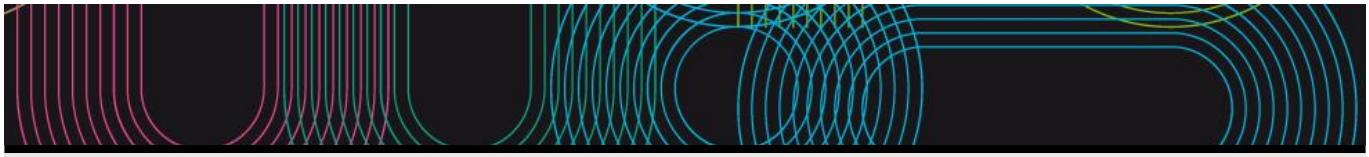

(*)Facultade de Ciencias do Mar

(*)Grao en Ciencias do Mar

Subjects			
Year 2nd			
Code	Name	Quadmester	Total Cr.
V10G060V01301	Bioquímica	1st	6
V10G060V01302	Botánica mariña	1st	6
V10G060V01303	Estatística	1st	6
V10G060V01304	Oceanografía química I	1st	6
V10G060V01305	Sedimentoloxía	1st	6
V10G060V01401	Ecoloxía mariña	2nd	6
V10G060V01402	Medios sedimentarios costeiros e mariños	2nd	6
V10G060V01403	Oceanografía química II	2nd	6
V10G060V01404	Principios de microbioloxía mariña	2nd	6
V10G060V01405	Zooloxía mariña	2nd	6

IDENTIFYING DATA				
Biochemistry				
Subject	Biochemistry			
Code	V10G060V01301			
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	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE4	To know the basic techniques to sample the water column, organisms, sediments and sea bottom, as well as the surveying methods for dynamic and structural variables
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE12	To be able to operate the instrumental techniques applied to sea
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CE26	To plan, direct and write technical reports on marine issues
CE28	To teach marine science at diferent levels
CT1	Analysis and synthesis ability
CT8	Teamwork ability

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.	CB1 CB5	CE2 CE5 CE28	CT1
Approach of the biological phenomena in molecular terms, relating the structure of each biomolecules family with the biological function that exert	CB2 CB3	CE2 CE5 CE28	CT1
Acquisition and appropriate utilisation of concepts and biochemical terminology	CB4	CE1 CE18 CE26 CE28	CT1
Resolution of questions of quantitative biochemistry	CB1 CB2	CE15 CE16 CE28	CT1

Familiarisation with use of basic instrumental and equipment of a biochemical laboratory	CB2 CB5	CE4 CE5 CE12 CE15 CE17 CE28	CT1 CT8
Knowledge and application of simple techniques of separation and quantification of biomolecules	CB1 CB2 CB5	CE4 CE5 CE12 CE15 CE17 CE28	CT1 CT8
Development of scientific thinking style	CB2 CB3 CB5	CE6 CE13 CE16	CT1 CT8

Contents	
Topic	
Inorganic components from living organisms:	Importance of no covalent interactions. Role of the water in the biological processes. Interactions of the macromolecules in solution.
Nucleic acids	Composition of nucleosides and nucleotides. Deoxyribonucleic acid. Ribonucleic acids.
Amino acids and proteins:	Classification and properties of the amino acids. Peptidic bond Peptides and proteins: structure, function and classification.
Carbohydratess:	General characteristics and classification. Monosaccharides, oligosaccharides and polysaccharides. Structure, importance and function.
Lipids:	General characteristics and biological importance. Classification: fatty acids; simple lipids; complex lipids; isoprenoid lipids; eicosanoids.
Enzymes:	Concept, active site, and classification. Enzymatic catalysis. Kinetical enzymatic. allosteric Enzymes.
Introduction to Metabolism:	Metabolic pathways. Anabolism and catabolism. Energy from biological processes. Metabolism regulation.
Carbohydrate metabolism:	Anaerobic processes of energy generation. Oxidative processes: citric acid cycle and route of the pentose phosphate cycle. Biological oxidations: electron transport chain and oxidative phosphorylation. Carbohydrate biosynthesis.
Lipid metabolism:	Beta oxidation of fatty acids. Fatty acids biosynthesis. Regulation of fatty acids metabolism. Biosynthesis of triacylglycerols and phospholipids Membrane lipids, steroids, isoprenoids and eicosanoids.
Metabolism of nitrogenous compounds:	Proteolysis. Amino acid catabolism. Nitrogen excretion and urea cycle. Catabolism of carbon skeletons of amino acids. Amino acid byosinthesis. Regulation of amino acids metabolism. Nucleotide metabolism.
Transmission and expression of genetic information	DNA Replication. Information restructuring: restriction, repair and recombination. Information transfer: Transcription. Information decoding: Translation.
Practice: Separation, identification and quantification of biomolecules	Extraction and quantification of protein
Practice: Enzymology	Enzyme activity measure. 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
Practices report	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 Competencess		
Lecturing	Assistance no avaliable	0			
Seminars	In the realization of the seminars values the capacity to relate and apply the concepts purchased, to identify and understand problems, the appropriate utilization of the terminoloxía biochemical, his capacity to transmit the information. How transversal competitions value the initiative, the capacity of autonomous learning, the work in team, the capacity of organization, the critical capacity and the skill in the research of information and handle of the computer.	20	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18 CE26 CE28	CT1 CT8

