistance

Methodologies	Description
Seminars	In the tutorials and seminars.
Laboratory practical	In the tutorials and seminars.
Autonomous problem solving	In the hours of tutoring and seminars. The student who wishes can go to personalized tutoring to answer questions, mainly in the hours indicated. The student may set a different schedule by previously contacting the professor.

Assessment

	Description	Qualification	Evaluated Competences
Laboratory practical	The result of the analysis of data made during the practices will be uploaded to the faitic platform will be evaluated.	10	CB3 CB4 CB5
Seminars	The students will be evaluated by solving an exercise in the classroom in an autonomous way.	10	CB2 CB3 CB4 CB5

Problem and/or exercise solving	There will be two midterm exams during the course that will take place during the theory classes.	20	CB3 CB5	CE2	CT1
	Midterm 1 (10%): lessons 1 and 2. Midterm 2 (10%): lessons 3 and 4.				
Essay questions exam	Final exam of the subject	60	CB3 CB5	CE2	CT1

Other comments on the Evaluation

It is possible to pass the subject through continuous evaluation. The continuous assessment note is obtained as the weighted average of the following qualifications:

- Average grade of laboratory practice reports. (25%)
- Average grade of the exercises solved in the seminars. (25%)
- Average grade of the midterm exams. (50%)

If the subject is not passed through continuous assessment, the grade of continuous evaluation will represent 40% of the final grade, with the remaining 60% being the final exam grade in the official exams.

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

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

The grade in the extraordinary call is computed exactly in the same way as in the ordinary call. Counting the continuous evaluation (seminars, practices and partials) 40% and the final exam 60%.

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

Mirás Calvo M.A., Sánchez Rodríguez E., **Técnicas estadísticas con hoja de cálculo y R : azar y variabilidad en las ciencias naturales**, 1, Servizo de Publicacións da Universidade de Vigo, 2018

Sokal R., Rohlf F., **Biometría**, 4, Blume, 2012

Steel R., Torrie J., **Bioestadística. Principios y procedimientos**, 4, McGraw-Hill, 1995

Susan Milton J., **Estadística para la biología y las ciencias de la salud**, 3, McGraw-Hill Interamericana, 2007

Complementary Bibliography

Fowler F., Cohen L., Jarvis P., **Practical Statistics for Field Biology**, 2, John Wiley & Sons, 2013

Recommendations

Contingency plan

Description

In the event of cancellation of face-to-face teaching, remote campus of the Universidade de Vigo will be used.

In these exceptional circumstances all the methodologies remain. Accompanying students will be performed through the remote campus (teacher's virtual office). The weights of the evaluation remain the same.

IDENTIFYING DATA				
Geology: Geology 2				
Subject	Geology: Geology 2			
Code	V10G061V01108			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Rubio Armesto, María Belén			
Lecturers	Bernabéu Tello, Ana María Gago Duport, Luís Carlos Lago Cameselle, Alejandra Marino , Gianluca Pérez Arlucea, Marta María Rubio Armesto, María Belén			
E-mail	brubio@uvigo.es			
Web	http://http://mar.uvigo.es/index.php/es/alumnado-actual/asignaturas			
General description	Comprises the understanding of the scientific principles that influence our planet, its evolution, its formations, the atmosphere and the oceans. It is about acquiring basic knowledge of geological processes that act in particular on the earth's surface, the so-called external geological processes.			

Competencies

Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
CE12	Acquire knowledge about processes and products related to internal and external geological cycles.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes

Learning outcomes	Competences			
☐ Identify the main mineral constituents and biological in sediments and sedimentary rocks by observations "de visu" in field and laboratory.	CB1	CG1	CE1	CT1
☐ Know and differentiate the external geological agents and their effects.	CB5		CE1 CE12	
☐ Recognize the relief forms		CG1		
☐ Handle the systems of cartographical maps		CG4		
☐ Handle the principles and the basic instruments of positioning and georeference	CB1	CG4	CE12	CT1
☐ Look for and handle specific information.	CB5			CT1 CT5

Contents

Topic	
The Earth as an study object	Evolution of the Earth. The geological and petrologic cycle
The systems of the Earth	The systems of the Earth: atmosphere, hydrosphere, Hydrologic cycle. Karstic systems and underground water.
External Processes	Weathering and soils Formation of sediments Sediments: erosion, transport and sedimentatón. Diagenesis and sedimentary rocks
Geological processes in continental environments	Desert, glaciár, fluvial and lacustrian sedimentary environments

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	10	12	22
Seminars	7	10	17
Studies excursion	8	4	12
Lecturing	20	60	80
Report of practices, practicum and external practices	0	12	12
Objective questions exam	0	3	3
Essay questions exam	2	0	2
Essay	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
Laboratory practical	Reconocimiento de rocas sedimentarias Sistemas de representación (mapas de isolíneas y cálculo de volúmenes) Cortes geológicos
Seminars	Procesos de erosión y transporte de sedimentos. Determinación del contenido en carbonato cálcico en sedimentos Interpretación geológica con Google Earth
Studies excursion	Inspección geológica en una salida de campo el largo del itinerario : Vigo-Ramalloza-Baiona Se trata de reconocer el control que ejerce la geología y la dinámica marina y fluvial en la morfología de la costa. Reconocimiento de los principales tipos de rocas y de los principales ambientes sedimentarios; mecanismos de actuación durante el Cuaternario. Potenciales riesgos geológicos.
Lecturing	Clases centradas en contenidos teóricos con predominio de la exposición, pero fomentando la participación del estudiante mediante preguntas

Personalized assistance

Methodologies	Description
Seminars	The students could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To optimize the time, it is necessary the student contact the teacher in advance.
Studies excursion	The students could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To optimize the time, it is necessary the student contact the teacher in advance.
Lecturing	The students could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To optimize the time, it is necessary the student contact the teacher in advance. B. Rubio schedule: Monday, Wednesday and Friday from 12:00 to 14:00 h.
Laboratory practical	The student that wish it will be able to *acudir the *tutorías customized to resolve doubts, mainly us time that indicate . To optimise the time, is necessary that the student contact with the in advance sufficient professor
Tests	Description
Report of practices, practicum and external practices	It corresponds to the final work that delivers the student and collects the work realized during them practical.

Assessment

	Description	Qualification	Evaluated Competences
Seminars	It contemplates the delivery of the questions or resolution of the exercises posed in the seminars.	10	CB1 CG1 CE1 CT5
Studies excursion	It values the assistance to the routes of field programmed, and the corresponding presentation of a report or questionnaire on the contents evaluated in the exit.	5	CG4 CE1 CE12
Report of practices, practicum and external practices	It will qualify the assistance and the correct realization of the practices of laboratory that have a mandatory character, in addition to the quality of the report	10	CB1 CG4

Objective questions exam	It comprises the answers of the quizzes	5	CB1	CG1	CE1	CT1
Essay questions exam	They will done in an only exam at the end of the course. It can contemplate any aspect of the theoretical lessons as well as in practical or seminars activities.	70	CB1	CG1	CE1	CE12
			CB5		CE12	

Other comments on the Evaluation

The quiz of the platform FAITIC and the practical lessons and seminars are compulsory. The minimum qualification of the theoretical examination will be of 3,5 to be able to compensate with the others qualifications obtained in practices and seminars.

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>

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e. copu 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

Anguita, F y Moreno, F., **Procesos Geológicos Externos y Geología Ambiental**, Rueda,

Pozo et al., **Geología Práctica**, Pearson,

Tarbutck, E.J. y Lutgens, F.K, **Ciencias de la Tierra. Una introducción a la geología física. 8ª ed.**, Pearson,

Azañón et al., **Geología Física**, Paraninfo,

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Coastal and marine sedimentary habitats/V10G061V01207

Subjects that it is recommended to have taken before

Geology: Geology 1/V10G061V01103

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of it uncertain and unpredictable evolution of the sanitary alert caused by the COVID- 19, the University establishes join extraordinary planning that will actuate in the moment in that the administrations and the institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching plan in a non-presential scenary. 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 beforehand (or with a wide advance) pole students and the teaching staff through the tool normalized and institutionalized of the teaching guides DOCNET.

=== ADAPTATION OF The METHODOLOGIES ===

Teaching Methodologies that keep

The lectures will be in a virtual way through remote campus

Teaching Methodologies that modify

For the field contemplate two possible options, depending of the confinement level was total or partial.

(1) Option. Walking around campus. Geomorphologic description of the Ría de Vigo, since the forest park. Measurements of direction and dip with the compass.

(2) Option. Virtual tour using Google Earth and geological maps (MAGNA). Explanation of the tectonic and lithologic units of the NW and the coastal geomorphology. Analysis of weathering processes trough photographs. Video-tutorials about direction and dip measurements.

Regarding laboratory sessions:

The practice of recognition of sedimentary rocks will do virtually by using photographs of the collection of rocks of the Marine Sciences Faculty

The other two practices do not change.

Regarding the seminars will adapt to the virtual way. The seminars 1 and 3, that do not require the use of specific laboratory, will be the same. The seminar 2 will develop using a group of synthetic data from which the students will obtain the determination of calcium carbonate

Mechanism of no presential of attention to the students

All the mentoring will be concerted with the teaching staff and they will take place in a virtual mode

Modifications (proceed) of the contained to impart

They do not change

Additional Bibliography to facilitate the learning

* Other modifications

=== ADAPTATION OF The EVALUATION ===

Proofs already done

Test Seminars: [previous Weight 10%] [Weight Proposed 20%]

Practical Proof: [previous Weight 10%] [Weight Proposed 20%]

Test Field: [previous Weight 5%] [Weight Proposed 10%]

Test Questionnaires: [previous Weight 5%] [Weight Proposed 10%]

...

Pending proofs that keep

Test: [previous Weight 70%] [Weight Proposed 40%]

...

* Proofs that modify

[Test of short questions] => [test online]

* New proofs

We will include the participation in forums that can be evaluated for adjustment of the final mark.

* additional Information

IDENTIFYING DATA				
Mathematics: Mathematics II				
Subject	Mathematics: Mathematics II			
Code	V10G061V01109			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Besada Morais, Manuel			
Lecturers	Besada Morais, Manuel			
E-mail	mbesada@uvigo.gal			
Web	http://fatic.uvigo.es			
General description	Basic course of integrate of line and surface and of equations *diferenciáis			

Competencies				
Code				
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy			
CE1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.			
CE2	Acquire basic knowledge of mathematics (differential and integral calculation) and statistics.			
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.			

Learning outcomes				
Learning outcomes	Competences			
□ Understand the concepts of *rotacional and divergence of a field *vectorial. Comprise the importance of the integrals of line and surface and know used in the study of the potential energy and other physical questions.	CB5	CE1 CE2	CT2	
□ Comprise, formulate and resolve any differential equations of first and second order.	CB5	CE1	CT2	
□ Use a program *informático in the resolution of problems related with the integral calculation and the differential equations.	CB5	CE1 CE2	CT2	

Contents	
Topic	
Integral of line. Fields *conservativos	Regular curves. Integral along a curve. Work realized by a field. Fields *conservativos. *Rotacional. Divergence
Double integration. Surfaces.	Integration in *rectángulos. Integration in general areas. Change of variable. Polar coordinates. *Teorema Of *Green. Parametric and regular surfaces. Orientation of a surface.
Integral of surface. Integration @triple.	Integral of flow. *Teoremas Of Stokes. Integration @triple. Spherical coordinates and *cilíndricas. *Teorema Of *Gauss.
Differential equations of first order	Solution of a differential equation. Equations in separate variables. Exact equations. Linear equations.
Linear differential equations of upper order	Linear equations of order *n. Solutions. Linear equations with @constante coefficients. General solution of the equation *homoxénea. Particular solution of the complete equation.
*Temario Of laboratory	Resolution of exercises of integration and differential equations by means of programs of calculation.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	26	26	52
Seminars	18	18	36
Practices through ICT	4	2	6
Autonomous problem solving	0	10	10
Collaborative Learning	4	0	4
Problem and/or exercise solving	5	10	15
Essay questions exam	2	10	12
Self-assessment	0	6	6

Methodologies	
	Description
Lecturing	Exhibition of the theoretical bases and resolution of exercises and basic examples.
Seminars	Activities focused to the *trabajo individual or in group of the student in the resolution of problems that allow *afondar or enlarge the contents of the discipline. They Will employ how supplement of the theoretical kinds.
Practices through ICT	Learning of the handle of one plan *informático of calculation and graphic representation.
Autonomous problem solving	Activity in that formulate problems and exercises related with the discipline. The students owes to resolved by means of the methods accommodated to the available information and interpret the results.
Collaborative Learning	Specific activities of work in group.

Personalized assistance	
Methodologies	Description
Seminars	The students will sue to the professor the clarifications that estimate opportune to comprise better to subject and develop successfully the tasks proposed. *Faráse Also a tracking of the individual work of the student.
Practices through ICT	The students will sue to the professor the clarifications that estimate opportune to comprise better to subject and develop successfully the tasks proposed. *Faráse Also a tracking of the individual work of the student.
Collaborative Learning	The student that wish it will be able to *acudir the *titorías customized to resolve doubts. To optimise the time, is necessary that the student contact with the in advance sufficient professor by *mail.
Tests	Description
Problem and/or exercise solving	The student that wish it will be able to *acudir the *titorías customized to resolve doubts. To optimise the time, is necessary that the student contact with the in advance sufficient professor by *mail.

Assessment					
	Description	Qualification	Evaluated Competences		
Practices through ICT	The *estudiantes owe to resolve any exercises with the plan *informático used in the sessions of laboratory.	5	CB5	CE2	CT2
Problem and/or exercise solving	During it study will realize partial proofs with questions type test and/or of short answer.	25		CE1 CE2	CT2
Essay questions exam	When finalizing the course *realizaráse a final proof with questions that will be able to be type test, of short answer and/or problems. It Will be requirement *imprescible surpass in a 30% the qualification of this proof to approve the subject.	45	CB5	CE1 CE2	CT2
Problem and/or exercise solving	Exhibition or delivery in the classroom in the that the *estudiantado owes to solve a series of low problems the conditions and the time established pole professor.	25	CB5	CE1 CE2	CT2

Other comments on the Evaluation

- The date, time and location of the assessment tests will be published on the official website of the Faculty of Marine Sciences: <http://mar.uvigo.es/index.php/gl/alumnado-actual/examenes-2>
- A partial test may be carried out, which may release material from the final test.
- To pass the subject, the following requirements will be essential:
 - Exceed 30% of the final test grade.
 - Get 50% of the grade in the sum of the grades for all sections.
- Any student who, during the course, participates in evaluation tests of two or more subjects of the program will not be able, in any case, to obtain the grade of NOT PRESENTED.
- Students who do not pass the subject in the ordinary call, and intend to do so in the extraordinary call, will maintain the grades obtained during the course in each of the assessment tests carried out, except for the qualifications of practices with the support of ICT and the two tests taken at the end of the course, which will be evaluated in the corresponding exam. Likewise, the qualification of the resolved exercises delivered during the course may be

modified through a work supervised by the teaching staff (in this case, it will be necessary to contact the teaching staff well in advance to specify the work to be done).

- Students are required to take this course responsible and honest behavior.
- Any form of fraud (copying or plagiarism) aimed at falsifying the level of knowledge and skills achieved in all types of evidence, reports or work is considered inadmissible. Fraudulent conduct may mean suspending the subject for a full course. An internal record of these actions will be kept to, in the case of recidivism, request the rector to open a disciplinary file.

Sources of information

Basic Bibliography

Besada, M.; García Cutrín, J.; Mirás Calvo, M.A.; Quinteiro, C.; Vázquez, C., **Un mar de matemáticas**, Servizo de publicacións da Universidade de Vigo, 2016

Besada, M.; García Cutrín, J.; Mirás, M.; Quinteiro, C.; Vázquez, C., **Matlab: todo un mundo**, Servizo de publicacións da Universidade de Vigo, 2007

Larson, R.; Edwards, B., **Cálculo. Vol 1 e 2.**, 9ª, McGraw-Hill, 2010

Adams, R., **Cálculo**, 6ª, Pearson, 2009

Complementary Bibliography

Besada, M.; García Cutrín, J.; Mirás Calvo, M.A.; Quinteiro, C.; Vázquez, C., **Matemáticas á Boloñesa**, Servizo de publicacións da Universidade de Vigo, 2014

Thomas, George B. Jr., **Cálculo, varias variables**, 12ª, Pearson, 2010

Campbel, S.; Haberman, R., **Introducción a las ecuaciones diferenciales**, McGraw-Hill, 1998

Bradley, G.; Smith, K., **Cálculo de varias variables (Volume 2)**, Prentice Hall, 1998

Recommendations

Subjects that it is recommended to have taken before

Mathematics: Mathematics I/V10G061V01104

Other comments

It recommends to had studied the subject of Mathematical II of the second course of *bacharelato.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

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

=== ADAPTATION OF The METHODOLOGIES ===

* teaching Methodologies that keep : Any

* teaching Methodologies that modify : The theoretical kinds the Seminars *realizaránse in the Virtual dispatch of the professor. The Practices with support of the TIC disappear.

* Mechanism no *presencial of attention to the students (*titorías): virtual Dispatch of the professor, previous petition by *mail to mbesada@uvigo.gal

* Modifications (proceed) of the contained to impart: No they modify

* additional Bibliography to facilitate to car-learning: Without variation

* Other modifications

=== ADAPTATION OF The EVALUATION ===

* Proofs already realized

Seminars : [previous Weight 25%] [Weight Proposed 30%]

* pending Proofs that keep : All

* Proofs that modify [Practical with support of the TIC] => [disappear]

* New proofs: None

IDENTIFYING DATA				
Chemistry: Chemistry 2				
Subject	Chemistry: Chemistry 2			
Code	V10G061V01110			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Graña Rodríguez, Ana María			
Lecturers	Correa Duarte, Miguel Ángel Estévez Guance, Laura Graña Rodríguez, Ana María Mariño López, Andrea Prieto Jiménez, Inmaculada			
E-mail	ana@uvigo.es			
Web				
General description				

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE6	Acquire the fundamentals and terminology of chemical processes.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Learning outcomes	
Learning outcomes	Competences
Knowledge and employment of basic concepts of thermodynamics. Knowledge of the processes of transfer of heat and the processes of mixture in marine means.	CB1 CG4 CE6 CT1 CT2
Knowledge and understanding of the phase equilibrium and the phase changes.	CG4 CT1 CT2
Knowledge of the model of ideal solutions and colligative properties. Apply the colligative properties to the water of the sea.	CB5 CG4 CE6 CT2
Knowledge of the properties of the real and electrolyte solutions. Knowledge and application of the concept of activity. Knowledge of the description of the sea water as an aqueous electrolyte solution and analysis of related properties.	CB5 CG4 CE6 CT1 CT2
Application of the concept of chemical equilibrium to real and electrolyte solutions. Knowledge of the influence of the characteristics of sea water in chemical reactions in that medium.	CB5 CG4 CE6 CT1 CT2

Contents	
Topic	
Principles of thermodynamics	The internal energy and the first principle. Enthalpy. Heat capacities. Ideal gases and first principle. Entropy and second principle. Calculation of entropy differences. Entropy, reversibility and irreversibility.
Thermodynamic functions	Gibbs and Helmholtz functions. Gibbs equations. Calculation of changes in state functions. Partial molar magnitudes. Chemical potential.
Phase equilibrium in one-component system	Phase equilibrium conditions. The phase rule. Phase diagram of water. The equations of Clapeyron and Clausius-Clapeyron.
Thermodynamics of ideal solutions	Chemical potential of an ideal gas. Ideal solutions. Vapor pressure. Ideal diluted solutions. Colligative properties: their influence on sea water. Osmotic pressure.

Thermodynamics of real solutions and electrolyte solutions	Deviations from Raoult's Law. Activity and activity coefficient. Determination of activities and activity coefficients. Chemical potential in electrolyte solutions and their activity coefficient. Debye-Hückel's theory. Thermodynamics of solvation of ions. Sea water as an electrolyte solution. Quantitative treatment of polyelectrolyte solutions.
Thermodynamics of chemical equilibrium	Chemical equilibrium and degree of progress of a reaction. Variation of the equilibrium constant with temperature. Chemical equilibrium in real solutions. Chemical equilibrium in electrolyte solutions. Effect of ionic strength on equilibrium.
Laboratory practices	Enthalpy of dissolution. Method of solubility: enthalpy. Heat capacity. Effect of ionic strength on solubility. Chemical balance. Solubility product. Balance constant. Activity. Coefficient of activity. Ionic strength and its effect on the equilibrium constant. Dissolution and neutralization heat. Calorimetric method. Enthalpy, heat, heat of reaction, thermal capacity. Integral and differential heat. Ebullioscopic increase. Raoult's Law. Chemical potential. Enthalpy of vaporization. Study of the liquid-vapor equilibrium of mixtures of two liquids. Rule of the phases. Liquid-vapor balance. Phase diagram. Raoult's Law. Chemical potential. Coefficient of activity

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	23	27	50
Seminars	14	42	56
Laboratory practical	15	5	20
Essay questions exam	4	8	12
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
Lecturing	Theoretical classes taught through a presentation (available to students in the TEMA website). In these classes will be introduced the basic contents, with emphasis in more important and difficult topics. Numerical problems will be also solved. The bulletins of problems will be also available in the TEMA website.
Seminars	Destined to the resolution of numerical problems and debate of the questions and exercises. The necessary material will be available in the TEMA website.
Laboratory practical	Application of techniques of laboratory in practical problems related with the subject.

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 advised 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 advised 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 advised to previously contact his/her teacher with reasonable anticipation

Assessment

	Description	Qualification	Evaluated Competences
Laboratory practical	Attendance required. Continuous assessment during class hours.	15	CG4 CT2

Essay questions exam	Written exams in which the level of theoretical knowledge and problem solving will be checked. Two optional partial exams will be made in the middle of the semester and at the end of it. The final grade will be the average of the one obtained in the two partial ones, provided that a minimum of 4 out of 10 is achieved in both. Alternatively, the student may submit to the final exam with all subject matter. The final exam grade must correspond to a minimum performance, which is set at 4 out of 10.	70	CB1 CB5	CG4	CE6	CT1 CT2
Problem and/or exercise solving	Resolution of problems at home and/or individual resolution of questionnaires in the TEMA website.	15	CB1		CE6	CT1 CT2

Other comments on the Evaluation

If the exam score (or the average of the two partial examinations) is lower than 4 out of 10, the final grade will be the one obtained in the exams.

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

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

In the call of Julio the previous percentages will be respected, and the obtained qualifications obtained in practices and resolution of questions are maintained.

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

Levine, **Fisicoquímica**, McGraw-Hill. 5ª Ed. (2004),
Atkins, **Química Física**, 8ª Ed. , Ed. Omega (2008),
Levine, **Problemas de Fisicoquímica**, 6ª Ed. McGraw-Hill (2014),

Complementary Bibliography

J. Pellicer, J. A. Manzanares, **100 Problemas de Termodinámica**, Síntesis (1996),
Laidler, Meiser, Sanctuary, **Physical Chemistry**, Edition, Houghton Mifflin (2002),
Klotz, Rosenberg, **Chemical Thermodynamics: Basic Theory And Methods**, 6th Ed., John Wiley (2000),
Rock, **Termodinámica Química**, Vicens-Vives (1989),
Rodríguez Renuncio, Ruiz Sánchez, Urieta Navarro, **Problemas resueltos de termodinámica química**, Síntesis. (2000),
W. Stumm, J. J. Morgan, **Aquatic Chemistry (Chemical equilibria and rates in Natural Waters)**, 3ª Ed. John Wiley & Sons (1995).,
D. Eisenberg e D. Crothers, **Physical Chemistry with Applications to the Life Sciences**, Benjamin/Cummings Publishing Company.(1979),
J. Wright e A. Colling, **Sea-water: its composition, properties and behaviour**, Oceanography, vol.2. The Open University. Pergamon Press.(1991),

Recommendations

Subjects that continue the syllabus

Chemical oceanography I/V10G061V01204
Chemical oceanography II/V10G061V01209

Subjects that are recommended to be taken simultaneously

Mathematics: Mathematics II/V10G061V01109

Subjects that it is recommended to have taken before

Physics: Physics I/V10G061V01102
Mathematics: Mathematics I/V10G061V01104
Chemistry: Chemistry I/V10G061V01105

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of its uncertain and unpredictable evolution of the sanitary alert caused by the COVID-19, the University establishes an extraordinary planning that will actuate in the moment in that the administrations and the institution determine it attending to criteria of security, health and responsibility, and guaranteeing teaching in a scenario partial or totally. These already scheduled measures guarantee, in the moment that is prescriptive, the development of teaching in a quick and effective way previously known by students and teaching staff through doctnet tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Methodologies that stay the same

Lecturing (partial or totally virtual)

Seminars (partial or totally virtual)

* Methodologies that modify

Laboratory practical : they will be partial or totally substituted by videos and documents that allow the presentation of a report.

* Mechanism for virtual attention to the students (tutorial sessions)

Remote Campus, email and fatic.

* Modifications of the contained to impart:

None.

* Additional Bibliography to facilitate to car-learning:

None.

* Other modifications:

None.

=== ADAPTATION OF THE EVALUATION ===

Essay questions exams will be substitute total or partially by tests through fatic with the same percentage of the qualification.

The resolution of problems and/or exercises remains with the same percentage of the qualification.

Continuous assessment during practical class hours will be substituted total or partially by the delivery of reports of practices.