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	CB1 CB2 CB3 CB4 CB5	CE1 CE4 CE5 CE12 CE13 CE15 CE16 CE17 CE18 CE26	CT1 CT8
Objective questions exam	Test: It asses, in a general way, the knowledge acquired of the course program Short answer: It asses the knowledge acquired, the ability to relate them and the proper use of concepts and biochemical terminology.	50	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE18	CT1
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	CB1 CB2 CB3 CB4 CB5	CE6	CT1

Other comments on the Evaluation

The student will have to cumplimentar the sua ficha in the platform FAITIC, approaching photograph in which was reconocible. This requirement is indispensable for the realization of the practices, the seminars and the distinct probas.

Advise to the students that use a direction of and-mail of the University of Vigo when they direct to the professor by this road and that do it always with the owed identification (name and surnames, course and titulación) and indicating the subject.
Advises the assistance to the kinds magistral.
Resolution of problems and / or exercises: The half note of the problems / exercises has to be equal or upper to 5 (on 10) to be had in account in the final evaluation.
Seminars: the realization of the seminars is compulsory for the superación of the subject. The half note of the seminars will have to be equal or main than 5 (on 10) so that it was had in account in the final note.
Practical: the realization of the practices and of the examination and/or report of the same compulsory sound for the superación of the subject. The note of the practices will have to be equal or main than 5 (on 10) so that it was had in account in the final note.
The final examination will consist in a proof of test and short answer of all the subjects impartidos in the kinds magistral and seminars. To surpass the subject to note of the final examination has to be equal or upper to 5 (on 10).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
To the student that have to present to the evaluation of July by not surpassing test them type test and of short answer, him conservará the note of the probas surpassed during the course.

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

Sources of information

Basic Bibliography

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

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

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

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

Complementary Bibliography

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

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

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

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

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

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

Recommendations
Subjects that continue the syllabus
Physiology of marine organisms/V10G060V01501

Subjects that it is recommended to have taken before
Fish and shellfish biology/V10G060V01902
Chemistry applied to the marine environment I/V10G060V01505
Chemistry applied to the marine environment II/V10G060V01604

IDENTIFYING DATA				
Marine botany				
Subject	Marine botany			
Code	V10G060V01302			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish English			
Department				
Coordinator	Castro Cerceda, María Luísa Sánchez Fernández, José María			
Lecturers	Castro Cerceda, María Luísa Muñoz Sobrino, Castor Sánchez Fernández, José María			
E-mail	lcastro@uvigo.es jmsbot@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
CT1	Analysis and synthesis ability
CT2	Organization and planning skills
CT3	Written and oral communication in the official languages of the University
CT5	Information technology skills (search and data analysis)

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		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 featuress of Cyanophyta 3.2. Main features of Prochlorophyta
4. Introduction to the eukaryotic algae	4.1. Origin of the main lines of photosynthetic organisms 4.2. Phylum Gaucophyta 4.3. Phylum Euglenophyta
5. Unicellular phyla; main features	5.1. Phylum Cryptophyta 5.2. Phylum Haptophyta 5.3. Phylum Pyrrophyta

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

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	9	9	18
Field practice	4	10	14
Seminars	3	3	6
Mentored work	0	23	23
Lecturing	25	25	50
Essay	7	14	21
Practices report	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 Competencess	
Essay	Public presentation of the groups' reports	15	CB2 CB3 CB4 CB5	CT3 CT5
Practices report	Evaluation of the reports on the field and laboratory sessions	20	CB5	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 aproved by the Faculty (http://mar.uvigo.es/index.php/gl/alumnado-actual/examenes-3)

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 Ecology/V10G060V01401
Marine and coastal management/V10G060V01704

IDENTIFYING DATA				
Statistics				
Subject	Statistics			
Code	V10G060V01303			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Lorenzo Picado, Leticia			
Lecturers				
E-mail				
Web	http://https://faitic.uvigo.es/index.php/es/			
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	
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
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE29	Skill in the practical use of models and in the incorporation of new data for their validation, improvement and development
CT1	Analysis and synthesis ability
CT4	Basic computing skills related to the field of study
CT5	Information technology skills (search and data analysis)
CT6	Problem management and solving skills
CT7	Decision making
CT15	Ability to apply knowledge in practice

Learning outcomes	Competences		
Learning outcomes			
Be able to identify the statistical aspects within an empirical problem and draw conclusions from the existing information applying the concepts studied in the subject. Know, apply and correctly interpret the descriptive techniques and calculation of basic probabilities and assess their interest as a fundamental tool in data analysis.	CB1 CB2 CB3	CE16	CT1 CT5 CT15
Know the importance of information and be able to assess and classify it in each decision area. Know how to correctly apply and interpret the basic descriptive techniques for the analysis of unidimensional and bidimensional variables.	CB2 CB3	CE14	CT5 CT15
Understand the concept of hypothesis testing.	CB3	CE16 CE29	CT6 CT7
Understand the principles of multivariate analysis.	CB3	CE16 CE29	CT6 CT15
Effectively solve problems and issues of each of the lessons using the appropriate quantitative method.		CE29	CT6 CT7 CT15
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	CE16 CE29	CT4 CT6 CT15
Understand the importance of statistical analysis when taking decisions and learn when to apply each technique and interpret the results obtained.	CB3	CE14 CE16 CE29	CT1 CT7 CT15
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	CE16	CT15

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. Frequency tables: means 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
Seminars	7	14	21
Laboratory practical	15	7.5	22.5
Autonomous problem solving	0	27.5	27.5
Lecturing	30	30	60
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
Seminars	Resolution of practical exercises of the subjects. In some cases, Excel will be used.
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.

Personalized assistance	
Methodologies	**Description**
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.
Laboratory practical	In the tutorials and seminars.
Seminars	In the tutorials and seminars.

Assessment			
	Description	Qualification	Evaluated Competencess

Seminars	The students will be evaluated by solving an exercise in the classroom in an autonomous way.	10		CE14	CT6 CT7 CT15
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		CT6 CT15
Problem and/or exercise solving	There will be two midterm exams during the course that will take place during the theory classes. Midterm 1 (10%): lessons 1 and 2. Midterm 2 (10%): lessons 3 and 4.	20	CB3		CT6 CT15
Essay questions exam	Final exam of the subject	60	CB3	CE14	CT1 CT6 CT7 CT15

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.

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%.

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

MIRÁS CALVO, M.A. / SÁNCHEZ RODRÍGUEZ, M.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 Biología y 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

IDENTIFYING DATA				
Chemical oceanography I				
Subject	Chemical oceanography I			
Code	V10G060V01304			
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	Marín Caba, Laura Prieto Jiménez, Inmaculada			
E-mail	iprieto@uvigo.es			
Web				
General description	"Chemical Oceanography I" aims to explain processes that take place in seawater from a physicochemical point of view. For this, the behavior of systems in different media and interfaces is studied.			

Competencies	
Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CT2	Organization and planning skills
CT3	Written and oral communication in the official languages of the University
CT8	Teamwork ability

Learning outcomes	Competences		
Describe the composition and behavior of materials present in seawater.	CB1	CE1 CE2 CE6	CT3
Explain the main properties of water, electrolyte solutions and seawater from a physicochemical point of view.	CB1	CE1 CE2 CE6	CT3
Recognize and interpret the transport phenomena of solutes.	CB2 CB3	CE1 CE2 CE6 CE15	CT2 CT3 CT8
Distinguish the types of estuaries based on water circulation and identify their characteristics.	CB2 CB3 CB5	CE1 CE2 CE6 CE18	CT3
Use quantitative models to study the water circulation and calculate residence times in estuaries.	CB2 CB3	CE1 CE2 CE6	CT3

Explain the characteristics of the air-sea interface, the processes that take place and the factors that control them.	CB2 CB3 CB4	CE1 CE2 CE6	CT3
Describe the gas solubility in the seawater and apply the models to estimate gas exchange across the air-sea interface.	CB2 CB3	CE1 CE2 CE6	
Explain the characteristics of the seawater-solid interface, the processes that occur in it and identify the factors that determine them.	CB2 CB3	CE1 CE2	CT3
Interpret the properties and behavior of particulate matter and colloids present in seawater.	CB2 CB3	CE1 CE2 CE6 CE15 CE17 CE18	CT2 CT3 CT8
Use appropriate experimental techniques to study the adsorption processes and apply the models at the solid-solution interface.	CB2 CB3 CB5	CE1 CE2 CE6 CE15 CE17 CE18	CT2 CT3 CT8
Explain the characteristics and composition of interstitial waters.	CB1 CB3 CB4 CB5	CE1 CE2	CT3

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. - 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 Competencess		
Problem solving	The problems, exercises and/or questions proposed will be evaluated, according to the guidelines established by the professor in the classes or in the seminars of the subject. Attendance at the seminars is mandatory. The student should achieve at least 40% of the maximun score to consider this section in the overall rating.	20	CB2 CB3 CB4	CE1 CE2 CE6 CE18	CT2 CT3
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 CB3 CB4	CE1 CE2 CE6 CE15 CE17 CE18	CT2 CT3 CT8

Essay questions exam	Written tests to evaluate skills acquired throughout the course, which may include open questions, questions and problems about contents of the course. The students must develop, relate, organize and present the knowledge and skills they have on the subject. It will be valued: - A midterm exam (20%) - The final exam (40%) To pass the subject a minimum grade of 3,5 points (of 10) must be achieved in both tests.	60	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE6 CE18	CT2 CT3

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.