* Additional information

None

IDENTIFYING DATA				
Biochemistry				
Subject	Biochemistry			
Code	V10G061V01201			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	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	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
CE11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Learning outcomes	
Learning outcomes	Competences
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.	CG1 CE9 CG3
Approach of the biological phenomena in molecular terms, relating the structure of each biomolecules family with the biological function that exert	CB2 CB3 CG1 CE9
Acquisition and appropriate utilisation of concepts and biochemical terminology	CB4 CG1 CE9 CE11
Resolution of questions of quantitative biochemistry	CB2 CT1 CT2
Familiarisation with use of basic instrumental and equipment of a biochemical laboratory	CB2 CG3
Knowledge and application of simple techniques of separation and quantification of biomolecules	CB2 CG3 CG4 CT1
Development of scientific thinking style	CB2 CB3 CB4 CG1 CT1 CT2

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.
Carbohydrates:	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. Kinetic 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 biosynthesis. 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	Evaluated Competences			
Lecturing		0				
	Assistance no available					
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 terminología 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	CB2 CB3 CB4	CG1	CE9 CE11	CT1 CT2
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	CB2 CB3 CB4	CG1 CG3 CG4	CE9 CE11	CT1 CT2
Objective questions exam	Test: It asses, in a general way, the knowledge acquired of the course program	50	CB2 CB3 CB4	CG1	CE9	
	Short answer: It asses the knowledge acquired, the ability to relate them and the proper use of concepts and biochemical terminology.					
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	CB2 CB3 CB4	CG1 CG4	CE9 CE11	CT1 CT2

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 actuaciones 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 Edición, 2014
Voet D., Voet J.G. y Pratt C.W., **Fundamentos de Bioquímica. La vida a nivel molecular**, 4ª Edición, 2016

Complementary Bibliography

Blas Pastor J.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 Edición, 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] => [new Proof]

* New test

* additional Information

1. BLENDED TEACHING

- The contents, methodologies, and tests of evaluation are maintained.
- Theory will be taught 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	Type	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	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE4	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.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
CT3	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.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes		
Learning outcomes	Competences	
To know the origin and evolution of the marine plants and the features of the main groups	CB2 CB3 CB4 CB5	CT3 CT5
To acquire the skills to collect, prepare, analyze, identify and preserve plant samples	CE4	CT1 CT2
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	CB3 CB4 CB5	CT1 CT2 CT3 CT5

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 features 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 Xanthophyceae 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	Evaluated Competences
Essay	Public presentation of the groups' reports	15	CB2 CB3 CB4 CB5
			CT3 CT5

Report of practices, practicum and external practices	Evaluation of the reports on the field and laboratory sessions	20	CB5	CE4	CT3
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 approved 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 LEARNING.

* 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	Type	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 environment and the development of models related with it. Furthermore, it is important to understand the fundamental physics concepts to understand how the instruments work and to know how to use and control them.			

Competencies

Code	
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
CE1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
CE4	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.
CE5	Formulate the mass, energy and moment conservation equations for geophysical fluids and solve them in basic oceanic processes.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Learning outcomes

Learning outcomes	Competences			
1.- Know the fundamental principles of the Thermodynamic and know applied to realize global analyses of thermodynamic 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 *refrigeración 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.	CB5	CG1 CG3	CE1 CE4 CE5	CT2
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.	CB5	CG1 CG3	CE1 CE4 CE5	CT1 CT2
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.	CB5	CG1 CG3	CE1 CE4 CE5	CT1 CT2

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.	CB5	CG1 CG3	CE1 CE4 CE5	CT1 CT2
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 *tarear where the physical behaviour of the water of the sea was *relevante.	CB5	CG1 CG3	CE1 CE4 CE5	CT1 CT2

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	Evaluated Competences
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/examen-3	40	CB5 CE1 CT1 CE4 CT2 CE5
Report of practices, practicum and external practices	It will qualify the realization of the laboratory experiments and the report in groups of two students.	25	CB5 CG1 CE1 CT2 CG3 CE4
Portfolio / dossier	Developing of a "portfolio" based on the subject in groups of two students.	35	CB5 CG1 CE1 CT1 CG3 CE4 CT2

Other comments on the Evaluation

Date, time and place of exams will be published in the official web of Marien Sciences
Faculty: <http://mar.uvigo.es/index.php/en/alumnado-actual-2/examen-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, 9ªEd., 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	Type	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	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE6	Acquire the fundamentals and terminology of chemical processes.
CE7	Apply to the marine and coastal environment the principles and methods used in Chemistry.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Learning outcomes	
Learning outcomes	Competences
Describe the composition and behavior of materials present in seawater.	CB2 CB4 CB5 CG1 CE6 CE7 CT1 CT2
Explain the main properties of water, electrolyte solutions and seawater from a physicochemical point of view.	CB2 CB4 CB5 CG1 CE6 CT1 CT2
Recognize and interpret the transport phenomena of solutes.	CB2 CB4 CB5 CG1 CE6 CE7 CT1 CT2
Distinguish the types of estuaries based on water circulation and identify their characteristics.	CB2 CB5 CG1 CE6 CE7 CT1 CT2
Use quantitative models to study the water circulation and calculate residence times in estuaries.	CB2 CB5 CG1 CG4 CE6 CE7 CT1 CT2
Explain the characteristics of the air-sea interface, the processes that take place and the factors that control them.	CB2 CB4 CB5 CG1 CE6 CE7 CT1 CT2
Describe the gas solubility in the seawater and apply the models to estimate gas exchange across the air-sea interface.	CB2 CB4 CB5 CG1 CE6 CE7 CT1 CT2
Explain the characteristics of the seawater-solid interface, the processes that occur in it and identify the factors that determine them.	CB2 CB4 CB5 CG1 CG3 CE6 CE7 CT1 CT2

Interpret the properties and behavior of particulate matter and colloids present in seawater.	CB2 CB5	CG1 CG3 CG4	CE6 CE7	CT1 CT2
Use appropriate experimental techniques to study the adsorption processes and apply the models at the solid-solution interface.	CB2	CG1 CG3 CG4	CE7	CT1 CT2
Explain the characteristics and composition of interstitial waters.	CB2 CB4 CB5	CG1	CE6 CE7	CT1 CT2

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	Evaluated Competences		
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 maximum score to consider this section in the overall rating.	20	CB2 CB4	CE6	CT2
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	CB2 CB4	CE6	CT2
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	CB2 CB4 CB5	CE6	CT2

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 realised 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 be 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	Type	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	
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG2	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.
CG3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
CE12	Acquire knowledge about processes and products related to internal and external geological cycles.
CE13	Acquire the basic sedimentological, geochemical and geophysical techniques and methodologies used in identification, use and sustainability of the natural resources of coastal and marine environments.
CE14	Know basic concepts and events of global change obtained from geological records.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.

CT2 Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Learning outcomes

Learning outcomes	Competences			
Recognise and identify the processes of physical and chemical weathering and their connection with sediment composition;	CB5		CE1 CE12 CE13	
2. Develop a basic knowledge of principles in sediment dynamics and master the concepts of erosion, transport, and deposition of (mostly siliciclastic) sediments;	CB5		CE1 CE12 CE13	
3. Characterise sediment's texture and mineralogy;	CB5		CE1 CE13	
4. Recognise and identify the most common sedimentary structures in (mostly) siliciclastic settings;	CB5		CE13	
5. Identify the relationship(s) between sedimentary structures and depositional processes;	CB5		CE12 CE13	
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;	CB5	CG1	CE1 CE12 CE13	
7. Understand carbonate minerals, the basic chemistry of the carbonate system, and the carbonate factory;	CB5	CG1	CE1 CE12 CE13	
8. Identify post-depositional alterations, i.e., the diagenesis of (e.g., siliciclastic, carbonate) sediments and understand the tools available to decipher diagenetic processes;	CB5		CE1 CE12 CE13	
9. Recognise and identify the different types of sediments;	CB5		CE12 CE13	CT1
10. Interpret the sedimentological data and understand the difference between how siliciclastic sediments and carbonate sediments are formed;	CB5		CE1 CE12 CE13	CT1
11. Develop an understanding of the factors that control sedimentation in the marine environment;	CB5	CG1	CE1 CE12 CE13	CT1
12. Comprehend the concepts of facies, depositional environment, and sedimentary sequence;	CB5		CE1 CE12 CE13	CT1
13. Use the sedimentological analysis to decipher the dynamics and evolutive trends of the sedimentary environment(s);	CB5		CE1 CE12 CE13 CE14	CT1
14. Become skilled in applying the analytical and investigative methods to perform sedimentological work in the marine environment;	CB5	CG2 CG3 CG4	CE13	CT1 CT2
15. Apply the knowledge developed during the course to address (sedimentological) problems in the marine environment.		CG4	CE13	CT1 CT2

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 Hjlstrom'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; postsedimentaries; 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	Evaluated Competences
-------------	---------------	-----------------------

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. Questionnaires after main topics will also form part of the evaluation	70	CB5	CG1	CE1 CE12 CE13 CE14	CT1 CT2
Studies excursion	Reports and/or questionnaires related to the information acquired during the fieldtrips.	5	CB5	CG1	CE1 CE12 CE13 CE14	CT1 CT2
Laboratory practical	Questionnaires related to the information acquired during the practicals	5	CB5	CG1	CE1 CE12 CE13 CE14	CT1 CT2
Seminars	Reports and/or questionnaires related to the information acquired during the seminars.	20	CB5	CG1	CE1 CE12 CE13 CE14	CT1 CT2

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	Type	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	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG2	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.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE10	Know the biological diversity and functioning of marine ecosystems.
CE11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes	
Learning outcomes	Competences
Capacity to understand and analyse the basic processes of the interactions between organisms.	CB2 CB3 CB4 CB5 CG1 CE10 CE11 CT1
Capacity to understand the bases of diversity and the the factors controlling organization and structure of the ecosystems	CB2 CB3 CB4 CB5 CG1 CE10 CE11 CT1 CT5
To design, analyze, interpret and present experimental results	CB2 CB3 CB4 CB5 CG1 CG2 CG4 CE10 CE11 CT1 CT2
To use software typically used in Marine Ecology	CB2 CB3 CB4 CB5 CG2 CG4 CE11 CT1 CT2

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.
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 hysteresis. 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	Evaluated Competences		
Problem and/or exercise solving	Problem Solving. 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	CB2 CB3 CB4 CB5	CG4	CT1 CT2
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	CB2 CB3 CB4 CB5	CG1 CG2 CG4	CE10 CE11 CT1 CT2
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	CB2 CB3 CB4 CB5	CE10 CE11	CT1 CT2 CT5

Other comments on the Evaluation

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

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

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

Sources of information

Basic Bibliography

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

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	Type	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	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG2	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.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE12	Acquire knowledge about processes and products related to internal and external geological cycles.
CE13	Acquire the basic sedimentological, geochemical and geophysical techniques and methodologies used in identification, use and sustainability of the natural resources of coastal and marine environments.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes

Learning outcomes	Competences			
Elaborate and interpret stratigraphic sections and perform correlations	CB3	CG2 CG4	CE13	CT1
Distinguish the different types of deep sediments		CG4	CE13	CT1
Relate the ressedimentation processes with the turbiditic systems	CB3	CG1 CG4	CE12 CE13	CT1
Understand the sedimentary effects of the deep oceanic circulation	CB2 CB4	CG1 CG4	CE12 CE13	CT5
Understand the pelagic sediments as the result of a global biogeochemical system.	CB2 CB3 CB4	CG2 CG4	CE12 CE13	CT1 CT5
Identify the different types of coastal sedimentary environments in function of their sedimentary record.	CB3	CG1 CG4	CE13	CT1 CT5
Understand the coastal and marine environments space-temporal evolution	CB2 CB3 CB4	CG1 CG4	CE13	CT1 CT5

Contents

Topic

Subject 1. Introduction to the sedimentary environments	Introduction to the Stratigraphy and the sedimentary environments 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 tutorial 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	Evaluated	Competences
Case studies	Report (memory) of the results obtained in the classroom of computing.	5	CB2 CG4	CE12 CT1 CE13 CT5
Studies excursion	Reports of the exits of field. It will evaluate the assistance to the field.	10	CB3 CG2 CB4 CG4	CE12 CT1 CE13 CT5
Seminars	Preparation of a work of synthesis and results for each one of the seminars	15	CB4 CG4	CE12 CT1 CE13 CT5
Objective questions exam	Exam with a short answer on the subject matter developed during master classes, practical, field-trips and seminars.	70	CB3 CG1 CB4	CE12 CT1 CT5

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	Type	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 subject explores the major metabolic pathways by which microbes obtain energy and carbon for cellular 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				
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study			
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues			
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences			
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.			
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.			
CE9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.			
CE10	Know the biological diversity and functioning of marine ecosystems.			
CE11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.			
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.			
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.			
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.			