In July, students who have not passed the subject in January call 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, maintaining the grades obtained by the students through the problems and/or issues solving during the course and the laboratory experiments.

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/index.php/en/alumnado-actual-2/examenes-3

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/V10G060V01403

IDENTIFYING DATA				
Sedimentology				
Subject	Sedimentology			
Code	V10G060V01305			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish English			
Department				
Coordinator	Rey García, Daniel Marino , Gianluca			
Lecturers	Alejo Flores, Irene Diz Ferreiro, Paula García Gil, María Soledad González Villanueva, Rita López Pérez, Ángel Enrique Marino , Gianluca Rey García, Daniel			
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	
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE12	To be able to operate the instrumental techniques applied to sea
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work

CE18 To transmit writing, verbal and graphical information for audiences of various types

CT6 Problem management and solving skills

CT16 Research skills

Learning outcomes

Learning outcomes	Competences		
1. Recognise and identify the different types of sediments	CB5	CE1 CE5 CE12 CE15 CE17 CE18	CT16
2. Characterise texture and mineralogy in sediments	CB5	CE1 CE5 CE12 CE15 CE17 CE18	CT16
3. Recognise and identify the sedimentary structures	CB5	CE1 CE5 CE12 CE15 CE17 CE18	CT16
4. Identify the relationship(s) between sedimentary structures and depositional processes	CB5	CE2 CE6 CE13 CE15	CT6 CT16
5. Master the sedimentary processes of erosion, transport, and deposition	CB5	CE5 CE12 CE15 CE17 CE18	CT16
6. Characterise the exchange of (geo)chemical properties between seawater and sediments	CB5	CE1 CE5 CE12 CE13 CE15 CE17 CE18	CT16
7. Identify post-depositional alterations in sediments	CB5	CE1 CE6 CE12 CE13 CE15 CE18	CT16
8. Interpret the sedimentological data	CB5	CE1 CE2 CE6 CE12 CE13 CE15 CE18	CT6 CT16
9. Develop an understanding of the factors that control sedimentation in the marine environment	CB5	CE2 CE6 CE13 CE17 CE18	CT6 CT16
10. Comprehend the concepts of facies, depositional environment, and sedimentary sequence	CB5	CE1 CE2 CE6 CE13 CE18	CT6 CT16
11. Use the sedimentological analysis to decipher the dynamics and evolutive trends of the sedimentary environment(s)	CB5	CE2 CE6 CE13 CE18	CT6 CT16

12. Become skilled in applying the analytical and investigative methods to perform sedimentological work in the marine environment	CB2 CB5	CE1 CE5 CE6 CE12 CE13 CE16 CE17 CE18	CT16
13. Apply the knowledge developed during the course to address (sedimentological) problems in the marine environment	CB2 CB5	CE2 CE5 CE6 CE12 CE16 CE17 CE18	CT6 CT16

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 practicals; 0.4. Fieldwork; 0.5. Tests; 0.6. Tutorials; 0.7. Assessment.
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, 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; 2.2. Sampling campaigns: strategy and planning; 2.3. Characterization of sediments: (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. Initiation of motion: (i) critical shear stress; (ii) sediment size and density, and (iii) biological activity; 5.2. Cohesive sediments; 5.3. Sediment transport: modes and transport rate; 5.4. Sedimentation of particles: static fluid (Stokes Law) and natural flows (drag coefficient); 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. Siliciclastic sediments, climate, and tectonics; 6.8. 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; 7.2. Fabric and texture; 7.3. Porosity and permeability; 7.4. Bedforms; 7.5. Sedimentary structures; 7.6. 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.
Topic 9. Chemical and biochemical sediments II: description and classification of carbonate sediments	9.1. Alochemical carbonate constituents; 9.2. Ortochemical 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. Physical processes that control carbonate production and facies distribution in the ocean; 10.3. Chemical processes that control carbonate production and facies distribution in the ocean; 10.4. 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. Sedimentary facies	12.1. Facies: concept and types; 12.2. Facies association; 12.3. Cyclicity, rhythms, and their origin; 12.4. Correlations.
Seminars	Seminar 1. grain size (part 1) and shape; Seminar 2. grain size (part 2) and composition; Seminar 3. sediment transport.
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	40	65
Studies excursion	14	10	24
Laboratory practical	6	0	6
Presentation	0.25	1.75	2
Mentored work	0	15	15
Seminars	7	15	22
Seminars	0	9	9
Essay questions exam	0	3	3
Problem and/or exercise solving	0	1	1
Objective questions exam	0	1	1
Practices report	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	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.
Presentation	Short presentations on topics related to those addressed during the lectures, seminars, and/or fieldtrips.
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.
Seminars	Activities associated to the practical and/or theoretical works.