Learning outcomes				
Learning outcomes	Competences			
(*)Comprender o concepto de microorganismo, as súas características estruturais e a súa posición na escala biolóxica	CB4	CG1	CE9	CT1
(*)Comprender e saber aplicar as diferentes técnicas de estudo da microbiota mariña	CB2 CB3	CG4	CE11	CT1 CT5
(*)Coñecer a diversidade da microbiota mariña e saber interpretar o seu papel nos ecosistemas mariños en relación á cadea trófica e ciclos dos elementos.	CB4	CG1	CE10 CE11	
New	CB2 CB3 CB4	CG1	CE11	CT2

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 physiology	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 quantification. 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: unespecific 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 Fatic 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	Evaluated Competences		
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	CB2 CB3 CB4	CE9 CE10	CT5
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	CB2 CB3 CB4	CE9 CE10	CT5
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	CB2	CG4	
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	CB2	CG1	CT1 CT2
Essay	SEMINAR II. The contents worked on will be evaluated through group work, to be carried out during the seminar.	6	CB3 CB4		CT2

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, justify an absense.
 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 official 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., Garland 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

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	Type	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	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG2	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.
CG3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE6	Acquire the fundamentals and terminology of chemical processes.
CE7	Apply to the marine and coastal environment the principles and methods used in Chemistry.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Learning outcomes

Learning outcomes	Competences			
Describe the foundations and the applications of the technicians of chemical analysis more usually used in the laboratory.	CB2 CB4	CG1 CG2 CG3	CE6 CE7	CT1
Know choose and use the material for the taking of sample of the water of mar.	CB2 CB4	CG1 CG2 CG3	CE6 CE7	CT1 CT2
Apply the technicians of chemical analysis to the compounds of greater interest in the Chemical Oceanography.	CB2 CB4	CG1 CG2 CG3 CG4	CE6 CE7	CT1 CT2
Apply the experimental conditions more adapted for the determination of a chemical compound in function of the chemical reactivity.	CB2 CB4	CG1 CG2 CG3 CG4	CE6 CE7	CT1 CT2
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.	CB2 CB4	CG1 CG2 CG3 CG4	CE6 CE7	CT1 CT2
Prepare the reagents and the necessary material to carry out an oceanographic campaign.	CB2 CB4	CG1 CG2 CG3	CE6 CE7	CT1 CT2

Contents

Topic

Analytical methodology (I): previous operations	Sampling. Preparation of the sample.
	Measurement and analytical chemistry references. Analytical measurement 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	Evaluated Competences			
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	CB2 CB4	CG1 CG2 CG3 CG4	CE6 CE7	CT1 CT2
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	CB2 CB4	CG1 CG2 CG4	CE6 CE7	CT1 CT2
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	CB2 CB4	CG1 CG2 CG3	CE6 CE7	CT1 CT2
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	CB2 CB4	CG1 CG2 CG3 CG4	CE6 CE7	CT1 CT2
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	CB2 CB4	CG1 CG2 CG3 CG4	CE6 CE7	CT1 CT2

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	CB2 CB4	CG1 CG2 CG3 CG4	CE6 CE7	CT1 CT2
-------	---	------	---------	-----------------	---------	---------

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/examen>

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 should obtain a qualification of equal or upper to 5 points.
- 3.- Works of seminars . This includes 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 should 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 not 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 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 unjustified 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 course 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,

Bearman 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 basic chemical reactions and calculation of stoichiometric ratios

Likewise, it is also assumed that the students have capability 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 tutorials, 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	Type	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	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG2	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.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
CE9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
CE10	Know the biological diversity and functioning of marine ecosystems.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Learning outcomes				
Learning outcomes	Competences			
Handle vocabulary, codes and inherent concepts to the marine zoology	CB2	CE1		
Know and comprise the essential facts, concepts, principles and theories related with the marine zoology.	CB2			
Know the basic techniques of sampling of the fauna in the column of water, and diverse types of fund	CB2 CB5			
Basic knowledge of the methodology of investigation in marine zoology	CB2	CG1 CG2		
Capacity to identify and understand the problems related with the marine zoology	CB3	CG1 CE1 CE9	CT1	
Know work in campaigns and in laboratory of responsible way and sure, promoting the tasks in team	CB2	CG2	CT1 CT2	
Transmit information of form written, verbal and graphic for audiences of diverse types	CB2 CB4			
Capacity of analysis and synthesis	CB2 CB3	CG4	CT1	
Capacity of organisation and planning		CG2 CG4	CT1 CT2	

Oral communication and writing in the official tongues of the University	CB4			
Capacity to work in one instrument	CB5		CT2	
Capacity to learn of autonomous and continuous form	CB5		CT2	
Capacity to apply the knowledges in practice	CB2	CG4		CT1
	CB4			
Skills of investigation	CB2	CG1	CE1	CT1
	CB3	CG2	CE9	CT2
	CB4	CG4	CE10	
	CB5			

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. (Cephalopod organisation) Form and function. Reproduction. Systematic summary
LESSON 5: The BILATERIA: INTRODUCTION. PHYLUM 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; (cephalopod organisation) form and function; reproduction and development; systematic summary.
LESSON 6. LOPHOTROCHOZOOA: THE LOWER PHYLA	Phyla Gnathostomulida, Rotifera, Acanthocephala, Cyclophora, 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. (Cephalopod organisation) Form and function. Classification. Synopses of the lower class (Caudofoveata, Solenogastera, Polyplacophora, Monoplacophora and Scaphopoda)
LESSON 9: PHYLUM MOLLUSCA (II)	Class Gastropoda: general characteristics; coiling; torsion; (cephalopod organisation) form and function; reproduction and development; systematic summary
LESSON 10: PHYLUM MOLLUSCA (III)	Class Bivalvia: general characteristics; (cephalopod organisation): form and function; reproduction and development; systematic summary
LESSON 11: PHYLUM MOLLUSCA (IV)	Class Cephalopoda: general characteristics; (cephalopod organisation): form and function; reproduction and development; systematic summary
LESSON 12: PHYLUM ANNELIDA (I)	General characteristics; metamerism; classification. Class Polychaeta: general characteristics; (cephalopod organisation): form and function; reproduction and development.
LESSON 13: PHYLUM ANNELIDA (II): The SIBOGNINIDAE. PHYLA ECHIURA and SIPUNCULA	The Sibogninidae: general characteristics; form and function; reproduction and development. Phylum 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. (Cephalopod 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: (cephalopod 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. (Cephalopod 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; (cephalopod organisation:) form and function; reproduction and development. Systematic summary
LESSON 21: PHYLUM ECHINODERMATA (III)	Class Echinoidea and Holothuroidea: General characteristics; (cephalopod 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; (cephalopod organisation:) form and function; reproduction and development; systematic summary.
LESSON 25: PHYLUM CHORDATA (III)	The Osteichthyes: general characteristics; (cephalopod 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 anatomy: dissection of a Bivalvia: <i>Mytilus galloprovincialis</i>. Lesson 5.- POLYCHAETA. External morphology: Errantia and Sedentaria polychaetes; identification with keys of some species. Lesson 6.- ARTHROPODA I. Crustacea: External morphology; internal anatomy: and dissection of a Malacostraca: <i>Nephrops norvegicus</i>; 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 anatomy: dissection of a Echinoidea: <i>Paracentrotus lividus</i>. Lesson 10.- Chordata. Observation of Tunicata and Cephalochordata; external morphology, identification and dissection 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	Collaborative 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 ask 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		Qualification	Evaluated Competences			
	Description					
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	CB2 CB5	CG1 CE9 CE10		CT1
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	CB2 CB3 CB4 CB5	CG1 CG2 CG4		CT1 CT2
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	CB2 CB3 CB4 CB5	CG1 CG2 CG4		CT1 CT2
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	CB2 CB5	CG1 CE1 CE9 CE10		

Other comments on the Evaluation

The update official 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., JANSON, 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 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 photographic transect will be provided to carry out the collaborative learning.

* Non-attendance mechanisms for student attention (tutoring)

If personalized 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.

IDENTIFYING DATA				
Biological oceanography I				
Subject	Biological oceanography I			
Code	V10G061V01301			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Lastra Valdor, Mariano			
Lecturers	Aranguren Gassis, María Costas Selas, Cecilia Delgadillo Nuño, Erick Jabalera Cabrerizo, Marco Lastra Valdor, Mariano			
E-mail	mlastra@uvigo.es			
Web				
General description	This subject deepens in the study of diverse coastal ecosystems, located in the transition continent-ocean as they are the beaches, rocky coast, estuaries, coastal lagoons, dunes, reefs, etc. The fundamental aim is to comprise the characteristics of these ecosystems and know the fauna and flora that inhabit them.			

Competencies	
Code	
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG2	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.
CG3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CG5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
CE1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
CE9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
CE10	Know the biological diversity and functioning of marine ecosystems.
CE11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
CT3	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.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes	
Learning outcomes	Competences
Through theoretical contents, practical, exits of field and the work of investigation, at the end of the course the student will have to have purchased the necessary knowledges that allow him interpret the operation of the coastal ecosystems (estuaries, beaches, coastal lagoons, etc), and his interaction with the anthropic activities in the open ocean.	CB3 CB4 CB5 CG2 CG3 CG4 CG5 CE1 CE9 CE10 CE11 CT2 CT3 CT5

Contents	
Topic	
1. Introduction to the marine habitat	1.1. Types of coastal habitats 1.2. Adequacy of the coastal ecosystems to the typology of habitats of interest 1.3. Conservation of the coastal ecosystems 1.4 Destruction of the coastal habitats

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

Planning

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

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

Methodologies

	Description
Seminars	They will divide the groups in subgroups of 4-5 people. Each subgroup will prepare a work to choose between the subjects offered by the professor at the beginning of the course. Each student will have to involve clearly in all or some of the facets of the work. The works will be directed during the destined hours to the seminars. The oral exhibition will have a length of 20 minutes for the oral presentation and 5 minutes for the round of questions of the professor and of the rest of students. The presentation will come accompanied by an archive in computer support (powerpoint) that will send to the professor in dates fixed previously to the presentation.
Laboratory practical	With the samples taken during the exit to the sea, the students will learn to realise separation, identification and headcounts of pertaining organisms to distinct groups of the benthos. With the table of data obtained will work the statistical section from univariate analysis, bivariate and multivariate.
Studies excursion	They will realise in the subject two field trips: 1) Exit to the estuary of Vigo in the fuselage Mytilus, for the collected of benthic samples with dragas quantitative (Van-Veen). 2) Exit to Aguiño (Ribeira, A Coruña)

Lecturing	They will present and they will argue theoretical contents that they will be evaluated in a final examination.
Mentored work	The works of investigation will be driving in group through the seminars. The students that belong to the same group will have to assist to same group of seminar.

Personalized assistance

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

Assessment

	Description	Qualification	Evaluated Competences			
Seminars	The groups will be divided into subgroups of 4-5 people. Each group will prepare a work to choose from among those proposed by the teacher at the beginning of the course. The works * will be tutored during the hours allocated to the seminars (small groups 2.5 * h). The presentation of the works will take place in December and will last 20 minutes for the oral presentation and 5 minutes for the round of questions from the teacher and the rest of the students. The presentation will be accompanied by a file on computer support (* powerpoint) that will be sent to the teacher on dates set before the presentation.	25	CB3	CG2	CE1	CT2
			CB4	CG3	CE9	CT3
			CB5	CG4	CE10	CT5
				CG5	CE11	
Laboratory practical	Participation in practices, rigor in sampling and laboratory work, aptitude for teamwork and the ability to prepare and interpret results will be evaluated.	10	CB3	CG2	CE1	
			CB4	CG3	CE9	
			CB5	CG4	CE10	
				CG5	CE11	
Lecturing	Written exam. Questions will be asked that show the level of understanding acquired by the students throughout the subject, both in the theoretical classes, as well as in the practical ones, seminars and field trips.	65	CB3	CG2	CE1	CT2
			CB4	CG3	CE9	CT3
			CB5	CG4	CE10	CT5
				CG5	CE11	

Other comments on the Evaluation

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

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

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

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

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

Sources of information

Basic Bibliography

Moore P.G. & R. Seed, **The ecology of Rocky coast**, First Edition, Columbia University Press, 1986

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

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

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

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

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

Nordstrom, K.F., Psuty, N. & Carter, B., **Coastal dunes**, Wiley & sons, 1990

Nybakken, James W., **Marine biology : an ecological approach**, Fourth edition, Pearson Benjamin Cummings, 2005

Brown, A.C. & McLachlan, **Ecology of sandy shores**, Elsevier, 1990

Complementary Bibliography

Knox G.A., **The ecology of seashores**, CRC Press, 2001

D. Bertness et al, **Marine community ecology and conservation**, Second edition, Sunderland, Massachusetts : Sinauer Associates, 2014

Levinton J.S., **Marine Biology: function, biodiversity, ecology**, Oxford University Press, 2001

Rupert F.G. Ormond, John D. Gage, and Martin V. Angel, **Marine biodiversity : patterns and processes**, First Edition, Cambridge University Press, 1997

Raffaelli D.G., **Intertidal ecology**, Second edition, Chapman & Hall, 1999

Little, C. & Kitching, J.A, **The Biology of rocky shores**, Second edition, Oxford University, 2009

Adam, P., **Saltmarsh ecology**, Cambridge University press, 2010

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

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

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

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

Recommendations

Subjects that continue the syllabus

Biological oceanography II/V10G060V01601

Subjects that are recommended to be taken simultaneously

Ocean Dynamics/V10G060V01702

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Teaching methodologies that are maintained

In the event of a health emergency, the contents of the theoretical teaching, practical teaching and seminars will be maintained.

* Teaching methodologies that are modified:

In the event of a health emergency, theoretical teaching and seminars will be taught through a remote campus, maintaining the content and teaching objectives.

Field trips will be replaced by audiovisual content that will allow the acquisition of the planned content, and attempts will be made to carry them out in person / as soon as possible.

If the presence in the laboratories is impossible, the practices will be taught virtually through a remote campus analyzing case studies identical to those provided for in-person teaching.

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

* Non-face-to-face service mechanism for students (tutorials)

The tutorials will be carried out through remote campus sessions agreed through email. Or simply through email.

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

There will be no changes in the teaching content.

* Additional bibliography to facilitate self-learning

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

* Other modifications

There is not

=== ADAPTATION OF THE EVALUATION ===

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

Public exhibition of group work: 15%

Written report of group work: 15%

* Evidence that is modified

Laboratory practice evaluation will be part of the theoretical exam

* New tests

There is not

* Additional Information

IDENTIFYING DATA				
Physical oceanography I				
Subject	Physical oceanography I			
Code	V10G061V01302			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Roson Porto, Gabriel			
Lecturers	Roson Porto, Gabriel			
E-mail	groson@uvigo.es			
Web				
General description	Knowledge of the main physical processes in the ocean as well as their relevant climatological causes.			

Competencies	
Code	
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CE3	Describe how works the global ocean circulation, its forcings and its climate implications.
CE4	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.
CE5	Formulate the mass, energy and moment conservation equations for geophysical fluids and solve them in basic oceanic processes.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.

Learning outcomes				
Learning outcomes	Competences			
Basic knowledge of the climatological processes and the meteorological phenomena, with special attention to his influence on the oceanic processes.	CB5	CG1	CE3	CT1
			CE5	
Descriptive knowledge of the main physical processes in the ocean			CE3	CT1
			CE4	
Descriptive knowledge of the oceanic circulatory systems.		CG1	CE3	CT1
			CE4	
			CE5	

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

II. HYDROGRPHY AND WATER MASSES

II.1. TEMPERATURE

II.1.1. Surface distribution.

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

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

II.2. SALINITY

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

II.2.2. Surface distribution and its relationship with balance precipitation + runoff - evaporation. Estuaries and estuarine circulation. Coupling estuarine circulation with upwelling and downwelling.

II.3. MASAS DE AGUA Y DIAGRAMAS TS

II.3.1. Water masses and water types. Abyssal circulation. Types of density variation in relation with water masses formation. The core method.

Identification of water masses circulation.

II.3.2. Equation of state of Seawater. Isopycnals. Density vertical profiles of by latitudes: The pycnocline. Density gradient and water masses stability.

II.3.3. TS diagrams. Mixing of water types; caballing. Stability of water masses using TS diagrams.

III. DYNAMICS OF OCEAN CURRENTS

III.1. Surface currents and wind systems. The westward intensification. Eulerian and lagrangian currents.

III.2. The subtropical and subpolar gyres. Equatorial currents. The Antarctic Circumpolar Current.

III.3. Dynamic topography and geostrophic currents. Barotropic and baroclinic regimes. Helland-Hansen equation.

III.4. Origin of the dynamic topography: cyclonic and anticyclonic winds. Convergences and divergences of the surface currents. Relationship with upwelling and downwelling. Ekman Pumping.

IV. REGIONAL OCEANOGRAPHY

IV.1. THE ANTARCTIC OCEAN.

IV.2. THE ATLANTIC OCEAN.

IV.3. THE MEDITERRANEAN SEA.

IV.4. THE PACIFIC OCEAN.

IV.5. THE INDIAN OCEAN.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	36	0	36
Seminars	16	8	24
Autonomous problem solving	0	46	46
Objective questions exam	1	3	4
Problem and/or exercise solving	0	20	20
Essay questions exam	4	16	20

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

Methodologies

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

Personalized assistance

Methodologies	Description
Lecturing	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation, only via institutional account @alumnos.uvigo.es. Monday-Tuesday-Wednesday 10-12 h.
Seminars	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation, only via institutional account @alumnos.uvigo.es. Monday-Tuesday-Wednesday 10-12 h.

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

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

Assessment						
	Description	Qualification	Evaluated Competences			
Lecturing	Exams	0	CB5	CE5	CT1	
Seminars	Seminars	0		CG1	CE3	CT1
				CE4		
				CE5		
Autonomous problem solving	Exam and seminars	0		CE3	CT1	
				CE4		
				CE5		
Objective questions exam	Exam in a non specified date.	20		CE3		
Problem and/or exercise solving	Deliverable questions in seminars	30		CG1	CE4	
Essay questions exam	Official exam	50	CB5	CG1	CE5	CT1

Other comments on the Evaluation

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

Assesment of classroom lectures:

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

Official Exam (weight 50%)

Assesment of Seminars:

individual memories of seminars (weight 30%).

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

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

Repeat students are also required to delivery seminar reports .

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

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

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

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

Sources of information

Basic Bibliography

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

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

Complementary Bibliography

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

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

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

R. STEWART, **Introduction to Physical Oceanography**, Texas A&M University.,

<http://www.uv.es/hegigui/Kasper/por%20Robert%20H%2>,

Recommendations

Subjects that continue the syllabus

Physical oceanography II/V10G060V01602

Other comments

IMPORTANT MARKS:

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

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

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

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

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

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

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

All methodologies would be maintained.

* Teaching methodologies modified

In the case of on line teaching, two resources will be set up, the remote campus <https://campusremoto.tv.uvigo.es/> and the on line teaching platform <https://fatic.uvigo.es/>, as well as other resorts that will help students to access to the contents of the matter.

* Non-attendance mechanisms for student attention (tutoring)

Personal attention will be arranged through the virtual office 2308 (Gabriel Rosón). Password: SeguroqueaprueboOF1 , as well as via email, only through the institutional student domain @alumnos.uvigo.es. Emails send via non institutional domain will not answered.

Tutoring schedule will be increased from monday to friday from 10 to 18 h.

* Modifications (if applicable) of the contents

Not applicable

* Additional bibliography to facilitate self-learning

In order to make learning easier, all additional bibliography will be uploaded in the online platform fatic if necessary.

* Other modifications Not applicable

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%] Not applicable

* Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%] Not applicable

* New tests Not applicable

* Additional Information

In this unusual situation, students are required to face this matter with a responsible and honest behaviour.

IDENTIFYING DATA				
Geological oceanography I				
Subject	Geological oceanography I			
Code	V10G061V01303			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Bernabéu Tello, Ana María			
Lecturers	Alejo Flores, Irene Bernabéu Tello, Ana María Marino , Gianluca			
E-mail	bernabeu@uvigo.es			
Web	http://193.146.32.240/tema1112/claroline/course/index.php			
General description	Geological oceanography (also called marine geology) is one of the broadest fields in the Earth Sciences and contains many subdisciplines, including geophysics, and plate tectonics, petrology and geochemistry, sedimentation processes, and micropaleontology and stratigraphy. Geological Oceanography I will focus on the study of basic earth processes affecting sedimentation in litoral areas, since sediments are the main geological feature of these region. The subject will cover the fundamental techniques to study the topography, structure, sedimentation, and associated geological processes of these areas to discover how they were formed and how ongoing processes (coastal dynamics, climate change, human impact...) may change them in the future. The subject will deal with the peculiarity of combining terrestrial and marine data to study litoral and coastal processes.			

Competencies

Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG2	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.
CG5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
CE12	Acquire knowledge about processes and products related to internal and external geological cycles.
CE13	Acquire the basic sedimentological, geochemical and geophysical techniques and methodologies used in identification, use and sustainability of the natural resources of coastal and marine environments.
CE14	Know basic concepts and events of global change obtained from geological records.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes

Learning outcomes	Competences			
2. Capacity to manage the basic techniques of observation, measurement and description of marine geological materials in these environments	CB5	CG2	CE13	CT1 CT5
3. Capacity to manage the basic techniques of sampling and surveying	CB1 CB5	CG1	CE12 CE13	CT1
4. Capacity to manage the basic techniques of sediment characterization and analyses	CB2 CB5	CG2	CE12 CE14	CT1
5. Geological mapping and representation skills	CB1 CB2 CB5	CG1 CG2	CE12 CE13	CT1 CT2

Contents

Topic

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

Planning			
	Class hours	Hours outside the classroom	Total hours
Seminars	7	9	16
Studies excursion	5	5	10
Introductory activities	2	4	6
Case studies	15	30	45
Lecturing	23	48	71
Essay questions exam	2	0	2

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

Methodologies	
	Description
Seminars	2:20 h long seminars on complementary topics
Studies excursion	It includes ship minicruises oriented to experience oceanographic work in real conditions
Introductory activities	It comprises the activities carried out during the two first lectures, like subject presentation, time schedule, qualification procedures and other pertinent indications for the course well-being.
Case studies	Preparation of a project in real terms: analysis of the problematic, definition of aims, methodological planning, timing and economic estimate.
Lecturing	Lectures comprising the major topics of the course program

Personalized assistance

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

Assessment						
	Description	Qualification	Evaluated	Competences		
Seminars	Individual written report on the seminar activities. May include tests.	10	CB1 CB2 CB3 CB5	CG1 CG5	CE12	CT1 CT2
Studies excursion	It comprises an individual brief written summary. It has to reflect the activities performed in the field trip.	10	CB2 CB5	CG1		CT1 CT5

Case studies	Group report that comprise the practical activities, including objectives, methodology, results and conclusions	10 6 20	CB2 CB3 CB5	CG1 CG5	CE13 CE14	CT1 CT2
Lecturing	Written individual test of 2 to 4 hours, whose aim will be the global evaluation of the process of learning and the acquisition of skills and knowledge. It will comprise one or several of the following types of assessments: long questions to elaborate, short questions, tests, problem resolution, interpretation of images, maps and diagrams. It will require a minimum of 4 over 10 to be able to compute with the rest of evaluation elements.	60	CB1 CB2 CB3 CB5	CG1	CE12 CE13 CE14	CT1 CT2
Essay questions exam	Individual written report on an additional activity derived from the lectures, practicals or seminars, pursuing the students own interest. It does not have compulsory character. Its execution takes 10% off the laboratory practicals.	10 6 0	CB3	CG1	CE12 CE14	CT1 CT2

Other comments on the Evaluation

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

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

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

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

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

Sources of information

Basic Bibliography

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

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

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

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

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

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

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

Complementary Bibliography

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

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

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

Recommendations

Subjects that continue the syllabus

Geological oceanography II/V10G060V01603

Subjects that are recommended to be taken simultaneously

Other comments

DELIVERY OF ASSIGNMENTS

Unless it is stated otherwise, all the hand outs have to be delivered in electronic format and uploaded to the TEMA platform. No email, or paper submission will be accepted or acknowledged.

IMPORTANT

All deadlines expire at 24:00 of the marked day.

REGARDING THE AUTHORSHIP OF THE GROUP ASSIGNMENTS

Submission of the assignment is the responsibility of the coordinator, who must state the participants. All coauthors must upload their copy at FAITIC to claim co-authorship.

Authorship cannot be modified after the deadline of the assignment.

Authors that appear in more than one assignment will cause the assignment to fail for all authors.

Plagiarism, partly or in whole, will cause course to fail and will be reported to the Dean for disciplinary action.

THE TEMA PLATFORM IS THE OFFICIAL COMMUNICATION CHANNEL OF THE COURSE

Any agreement has to be stated in the TEMA platform to be official.

Contingency plan

Description

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

1. Theoretical classes: they will be taught through the Campus Remoto
2. Practical classes: They will be taught through the Campus Remoto
3. Field trip: information and audiovisual resources will be given to students related to the content and learning outcomes associated with this methodology.
4. Seminars: They will be taught through Campus Remoto with additional supporting information

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

1. Theoretical contents:

Exam 20%

Continuous assessment 20%

2. Practical content: 25%

Group report reflecting the activities made during the practices, which will include objectives, methodology, results and conclusions

3. Field trip: 15%

Includes an individual written report of the material and information provided

4. Seminars: 20%

Individual written report on the activity carried out in seminars. May include questionnaires.

IDENTIFYING DATA				
Chemistry applied to the marine environment I				
Subject	Chemistry applied to the marine environment I			
Code	V10G061V01304			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Couce Fortúnez, María Delfina Besada Pereira, Pedro			
Lecturers	Besada Pereira, Pedro Castro Fojo, Jesús Antonio Couce Fortúnez, María Delfina			
E-mail	delfina@uvigo.es pbes@uvigo.es			
Web				
General description	This subject includes the study of elements, inorganic substances and organic substances that can reach and alter the marine environment, acting as pollutants. Behaviour, influence and prevention of the effects produced by these elements, inorganic substances and organic substances in the environment will be studied. Moreover, the study of marine natural products (classification, function, pharmacological interest) will be addressed.			