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.
Seminars	Questions and doubts that may arise during seminars 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 Competencess		
Lecturing	Written exam that consists mostly of short questions. 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.	60	CB2 CB5	CE1 CE2 CE5 CE6 CE18	CT6
Studies excursion	Reports and/or questionnaires related to the information acquired during the fieldtrips.	15	CB2	CE1 CE5 CE12 CE13 CE15 CE16 CE17	CT16
Laboratory practical	Written report and/or questionnaires related to the activity that was developed during seminars and laboratory practicals.	20	CB2	CE1 CE5 CE12 CE13 CE15 CE16 CE17	CT6 CT16
Presentation	Assessment of the oral presentation skills.	5	CB2 CB5	CE1 CE2 CE6 CE18	CT16

Other comments on the Evaluation

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.

It is required to reach at least a mark of 40% in each component of the course (i.e., practical, fieldstrip, seminar, and final exam) for the final mark to be computed and pass the exam.

If none of the students reaches a mark of 90% in the final qualification, scheduling of an additional test will be considered to improve the mark. No more than 4 top students with a final mark better than 75% mark will be eligible for such a test.

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

Tucker, M. E., **Sedimentary Petrology. An Introduction to the origin of sedimentary rocks.**, 3, Blackwell Science Ltd., 2001

Tucker, M., **Techniques in Sedimentology**, Blackwell Scientific Publications, 1988

MacKenzie, W. S. & Adams, A. E., **Rocks and Minerals in Thin Section: A Colour Atlas**, Manson, 1994

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

Arche, A, **Sedimentología**, Ed CSIC, 2010

Complementary Bibliography

Allen, J., **Principles of Physical Sedimentology**, Allen & Unwin, 1985

Schlager, W., **Carbonate Sedimentology and Sequence Stratigraphy.**, SEPM (Society for Sedimentary Geology), 2005

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, **Ameriacan Association of Petroleum Geologist (AAPG)**,

Recommendations

Subjects that continue the syllabus

Coastal and marine sedimentary habitats/V10G060V01402

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 24:00 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.

IDENTIFYING DATA				
Marine Ecology				
Subject	Marine Ecology			
Code	V10G060V01401			
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 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	
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
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE10	To know the problems and the basic principles of sustainability in relation to the use and exploitation of the marine environment
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CE37	Technical advice or assistance on issues related to the marine and coastal environment
CT1	Analysis and synthesis ability
CT6	Problem management and solving skills

Learning outcomes			
Learning outcomes	Competences		
Capacity to understand and analyse the basic processes of the interactions between organisms.	CB1 CB2 CB3 CB4 CB5	CE2 CE6 CE10	CT1 CT6
Capacity to understand the bases of diversity and the the factors controlling organization and structure of the ecosystems	CB1 CB2 CB3 CB4 CB5	CE2 CE6 CE10 CE18	CT1 CT6

To design, analyze, interpret and present experimental results	CB1 CB2 CB3 CB4 CB5	CE2 CE5 CE6 CE10 CE13 CE15 CE16 CE17 CE18 CE37	CT1 CT6
To use software typically used in Marine Ecology	CB1 CB2 CB3 CB4 CB5	CE5 CE13 CE16	CT1
To use the basic bibliography related to the ecological concepts	CB1 CB2 CB3 CB4 CB5	CE2 CE5 CE6 CE16 CE37	CT1

Contents	
Topic	
Ecology and environmental crisis	Construction of the sociocultural human niche. The anthropocene. Planetary boundaries. Ecology in an anthropogenic biosphere. Presentation of the subject.
Biogeochemical reactions in the sea	Energy in the ecosystem. Cycles of matter and energy flows. Metabolic diversity of the biosphere. Compartments, mass balances and residence time. Oxygen: distribution and redox gradients. Reactions of the carbon cycle: acidification. Reactions of the nitrogen cycle: eutrophication. Reactions of the phosphorus cycle: dynamics in the water-sediment interphase.
Energy flows and biological production	Primary production. Magnitudes. Control of primary production: efficiency of the photosynthesis, irradiance and nutrients. Hydrodynamic control of primary production: Sverdrup model. spatial and temporal variability of primary production. Secondary production. Efficiencies. Organic matter decomposition and remineralization. Microbial heterotrophic production.
Dynamics of isolated populations	Concept of individual and population. Characteristics of populations. Evolutionary strategies. Fundamental equation of population growth. density independent growth: exponential model. Density independent growth in aged-structured populations: life tables, survival curves, Allen diagrams. Density dependent growth: logistical model. Variations of the logistical model: Time-lag, Allee effect, discrete growth. growth.
Interactions between species	Interspecific competition. Experimental evidences of competition. Competition and ecological niche. Lots and Volterra model of competition. Predation. Functional and numerical responses. Variations of the Lotka and Volterra predation model.
Community structure and dynamics	Diversity, biodiversity and species richness. Colonization and extinction: Island population dynamics. Implications on habitat reduction and fragmentation. Equitativity: Models of distribution of abundance. Diversity indexes. Diversity in space: diversity spectra and gradients. Topology of the food webs. 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.

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	The seminars will address contents of more complex assimilation, that require the utilisation of computer programs and capacities of data analysis which will be later used by the students in the experimental work The contents of these seminars will be: Seminar 1: experimental and technical sampling design. Data analysis I: analysis of variance in Ecology. Practical case. Seminar 2: Discussion on the experimental approach of the practical work. Data analysis II. Multivariate analysis in Ecology: similarity analysis, MDS. Practical case. Seminar 3: Presentation of scientific results. Models in Ecology: use of the Stella software. Practical case
Laboratory practical	The experimental work consists in the design, sampling, experimentation, processing of samples, data analysis, preparation and discussion of results and, finally, presentation of the results byf the students. They will develop , therefore, all the phases of an investigation. The experimental work will be carried out in an autonomous way in 4 people groups supervised by the professors. The seminar sessions will tackle the necessary practical contents for the experimental design and data treatment of the practical work. The students will have to his disposal the Ecology laboratory in the allocated dates. The results of the will be present in format poster.

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	Seminars will be evaluated by means of a specific examination of the contents presented in the seminar sessions. The qualification of this examination will represent 10% of the total qualification.
Project	The qualification of the experimental work will be based on the quality of the design, preparation and presentation of results. Each group will present a poster during 10 minutes in a public session. The students will evaluate the presentations of their colleagues, whose qualifications will allow to award prizes to the three best projects. The qualification of the experimental work will represent 25 % of the total. The groups obtaining the first prize, second prize and third prize in accordance with the rates issued by their colleagues will increase the qualification by 10 %, 7 % and 5 %, respectively.
Essay questions exam	Along the course, short exams will be developed. The qualification of these exams will represent 5% of the final qualification. A final exam will be held at the end of the course. This exam will represent 60 % of the total qualification. To pass the subject a minimum qualification of 4 points (over10) in the final exam will be required.

Assessment

	Description	Qualification	Evaluated Competencess		
Problem and/or exercise solving	Seminars. They will be evaluated by means of a specific examination of the contents of the seminars. The qualification of this examination will represent 10% of the total qualification.	10	CB1 CB2 CB3 CB4 CB5	CE5 CE6 CE13 CE16 CE17	CT1 CT6
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 better 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.	25	CB1 CB2 CB3 CB4 CB5	CE5 CE6 CE13 CE15 CE16 CE17 CE18	CT1 CT6
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.	65	CB1 CB2 CB3 CB4 CB5	CE2 CE6 CE10	CT1 CT6

Other comments on the Evaluation

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

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

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

Sources of information

Basic Bibliography

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

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

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

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

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

IDENTIFYING DATA				
Coastal and marine sedimentary habitats				
Subject	Coastal and marine sedimentary habitats			
Code	V10G060V01402			
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	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CE19	To map and characterize the seabed and the underground in marine and coastal areas
CE26	To plan, direct and write technical reports on marine issues
CT1	Analysis and synthesis ability
CT15	Ability to apply knowledge in practice

Learning outcomes			
Learning outcomes		Competences	
Elaborate and interpret stratigraphic sections and perform correlations	CB3	CE1 CE2 CE13 CE17 CE18 CE19	CT1 CT15

Relate the coastal processes with the architecture of the coastal sedimentary environments	CB1 CB2 CB3 CB5	CE1 CE2 CE5 CE6 CE13 CE16 CE26	CT1 CT15
Distinguish the different types of deep sediments	CB1 CB5	CE1 CE2 CE5 CE6 CE13 CE15 CE16 CE17 CE19 CE26	CT1 CT15
Relate the ressedimentation processes with the turbiditic systems	CB2 CB3	CE1 CE2 CE5 CE6 CE15 CE16 CE17 CE19	CT1 CT15
Understand the sedimentary effects of the deep oceanic circulation	CB2 CB3	CE1 CE2 CE5 CE6 CE13 CE15 CE16 CE19	CT1 CT15
Understand the pelagic sediments as the result of a global biogeochemical system.	CB1 CB2 CB3	CE1 CE2 CE5 CE6 CE13 CE14 CE16 CE17 CE18	CT1 CT15
Identify the different types of coastal sedimentary environments in function of their sedimentary record.	CB1 CB3 CB5	CE1 CE2 CE6 CE14 CE18	CT1 CT15
Understand the coastal and marine environments space-temporal evolution	CB1 CB2 CB3 CB4 CB5	CE1 CE2 CE5 CE6 CE14 CE19 CE26	CT1 CT15

Contents	
Topic	
Subject 1. Introduction to the sedimentary environments	Introduction to the Stratigraphy and the sedimentary environmnts Evolution of the sedimentary environments in the context of the sequential Stratigraphy
Subject 2. Introduction to the processes of transport and sedimentation in sedimentary environments	Transport and sedimentation by currents, tides, waves and wind Characteristics and related sedimentary structures. Mass transport,sediments flows and turbidity currents. Associated sedimentary structures.
Subject 3. Beaches and systems island- barrier-lagoon	Factors that influence in the coastal morphology. Coastal dynamics and sedimentary processes. Beaches: types, subenvironments and dynamics. Barriers: types and morphology.