Competencies

Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG2	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.
CG3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE6	Acquire the fundamentals and terminology of chemical processes.
CE7	Apply to the marine and coastal environment the principles and methods used in Chemistry.
CE8	Know the main pollutants, their causes and effects in the marine and coastal environment.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes

Learning outcomes	Competences				
To describe global cycles of the elements, including the input and output processes.	CB1 CB2 CB3 CB5	CG1	CE6	CT1	
To define and to explain concepts, principles and sources related to chemical pollution.	CB1 CB2 CB3 CB5	CG1	CE6 CE8	CT1 CT5	

To describe the chemical composition and speciation in seawater and to determine the mechanisms and factors that regulate it.	CB1 CB2 CB3 CB5	CG1	CE6	CT1
To determine the processes that regulate chemical species complexation.	CB1 CB2 CB3 CB5	CG1	CE6	CT1
To identify the toxicity mechanisms of metal ions, as well as the factors that determine and control the biomethylation processes.	CB1 CB2 CB3 CB5	CG1	CE6 CE7 CE8	CT1 CT5
To identify the toxicity mechanisms of the major organic pollutants.	CB1 CB2 CB3 CB5	CG1	CE6 CE7 CE8	CT1 CT5
To identify the most important natural products in the marine environment.	CB1 CB2 CB3 CB5	CG1	CE6	CT1 CT5
To identify the main interactions between marine organisms.	CB1 CB2 CB3 CB5	CG1	CE6 CE7	CT1
To describe the main applications of marine natural products.	CB1 CB2 CB3 CB5	CG1	CE6 CE7	CT1 CT5
To analyze the results obtained in the laboratory using the theoretical concepts.	CB1 CB2 CB3 CB5	CG1 CG2 CG3 CG4	CE6	CT1
To develop the necessary skills for the resolution of the applications related with the subject.	CB1 CB2 CB3 CB5	CG1 CG2 CG3 CG4	CE7	CT1 CT5

Contents

Topic	
1. Introduction to environment	Cycles of the elements in the environment
2. Pollution of marine environment	Generalities. Major sources of pollution
3. Metal speciation	Aerobic and anaerobic environments. Pourbaix diagrams
4. Metals and metallic species	General characteristics. Effects of metal complexation with natural ligands
5. Pollution by heavy metals	Biogeochemical cycles. Methylation processes. Mechanisms of toxicity associated. Applicable defense and detoxication procedures.
6. Reactivity of pollutants non-metallic chemical species	Introduction: carbonates, nitrates, phosphates, sulfates, perchlorates
7. Radioactive pollution in marine environment	Study, behavior and control of radioactive pollutants
8. Organic pollutants in the marine water	Classification. Functional and structural description. Origin of marine pollution
9. Chemical transformations of organic compounds	Solubility of organic compounds. Reactions of organic pollutants with nucleophilic species. Redox processes. Photochemical and biological transformations
10. Types of natural products	Terpenes, steroids and carotenoids. Oxygen compounds: Phenols, lignans, coumarins, macrolides and polyethers. Nitrogenous compounds: alkaloids, peptides
11. Marine natural products and their biologic function	Metabolite transfer in marine ecosystems. Biogenesis. Incorporation of halogens: Haloperoxidases
12. Marine chemical ecology	Chemical interactions between organisms. Organic compounds of marine origin and their ecological function
13. Marine natural products in drug discovery	Organic compounds of marine origin: isolation, characterization and biological activity

Planning

	Class hours	Hours outside the classroom	Total hours

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

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

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

Personalized assistance

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

Assessment		Qualification	Evaluated	Competences
	Description			
Seminars	Participation, attitude and ability to relate and apply acquired concepts will be evaluated	5	CB1 CB2 CB3 CB5	CG1 CE6 CE7 CE8 CT1
Mentored work	Students will carry out a brief tutored work, evaluating the report presented and its presentation	20	CB1 CB2 CB3 CB5	CG1 CE6 CE8 CT1 CT5
Problem and/or exercise solving	Final exam in which the theoretical contents of the subject worked in the master sessions and in the seminars will be evaluated. The contents of this subject are divided in two blocks (Chapters 1-7 and 8-13) so the test will also be divided into two parts. To get promoted the student must obtain a minimum of 3.5 out of 10 in each of the two parts into which the exam is divided.	65	CB1 CB2 CB3 CB5	CG1 CE6 CE7 CE8 CT1

Report of practices, practicum and external practices	Students must present a report of the virtual practices carried out. Attendance at the laboratory sessions as well as preparation of the report is compulsory to get promoted. The attitude in the lab sessions, the skills and the understanding of the experimental techniques used will be evaluated.	10	CB1 CB2 CB3 CB5	CG1 CG2 CG3 CG4	CE6 CE7	CT1 CT5
---	--	----	--------------------------	--------------------------	------------	------------

Other comments on the Evaluation

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

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

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

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

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

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

Sources of information

Basic Bibliography

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

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

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

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

Complementary Bibliography

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

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

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

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

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

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

Journal of Natural Products,

Natural Products Reports,

Marine Chemistry,

Marine Pollution Bulletin,

Recommendations

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

Seminars

Lecturing

* Teaching methodologies modified

Laboratory practical: Virtual activities related to the application of laboratory techniques in practical problems related to the subject will be carried out.

Mentored work: Preparation of a tutored work on a topic related to the contents of the subject.

* Non-attendance mechanisms for student attention (tutoring)

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

* Modifications (if applicable) of the contents

Not applicable

* Additional bibliography to facilitate self-learning

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

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

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

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

* Pending tests that are maintained

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

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

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

Problem and/or exercise solving: [Previous Weight 65%] [Proposed Weight 65%]. Final exam in which the theoretical contents of the subject worked in the master sessions and in the seminars will be evaluated.

The contents of this subject are divided in two blocks (Chapters 1-7 and 8-13) so the test will also be divided into two parts. To get promoted the student must obtain a minimum of 3.5 out of 10 in each of the two parts into which the exam is divided.

* Tests that are modified

[Previous test] => [New test]

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

Mentored work [Previous Weight 20%] => Mentored work [Proposed Weight 20%]. Students will carry out a brief tutored work, evaluating the presented report.

Report of practices, prácticum and external practices [Previous Weight 10%] => Report of practices, prácticum and external practices [Proposed Weight 10%]. Students must present a report of the virtual practices carried out.

The realization of the virtual practices as well as preparation of the report is compulsory to get promoted.

* New tests

* Additional Information

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

IDENTIFYING DATA				
Physiology of marine organisms				
Subject	Physiology of marine organisms			
Code	V10G061V01305			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Lopez Patiño, Marcos Antonio			
Lecturers	Blanco Imperiali, Ayelén Melisa Conde Sieira, Marta Lopez Patiño, Marcos Antonio Pedrol Bonjoch, María Nuria Verde Rodríguez, Antía			
E-mail	mlopezpat@uvigo.es			
Web				
General description	Study of the operation of the marine organisms (animal and vegetal) and of the mechanisms that make possible his adaptation to the half. It will loan special attention the those physiological **appearances mothers related with the integration of the pertinent information of the half marine and the generation of specific answers.			

Competencies

Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CG5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
CE1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
CE5	Formulate the mass, energy and moment conservation equations for geophysical fluids and solve them in basic oceanic processes.
CE6	Acquire the fundamentals and terminology of chemical processes.
CE9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
CE10	Know the biological diversity and functioning of marine ecosystems.
CE11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
CT3	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.
CT4	Ability to communicate orally and in writing in Galician language.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes

Learning outcomes	Competences			
PLANT PHYSIOLOGY	CB1	CG1	CE1	CT2
1. To identify and understand key physiological processes in the development of photosynthetic marine organisms.	CB2		CE9	
	CB3		CE10	
			CE11	

2. To know the relationships among the photosynthetic marine organisms and the marine environment by means of the study of changing physiological processes	CB1 CB2 CB3 CB5	CG1	CE1 CE9 CE10	CT2 CT5
3. To handle equipments and techniques to study plant physiology.	CB2 CB3 CB5	CG1 CG4 CG5	CE11	CT2 CT3 CT4 CT5
4. To understand the scientific methodology and the technologies applied to plant physiology research.	CB1 CB3 CB5		CE1	CT2 CT3 CT4 CT5
5. To gain capacity of analysis and approaching to hypothesis in plant physiology.	CB2 CB3		CE5 CE6	CT3
6. To know the relationships among the photosynthetic marine organisms and the abiotic and biotic marine environments, by means of the study of their adaptations and the physiological processes of acclimation (functional types, osmoregulation, fotoprotection, biomass partitioning).	CB1 CB2 CB5	CG1	CE10	CT4 CT5
ANIMAL PHYSIOLOGY:				
7. To know the mechanisms of acquisition and integration of the sensory information in marine animals	CB2 CB3 CB5	CG1	CE1	
8. To know the physiological bases of muscular activity and its implication in aquatic locomotion	CB3	CG1	CE1	
9. To know in marine animals the mechanisms trough which synthesis, release, transport and the action of hormones synthesised by endocrine glands and the nervous system of marine animals occur.	CB2 CB3	CG1	CE1	
10. Knowing the corporal fluids and the functioning of cardiovascular systems.	CB3	CG1	CE9	
11. To know the mechanisms of gas exchange between the animals and the water where they live.	CB3	CG1	CE1	
12. To know the mechanisms for wastes elimination and of osmotic regulation in distinct groups of marine animals.	CB3	CG1	CE1	
13. To know how animals obtain energy through food consumption, and how to use such energy as well.	CB3 CB5	CG1	CE1	CT3 CT5
15. To know the general and basic terminology in Animal Physiology.	CB3	CG1	CE1	
16. To know and to understand the general functioning of different systems in animals addapted to different environmental conditions.	CB2 CB3	CG1	CE1	CT5
17. To understand the general functioning of the animal as a whole, emphasizing in the role played by the integratory and coordinatory systems.	CB2 CB3	CG1	CE1 CE9 CE10	CT5
18. To understand basic aphysiology-related aspects, such as aquaculture.	CB2 CB3 CB5	CG1	CE1 CE11	CT1 CT5

Contents

Topic

PLANT PHYSIOLOGY:	1. Plant Physiology in the ocean. 2. Cell and tissue basic characteristics photosynthetic marine organisms 3. Water relations in photosynthetic marine organisms. Osmoregulation and osmoprotection. 4. Mineral nutrition in marine environments. 5. Photosynthesis: definition and physiological, ecological and evolutionary relevance. 6. The photosynthetic organelles. 7. Light and photosynthetic pigments. 8. The photochemical phase of photosynthesis. 9. The biochemical phase of photosynthesis. 10. Mechanisms of carbon gain and concentration in photosynthetic marine organisms.
-------------------	--

ANIMAL PHYSIOLOGY:

1. Physiological bases of excitability
2. The nervous system and the neural communication
3. Physiology of the systems effectors in marine animals: muscular activity and locomotion, chromatophora and bioluminescence
4. Sensory physiology in marine animals: mechanoreception, electroreception, magnetoreception, quimioreception, fotoreception and vision.
5. Physiology of the neuroendocrine and endocrine systems in marine animals
6. Circulatory fluids and operation of the cardiovascular systems in marine animals
7. Operation of the respiratory systems in marine animals
8. Physiology of excretion and osmoregulation in marine animals
9. Physiology of the digestive systems in marine animals

Planning

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

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

Methodologies

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

Personalized assistance

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

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

Assessment						
	Description	Qualification	Evaluated Competences			
Lecturing	Attendance will be valued	0	CB1 CB2 CB3 CB5	CG1 CG4 CG5	CE1 CE5 CE6	CT3 CT5
	By means of a final exam comprising the two modules. The weighting per module is 50%. It demands a minimum of 4 each in each module to pass the examination.					
	The final exam will consist on short answer tests, long answer tests, and resolution of exercises.					
Laboratory practical	In the module of Plant Physiology (5% of the qualification) the evaluation will be by attendance and questions in the final exam.	10	CB1 CB2 CB3 CB5	CG1 CG4 CG5	CE1 CE5 CE9	CT1 CT5
	In the module of Animal Physiology (5% of the qualification) the evaluation will be by attendance				CE10 CE11	
Mentored work	Voluntary for Plant Physiology	0	CB1 CB2 CB3 CB5	CG1	CE5 CE6 CE9 CE10	CT1 CT2 CT4 CT5
Discussion Forum	Voluntary for Plant Physiology	0	CB1 CB2 CB3 CB5		CE1 CE6 CE10 CE11	CT1 CT2 CT3 CT4 CT5
Seminars	It is compulsory the attendance to the seminars	10	CB1 CB2 CB3 CB5	CG4 CG5	CE1 CE6 CE11	CT1 CT2 CT3 CT4 CT5
	In the module of Plant Physiology (10% qualification) the assessment will be by attendance and performance, and the problems will be matter of examination.					
	In the module of Animal Physiology (10% qualification) the students in groups of 2-3 will elaborate a memory and will present in public a work of a listing of subjects proposed.					
Objective questions exam	Mandatory	25	CB1 CB2	CG1	CE1 CE9 CE10 CE11	CT4
Essay questions exam	Mandatory	35	CB1 CB2 CB5	CG1 CG5	CE1 CE9 CE10	CT4
Problem and/or exercise solving	Mandatory	10	CB3	CG4	CE1 CE10	CT1 CT4
Essay	Mandatory for Animal Physiology	10	CB1 CB2 CB3 CB5	CG1 CG5	CE9 CE10 CE11	CT1 CT2 CT4

Other comments on the Evaluation

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

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

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

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

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

Sources of information

Basic Bibliography

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

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

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

Complementary Bibliography

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

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

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

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

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

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

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

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

Recommendations

Subjects that continue the syllabus

Aquaculture/V10G060V01801

Other comments

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

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

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

* Teaching methodologies modified

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

* Non-attendance mechanisms for student attention (tutoring)

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

* Modifications (if applicable) of the contents:

None

* Additional bibliography to facilitate self-learning:

None

* Other modifications

=== ADAPTATION OF THE TESTS ===

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

IDENTIFYING DATA				
Biological oceanography II				
Subject	Biological oceanography II			
Code	V10G061V01306			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Marañón Sainz, Emilio			
Lecturers	Marañón Sainz, Emilio Martínez García, Sandra Teira Gonzalez, Eva Maria			
E-mail	em@uvigo.es			
Web				
General description	This course addresses the study of the interaction between the composition and dynamics of biological communities and the production and fate of organic matter in the ocean. The diversity and metabolic activity of microbial plankton receive special attention, due to their key role in the regulation of marine biogeochemical cycles. Multiple levels of organization are considered, including cells, populations, communities and the ecosystem. The ultimate aim is to understand the role of ocean's biology in the functioning of the Earth system.			