Subject 4. Deltas	Deltaic processes. Classification of deltas and subenvironments Processes of deformation. Temporal and spatial variability of the deltaic systems.
Subject 5. Estuaries, rias and intertidal flats	Introduction to these transitional environments. Differences and classification. Physical processes. Biogeochemical processes. Zonation and sedimentology. Evolution and stratigraphic implications fo these transitional enviroments.
Subject 6. The continental shelf	Continental shelfs and epicontinental seas: geomorphological classification. Processes in the continental shelf. Siliciclastic and carbonatic continental shelfs.
Subject 7. Sedimentary oceanic processses	Contribution of sediments to the ocean. Atmospheric and oceanic processes of control of the sedimentation. Upwelling and downwelling. Biogeochemical processes in the oceanic sedimentation
Subject 8. Sedimentay processes in the slope and in the oceanic basins	Dynamics of the dense flows Types of deposits, classification and morphology The turbidites. Types and deposits
Subject 9. Contourites and depositional contourite systems	Classification and factors that define a turbiditic system. Deep oceanic circulation. Erosional and depositional contouritic features. Dynamic and evolution of the contouritic systems. Economic interest of the contouritic deposits.
Subject 10. Pelagic and hemipelagic sedimentation.	Distribution of the pelagic and hemipelagic sediments in the ocean bottoms. Oceanic sedimentary processes and distribution of pelagic and hemipelagic sediments. Types of deposits.
Subject 11. Synthesis:	Sedimentary evolution of marine and coastal environments.

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	Mapping 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. Stratigraphic sections Seminar 3. Videos of marine sedimentary en environments.

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

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

Assessment

	Description	Qualification	Evaluated Competencess		
Case studies	Report (memory) of the results obtained in the classroom of computing.	5	CB2	CE19	
Studies excursion	Reports of the exits of field. It will evaluate the assistance to the field.	10	CB3 CB4	CE5 CE6 CE13 CE16 CE17 CE18	CT1 CT15
Seminars	Preparation of a work of synthesis and results for each one of the seminars	15	CB4	CE1 CE2 CE5 CE18 CE19	CT1 CT15
Objective questions exam	Examination with short answer questions on the topics developed during master classes	70	CB4	CE1 CE2 CE5 CE18	CT1 CT15

Other comments on the Evaluation

To surpass the matter, will be necessary to surpass 45% 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

Masselink, G. y Hughes, **Introduction to Coastal Processes & Geomorphology**, 2nd, Routledge, 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

Thurman, H.V. y Trujillo, A.P., **Essentials of Oceanography (11 Edition)**, 11st, Pearson, 2011

Tucker, M. y Wright, P., **Carbonate Sedimentology**, 1st, Blackwell Science, 1990

Weimer, P. y Link, M.H., **Seismic facies and sedimentary processes of submarine fans and turbidite systems**, 1st, Springer-Verlag, 1991

Complementary Bibliography

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

Rebesco, M., Camerlenghi, A., **Contourites. Developments in Sedimentology**, 1st, Elsevier, 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

Wefer, G.; Billet, D.; Hebbeln, D.; Jorgensen, Bo B.; y otros, **Ocean Margin Systems**, 1st, Springer-Verlag, 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

Sedimentology/V10G060V01305

IDENTIFYING DATA				
Chemical oceanography II				
Subject	Chemical oceanography II			
Code	V10G060V01403			
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	Estévez Bastos, Pablo Leao Martins, Jose Manuel Nieto Palmeiro, Óscar Pena Pereira, Francisco Javier			
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
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE4	To know the basic techniques to sample the water column, organisms, sediments and sea bottom, as well as the surveying methods for dynamic and structural variables
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE12	To be able to operate the instrumental techniques applied to sea
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE14	To recognize and analyze new problems and to propose problem-solving strategies
CE15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
CE16	To plan, design and implement applied research from the recognition stage to the final evaluation of results and discoveries
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CT3	Written and oral communication in the official languages of the University
CT6	Problem management and solving skills
CT11	Ability to learn independently and continuously
CT15	Ability to apply knowledge in practice

Learning outcomes	Competences		
Enumerate the physical parameters-chemical more notable in the water of sea to realise oceanographic studies.	CB2 CB5	CE1 CE2 CE6 CE18	CT3 CT11
Describe the foundations and the applications of the technicians of chemical analysis more usually used in the laboratory.	CB4 CB5	CE1 CE2 CE4 CE5 CE12 CE15 CE18	CT3 CT6 CT15