Competencies

Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE10	Know the biological diversity and functioning of marine ecosystems.
CE11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Learning outcomes

Learning outcomes	Competences			
Know and understand how organisms and communities drive the cycling of matter in the ocean, linking the physiological and ecological traits of key functional groups with their biogeochemical role.	CB1	CG1	CE10	
Ability to connect the different physical, chemical and biological processes that determine the role of the ocean within the Earth system.	CB1	CG1	CE10	CT1
Know and understand the natural and anthropogenic variability in pelagic ecosystems and marine biogeochemical cycles, as well as their response to processes of global environmental change.	CB1		CE10 CE11	CT1
Ability to interpret biological oceanography data.		CG4	CE10 CE11	CT1
Ability to use computing applications to run mathematical models of biogeochemical processes.		CG4	CE11	CT2
Ability to use specialised bibliography				CT1 CT2

Contents

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

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

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	22.5	49.5	72
Seminars	10	15	25
Problem solving	10	25	35
Practices through ICT	10	5	15
Problem and/or exercise solving	3	0	3

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

Methodologies

	Description
Lecturing	Presentation of fundamental contents of the course, supported by graphic material.
Seminars	Using data and scientific articles, specific topics are explored in detail. Subjects tackled include, amongst others, the ecology and biogeochemical role of diatoms and coccolithophores, the ecological and biogeochemical importance of iron, and ocean acidification.
Problem solving	Practical cases are solved using real data presented numerically and graphically.
Practices through ICT	Numerical modelling of the carbon biogeochemical cycle. Analysis of data on the size-scaling of phytoplankton abundance, biomass and metabolism.

Personalized assistance

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

Assessment

	Description	Qualification	Evaluated Competences		
Seminars	Students write a short essay in which they provide a critical synthesis of a scientific article. The clarity and correctness of the writing, as well as the rigour in the use and application of scientific concepts, are particularly valued. The mark obtained is conserved for the July call. Upon consultation with the course's coordinator, students may resubmit this work for the July call.	20	CG1	CE10	CT1 CT2
Problem solving	Students solve practical cases similar to those used during the practical sessions. The mark obtained is conserved for the July call. Upon consultation with the course's coordinator, students may resubmit this work for the July call.	20	CG1 CG4	CE10 CE11	CT1 CT2
Problem and/or exercise solving	Written test includes a questionnaire, short questions and practical cases. The test is designed to assess the acquisition of knowledge and skills covered during the lectures, seminars and practical sessions.	60	CB1 CG4	CE10 CE11	

Other comments on the Evaluation

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

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

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

Sources of information

Basic Bibliography

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

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

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

Complementary Bibliography

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

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

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

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

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

Recommendations

Subjects that are recommended to be taken simultaneously

Physical oceanography II/V10G060V01602

Subjects that it is recommended to have taken before

Biological oceanography I/V10G060V01502

Physical oceanography I/V10G060V01503

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

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

- * Teaching methodologies modified

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

- * Non-attendance mechanisms for student attention (tutoring)

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

- * Modifications (if applicable) of the contents

- * Additional bibliography to facilitate self-learning

- * Other modifications

=== ADAPTATION OF THE TESTS ===

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

IDENTIFYING DATA				
Physical oceanography II				
Subject	Physical oceanography II			
Code	V10G061V01307			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Varela Benvenuto, Ramiro Alberto			
Lecturers	Varela Benvenuto, Ramiro Alberto			
E-mail	rvarela@uvigo.es			
Web	http://www.gofuvi.org			
General description	This course, mostly a practical one, brings to the student knowledges of the fundamental methodologies used in physical oceanography			

Competencies

Code	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CE1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
CE3	Describe how works the global ocean circulation, its forcings and its climate implications.
CE4	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.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes

Learning outcomes	Competences		
The student should be able to interpret the meaning, implications and interrelationships of the main meteorological and oceanographic variables/parameters	CB3 CB4	CE1 CE3 CE4	CT1 CT2
The student has to know how to calculate variables derived from the basic parameters such as speed of the sound, dynamic height, density, frequency of Brunt-Vaisala, stability and interpret them properly.	CB2 CB3 CB4	CE3 CE4	CT1 CT2
The student has to understand the principles and main uses of several advanced oceanographic instruments and its implications in current physical oceanography (i.e., High Frequency radars, gliders, lines of data)	CB2 CB3 CB4	CE4	CT1 CT2
The student should understand and distinguish the advantages and disadvantages of the several wave and tide related energy systems available	CB2 CB3	CE3 CE4	CT1 CT2 CT5
The student has to be able to understand the complete process of treatment of pertinent data of oceanographic probes (CTD), and to use at an intermediate user level programs of generation of charts and analysis of the oceanographic information such as Surfer, Ocean Data View and the Seabird proprietary Seabird system.	CB3 CB4	CE4	CT1 CT2

Contents

Topic	
Sea Temperature	Horizontal and vertical distribution of temperature. Temperature measurement at the sea. Termistors. Temperature sensors
Sea Salinity	Horizontal and vertical distribution of the salinity. Measurement of sea salinity. Salinity sensors.
Sea surface circulation	Methods of measurement of the sea surface circulation. Geostrophic approximation. Current meters

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

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	18	54	72
Seminars	25.75	25.75	51.5
Studies excursion	4	2	6
Mentored work	9	9	18
Objective questions exam	0.25	0	0.25
Essay questions exam	2.25	0	2.25

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

Methodologies

	Description
Lecturing	The lecturer will give an insight of the main subjects treated during the course.
Seminars	Student work on subjects and exercises brought by the teachers. Data come from the real world and the discussion can either be individual or in small groups. A questionnaire must be solved at the end of each session
Studies excursion	Cruise to practise several physical oceanography instruments.
Mentored work	Practical problems that the students must solve with the help of other students and/or the teacher

Personalized assistance

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

Assessment

	Description	Qualification	Evaluated Competences		
Seminars	During the seminars the student will be asked to solve several theoretical and practical subjects taken from real cruises/data. At the end of the seminar a questionnaire must be solved (and evaluated)	5	CB2 CB3 CB4	CE1 CE3 CE4	CT5
Studies excursion	After the cruise a report is required.	5	CB3	CE1 CE4	CT1

Mentored work	After classroom work reports are required	5	CB2 CB3	CE1 CE3 CE4	CT1 CT2
Objective questions exam	Multiple option test to validate the student's knowledge.	20		CE1 CE4	
Essay questions exam	A series of questions and problems presented to the students to judge its knowledge.	65	CB2 CB3	CE1 CE4	

Other comments on the Evaluation

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

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

The assessment of questionnaires keeps during two academic courses. Happened this term, the student will have to redo the questionnaires. Qualifications obtained during the May-June period are kept to the July period.

The official exam dates can be obtained at: <http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3>

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

Sources of information

Basic Bibliography

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

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

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

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

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

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

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

Complementary Bibliography

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

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

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

Recommendations

Subjects that it is recommended to have taken before

Physical oceanography I/V10G060V01503

Contingency plan

Description

The plan of development and evaluation described contemplates the case of a normal development of the theoretical and practical classes in a face-to-face context. If by exceptional circumstances this context varies, having to take into account

mixed or telematic teaching, we will proceed as follows:

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

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

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

Reports of seminars and memories of practices: 30%

Questionnaires: 30%

Examination: 40%

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

IDENTIFYING DATA				
Geological oceanography II				
Subject	Geological oceanography II			
Code	V10G061V01308			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Alejo Flores, Irene			
Lecturers	Alejo Flores, Irene García Gil, María Soledad Nombela Castaño, Miguel Angel Pérez Arlucea, Marta María			
E-mail	ialejo@uvigo.es			
Web	http://https://sites.google.com/site/oceangeolvigo/			
General description	The subject Geological Oceanography II, intends to train the student in the direct and indirect techniques for the characterization of the submarine bottoms, as well as the geological record in marine environments of continental shelf and deep environments (continental slope, continental abyssal plains, dorsal flanks , Ridges and ocean trenches). Therefore this subject has a different approach to the one of the Geological Oceanography I dedicated to the coastal and coastal areas. It is intended therefore that the student acquire the knowledge in the use and application of the latest generation techniques in sea surveys, as well as the ability to plan and develop oceanographic geological field works and prepare and submit reports. Students are required to take this course in responsible and honest behavior. Any form of fraud (i.e. copy and / or plagiarism) intended to falsify the level of knowledge or skill attained by a student in any type of test, report or work designed for this purpose is considered inadmissible. This fraudulent conduct will be sanctioned with the firmness and rigor that establishes the current regulation.			

Competencies

Code	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CG2	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.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CG5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
CE13	Acquire the basic sedimentological, geochemical and geophysical techniques and methodologies used in identification, use and sustainability of the natural resources of coastal and marine environments.
CE14	Know basic concepts and events of global change obtained from geological records.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes

Learning outcomes	Competences			
1. Get skills to plan and carry out geological oceanographic surveys	CB3	CG2	CE13	CT5
2. Get familiar with oceanographic databases in public repositories	CB3	CG4	CE14	CT1
3. To know the basic methods of geophysical exploration	CB3	CG2	CE13	CT5
		CG4	CE14	
4. To know the basic techniques of compositional analysis and physical properties of sedimentary cores	CB2	CG2	CE13	CT5
	CB3	CG4	CE14	
5. To know and apply the techniques of geochemical characterization in sediments.	CB2	CG2	CE13	CT1
		CG4	CE14	CT5
6. Get familiar with geophysical and geochemical data processing methods	CB3	CG4	CE13	CT1
	CB4	CG5		
7. Get skills to write and submit reports	CB2	CG4	CE14	CT1
	CB3	CG5		
	CB4			
8. Security during the execution of an oceanographic survey	CB2	CG2	CE13	CT5

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

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	24	51.6	75.6
Laboratory practical	15	16.08	31.08
Mentored work	2.16	10.8	12.96
Seminars	4.34	13.02	17.36
Studies excursion	5	5	10
Objective questions exam	2	0	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

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

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

Personalized assistance

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

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

Assessment						
	Description	Qualification	Evaluated	Competences		
Laboratory practical	Attendance at the laboratory practices is MANDATORY. The correct implementation of the exercises proposed in these practices will be evaluated.	15	CB2 CB3	CG2 CG4	CE13 CE14	CT1
Mentored work	The assignment of individual or paired work will be evaluated, assessing both the preparation of the topic, the presentation of a summary document of the subject as well as the presentation of the same. This activity is MANDATORY	15	CB2 CB3 CB4	CG5	CE13 CE14	CT1
Seminars	Seminar attendance is MANDATORY. The correct implementation of the exercises proposed in these seminars will be evaluated.	5	CB2 CB3	CG2 CG4	CE13 CE14	CT1
Studies excursion	Attendance at the sea survey is MANDATORY. The correct implementation of the exercises proposed in these practices will be evaluated.	10	CB2 CB3	CG2 CG4 CG5	CE13	CT5
Objective questions exam	Questions and exercises to assess understanding, analytical capacity and synthesis of acquired knowledge.	55	CB2 CB3 CB4	CG2 CG4 CG5	CE13 CE14	CT1 CT5

Other comments on the Evaluation

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

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

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

Sources of information

Basic Bibliography

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

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

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

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

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

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

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

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

NOAA - National Geophysical Data Center, <http://www.ngdc.noaa.gov/mgg/mggd.html>,

Complementary Bibliography

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

OpenCourseWare, <http://ocw.mit.edu/index.htm>,

Recommendations

Subjects that continue the syllabus

Applied marine geology/V10G060V01909

Subjects that are recommended to be taken simultaneously

Basin Analysis/V10G060V01901

Subjects that it is recommended to have taken before

Geological oceanography I/V10G060V01504

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

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

* Teaching methodologies modified

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

* Non-attendance mechanism for student attention (tutoring)

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

* Modifications (if applicable) of the contents

- 1.- Mixed teaching: don't change.

2.- Non-face-to-face teaching: don't change.

* Additional bibliography to facilitate self-learning

No need.

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

1.- Mixed teaching: se conservan los pesos de la situación presencial.

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

* Pending tests and test modified

1.- Mixed teaching: don't change.

2.- Non-face-to-face teaching: are modified as follows

Seminars [previous value 5%]] => [proposed value 10%]

Laboratory practices [previous value 15%]] => [proposed value 20%]

Mentored work [previous value 15%]] => [proposed value 20%]

Field trip [previous value 10%]] => alternative activity [proposed value 10%]

Final exam [previous value 55%]] => [proposed value 40%]

* Additional Information

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

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

IDENTIFYING DATA				
Chemistry applied to the marine environment II				
Subject	Chemistry applied to the marine environment II			
Code	V10G061V01309			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Moldes Moreira, Diego Leao Martins, Jose Manuel			
Lecturers	Calle González, Inmaculada de la Leao Martins, Jose Manuel Moldes Moreira, Diego			
E-mail	leao@uvigo.es diego@uvigo.es			
Web				
General description	The student will acquire competences and skills on several topics of the chemistry in the marine environment. In the first part of the subject, students will tackle important application such as wastewater treatment, desalination and marine biotechnology. In the second part will acquire theoretical and practical competences in the analysis of chemical contaminants as well as other compounds of interest in the marine environment. In this case they will learn to use simple techniques for sample preparation prior to the measurement step and their applications in the compartments of the marine environment. The students will get knowledge about the relevance of the control of the environmental quality.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE6	Acquire the fundamentals and terminology of chemical processes.
CE7	Apply to the marine and coastal environment the principles and methods used in Chemistry.
CE8	Know the main pollutants, their causes and effects in the marine and coastal environment.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes			
Learning outcomes	Competences		
Recognise the main characteristics of the wastewater. Classify the wastewater depending on their origin.	CB1 CB2 CB3	CE6 CE8	
Knowing the main technologies used for wastewater treatment and choosing the suitable one depending on the wastewater properties.	CB1 CB2 CB3	CG1 CE6 CE7	

Elaborate scientific documents with own data obtained by means of a simulation software	CB1 CB2 CB3 CB4 CB5	CG1 CG4	CE6 CE7 CE8	CT1 CT2
Recognise the main methodologies of sea water desalination	CB1 CB3 CB4	CG1	CE6 CE7 CE8	CT5
Knowing the potential of the marine environment as a source of marketable products by means of biotechnological processes	CB1 CB2 CB3 CB4 CB5		CE6	
Enumerate the most important points regarding the setup of a control plan about marine pollution.	CB2 CB4 CB5	CG1 CG4	CE6 CE8	CT2 CT5
Choose and use the suitable material for sediments sampling. Choose the most important sentinel organisms for studying marine pollution.	CB3 CB4 CB5		CE6 CE7 CE8	
Apply the suitable chemical analytical techniques for the most interesting compounds in Environmental Chemistry. Knowing the suitable experimental conditions for the determination of a chemical compound depending on the selected technique.	CB2 CB3 CB4 CB5	CG1 CG4	CE6 CE7 CE8	CT1
Being able to determine the concentration of a chemical compound in the marine environment depending on the analytical technique employed.	CB2 CB3 CB4 CB5	CG4	CE6 CE7 CE8	CT1 CT2
Apply the fundamental concepts of quality control in an analytical laboratory.	CB2 CB3 CB5	CG4	CE7	CT1

Contents

Topic

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

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	2	3
Lecturing	22	40	62
Mentored work	7	21	28
Laboratory practical	10	10	20
Practices through ICT	5	0	5
Studies excursion	5	0	5
Presentation	0.5	1.5	2
Objective questions exam	0.5	1	1.5

Problem and/or exercise solving	1	4	5
Essay	0	12	12
Report of practices, practicum and external practices	0	2	2
Essay questions exam	1.5	3	4.5

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

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

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

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

Assessment					
	Description	Qualification	Evaluated Competences		
Laboratory practical	Some lab activities regarding the analysis of marine contaminants will be carried out. A report should be presented following the previously provided rules. The evaluation criteria will be previously published in the web platform (FAITIC). Those students that have pass this activity in the previous course, may conserve their qualifications.	2.5	CB5	CG4	CT2
Studies excursion	The students will visit a wastewater treatment facility. After that, a brief questionnaire must be answer.	5	CB3 CB4		CE6
Presentation	The students will do a brief public presentation related to the analytical work performed in tutored works. The lecturer will make questions about the presented work. The evaluation criteria will be previously published in the web platform (FAITIC).	2.5	CB3 CB4	CG1	CT2
Objective questions exam	When finalising lessons 1 to 3, as well as in the final examination (for these lessons), a test exam will be performed.	15	CB1 CB3 CB5	CG1	CE6 CE7 CE8
Problem and/or exercise solving	In the final exam, a writing exam about the calculation of chemical concentrations will be carried out. The result obtained, as well as the clarity and the reasoning used to achieve this will be considered for evaluation.	12.5	CB2 CB3 CB4 CB5	CG4	CE7 CT1
Essay	A scientific article must be written by the students. The data will be obtained by means of a wastewater simulation software. Moreover, a bibliographic study must be carried out regarding the analysis of a typical marine contaminant. The evaluation criteria will be previously published in the web platform (FAITIC). Those students that have pass this activity in the previous course, may conserve their qualifications.	30	CB2 CB3 CB4 CB5	CG1 CG4	CE6 CT1 CE7 CE8
Report of practices, practicum and external practices	Some lab activities regarding the analysis of marine contaminants will be carried out. A report should be presented following the previously provided rules. The evaluation criteria will be previously published in the web platform (FAITIC). Those students that have pass this activity in the previous course, may conserve their qualifications.	10	CB2 CB3 CB4 CB5		CE6 CT1 CE7 CT2 CE8
Essay questions exam	When finalising lessons 1 to 3, as well as in the final examination (for these lessons), some questions should be answered by the students. This exam will count for 10% of the final qualification. At the end of the subject, some questions about the methodologies used in chemical analysis will be aswered. It will count for 12,5% of the final qualification.	22.5	CB1 CB2 CB4	CG1	CE6 CT5 CE7 CE8

Other comments on the Evaluation

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

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

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

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

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

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

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

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

- Presentations exhibitions
- Practical of laboratory
- Gone out of practical/study of field
- Works and projects
- Inform/memories of practices

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

Sources of information

Basic Bibliography

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

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

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

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

Complementary Bibliography

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

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

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

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

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

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

Beiras R., Pérez S., **Manual de métodos básicos en Contaminación Acuática**, Universidade de Vigo, 2013

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

Fifield F.W., Haines P.J., **Environmental Analytical Chemistry**, Blackie Academic, 1995

Harris D.C., **Análisis Químico Cuantitativo**, Reverté, 2007

Recommendations

Subjects that it is recommended to have taken before

Chemistry applied to the marine environment I/V10G060V01505

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Educational Methodologies that will be kept

Introductory Activities

Lectures

Works

Practice with ICT support

Presentations

These methodologies will not be modified, but they will be adapted to the extraordinary situation by means of the utilisation of telematic tools like videoconferences through Campus Remoto, or similar, as well as the utilisation of FAITIC platform, although the utilisation of other tools could be possible in order to guarantee and facilitate the access of the students to the

learning contents.

* Educational methodologies that modify

Visits: a virtual visit using Remote Campus will be performed; one of the most important wastewater treatment plants of the region can be visited by Google Maps; a virtual by using this tool, with explanations of the teacher, will be performed; also he or she will show photos of visits of previous years.

Lab Practices: the classes of laboratory will be substituted by short videos of the conventional lab practices. Later, the student will have to perform the activities programmed and indicated in the conventional syllabus.

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

The student will receive attention through the tool available at the Universidade of Vigo (Remote Campus) or similar, as well as by means of email, forums of Fatic, etc. The office hours will be previously booked.

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

The contents will not suffer modifications.

* Additional bibliography to facilitate the learning

Recent articles will be provided related with the different topics showed in the subject. This activity, although it comes carrying out of general form, will have more importance in the plan of contingency.

* Other modifications

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

=== ADAPTATION OF THE EVALUATION ===

* Test slopes that keep

Examination of questions of development (examination theory - Chemical Engineering): [previous Weight 10%] [Weight Proposed 20%]

Examination of objective questions (examination test theory - Chemical Engineering): [previous Weight 15%] [Weight Proposed 0%]

Visit questionnaire/virtual visit (Chemical Engineering): [previous Weight 5%] [Weight Proposed 5%]

Work - scientific article (Chemical Engineering): [previous Weight 20%] [Weight Proposed 25%]

Examination of objective questions (examination test theory - Chemical Analytical): [previous Weight 0%] [Weight Proposed 10%]

Examination of questions of development (examination theory - Chemical Analytical): [previous Weight 12,5%] [Weight Proposed 0%]

Resolution of problems and/or exercises (Analytical Chemistry): [previous Weight 12,5%] [Weight Proposed 10%]

Work *tutelado (Analytical Chemistry): [previous Weight 10%] [Weight Proposed 12,5%]

Report of practices of laboratory (Analytical Chemistry): [previous Weight 12,5%] [Weight Proposed 15%]

Presentation (Analytical Chemistry): [previous Weight 2,5%] [Weight Proposed 2,5%]

* Proofs that modify

[Examination of objective questions (Chemical Engineering)] => [Examination of questions of development (Chemical Engineering)]

[Examination of questions of development (Analytical Chemistry)] => [Examination of objective questions (Analytical Chemistry)]

* additional Information

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

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

Competencies	
Code	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CG3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
CG4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
CE11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
CT1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
CT5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes				
Learning outcomes	Competences			
Knowing the potentially cultivable marine species in the world	CB2 CB3	CE11	CT1 CT5	
Know the aquaculture installations in land and sea	CB2	CG3		
Dominate the aquaculture auxiliary techniques (phytoplankton and zooplankton) and the culture technics of the main species that are cultivate now in Europe	CB2	CG3 CG4		
Know the treatments for the water in the culture systems	CB3		CT1 CT5	
Recognise and analyse problems and propose solution strategies	CB2 CB3	CG3 CG4	CE11	CT1 CT5
Identify and control problems of environmental impact and marine pollution caused by marine aquaculture	CB2			CT5
Design, control and management of culture centres and recovery of marine endangered Species		CG3 CG4		CT5
Known the operational details of marine companies, recognise specific problems and propose solutions	CB3			CT5
Design, control and manage culture production plants	CB2			CT1 CT5
Aquariology	CB2	CG4		CT1

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

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

Planning

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

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

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

Personalized assistance

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

Assessment

	Description	Qualification	Evaluated Competences		
Seminars	Following the completion of the seminars, each student group must submit a summary report of the subject matter, which will be evaluated. A minimum of 5 will be required to approve.	10	CB2 CB3	CG4	CT1 CT5
Laboratory practical	Laboratory practices are considered an essential part of the subject. Practices will be evaluated by the attendance and assistance of students to them.	5		CG3 CG4	
Essay questions exam	There will be a long written test on the official date will be assessed on the knowledge gained throughout the course. This test will assess all the knowledge acquired in the course of the subject. The minimum grade to pass the exam will be 5	40	CB2 CB3		CE11 CT5

Objective questions exam	There will be several quizzes, multiple choice, during the course of lectures. Since the objective of these tests is that students prepare in advance the subjects to be discussed, questions of each test will cover the topics that are being treated that week (including topics to be covered in that class or the next if they are part of issue). The minimum grade to pass the test will be 5.	15	CB2 CG3	CT1
Report of practices, practicum and external practices	For the evaluation of practices each student must prepare a written report on the implementation and results of laboratory practices, which will be evaluated. The minimum grade to approve the report will be 5.	30	CG4	CT1 CT5

Other comments on the Evaluation

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

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

The official calendar of the evaluation will be published in:

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

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

Sources of information

Basic Bibliography

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

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

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

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

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

Complementary Bibliography

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

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

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

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

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

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

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

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

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

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

Recommendations

Subjects that are recommended to be taken simultaneously

Marine and coastal management/V10G060V01704

Subjects that it is recommended to have taken before

Fish and shellfish biology/V10G060V01902

Marine and coastal management/V10G060V01704

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

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

* Teaching methodologies modified

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

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

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

* Non-attendance mechanisms for student attention (tutoring)

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

* Modifications (if applicable) of the contents

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

* Additional bibliography to facilitate self-learning

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

* Other modifications

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

=== ADAPTATION OF THE TESTS ===

* Tests already carried out and pending

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

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

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

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

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

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

*** Tests that are modified**

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

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

*** Additional Information**

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