Know choose and use the material for the taking of sample of the water of mar.	CB2 CB4 CB5	CE2 CE4 CE5 CE12 CE13 CE15 CE16 CE17	CT3 CT6 CT15
Apply the technicians of chemical analysis to the compounds of greater interest in the Chemical Oceanography.	CB2 CB4 CB5	CE2 CE5 CE12 CE13 CE15 CE16 CE17	CT6 CT15
Apply the experimental conditions more adapted for the determination of a chemical compound in function of the chemical reactivity.	CB2 CB5	CE5 CE6 CE12 CE13 CE14 CE15 CE16	CT3 CT6 CT15
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 CB5	CE2 CE13 CE15 CE18	CT15
Prepare the reagents and the necessary material to carry out an oceanographic campaign.	CB2 CB4 CB5	CE1 CE2 CE4 CE5 CE12 CE13 CE15 CE16 CE17 CE18	CT3 CT6 CT15

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

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	0.5	0	0.5
Lecturing	18.5	40	58.5
Problem solving	6	20	26
Laboratory practical	20	0	20
Mentored work	7	0	7

Presentation	0.5	0.5	1
Essay questions exam	1.5	0	1.5
Problem and/or exercise solving	1.5	0	1.5
Practices report	0	20	20
Essay	0	14	14

*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 Competencess		
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 CB5	CE2 CE5 CE12 CE13 CE15 CE16 CE18	CT3 CT6 CT15
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		CE1 CE2 CE4 CE5 CE6 CE12 CE15 CE16 CE18	CT3 CT15
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 CB5	CE1 CE4 CE5 CE12 CE15 CE18	CT3
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 CB5	CE2 CE4 CE6 CE12 CE13 CE15 CE16 CE18	CT3 CT6 CT11 CT15
Practices report	The work of laboratory and the memory of practices will be evaluated by the professor of agreement to some previously established criteria that will be published in the platform TEMA. 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 CB5	CE1 CE2 CE4 CE5 CE6 CE12 CE13 CE15 CE16 CE17 CE18	CT3 CT6 CT15
Essay	The report presented in the tutored works will be evaluated by the professor of agreement to some previously established criteria that will be published in the platform TEMA. 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 CB5	CE1 CE2 CE4 CE5 CE6 CE14 CE15 CE16 CE17 CE18	CT3 CT6 CT15

Other comments on the Evaluation

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

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

The subject consists of four big principal blocks and the qualification of each one of them is weighted by 25 % on the final note:

1.-Long answer tests. To consider this one to be passed, the students will have to obtain a qualification equal or superior to 5 points.

2.-Resolution of problems and / or exercises. To consider this one to be passed, the students will have to obtain a qualification equal or superior to 5 points.

3.-Works of seminars. They consist on Tutored Works and Presentations. To consider this one to be passed, the students will have to obtain a qualification equal or superior to 5 points.

4.- Practical of laboratory. They consist on Laboratory Practises and Reports / memories of practises. To consider this one to be passed, the students will have to obtain a qualification equal or superior to 5 points.

. It will evaluate the work realised in the laboratory (5%) and the corresponding report of practices (20%) following some criteria that will be published in the platform TEMA.

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

In case that the minimal qualification was not achieved in the blocks 1.-and / or 2.-, they will have to perform again the examination in the summons of July.

In case that the minimal qualification was not achieved in the blocks 3.-and / or 4.-, the works will have to be sent again by the pertinent corrections in the term that the corresponding teacher will consider opportune.

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

The not properly justified absence to one of the sessions of seminars or practical, blocks 3.- and 4.-, it supposes the no evaluation of the block that correspond, having to repeat in the following course.

It is required that the students curse this subject with a responsible and honest behaviour.

It is considered 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 exam, report or work designed with this purpose. This fraudulent behaviour will be sanctioned with the firmness and rigour that establishes the valid legislation.

In case of not surpassing the subject, only will validate for the following year the following proofs in case to have them surpassed:

- Presentations/exhibitions

- Practical of laboratory

- Inform/memories of practices

- Works and projects

Sources of information

Basic Bibliography

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

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

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

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

Complementary Bibliography

Aminot A., Chaussepied M. (Eds.), **Manuel des Analyses Chimiques en Milieu Marin**, CNEXO,

Parsons T.R., Maita Y., Lalli C.M., **A Manual of Chemical and Biological Methods of Seawater Analysis**, Pergamon Press,

Skoog D.A., West D.M., Holler F.J., (Crouch S.R.), **Fundamentos de Química Analítica**, McGraw-Hill o Reverté,

Beiras R., Pérez S. (Eds.), **Manual de métodos básicos en contaminación acuática**, Universidade de Vigo,

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

Chester R., **Marine Geochemistry**, 2, Blackwell Science,

Bearmean G. (ed.), **Sewater: its composition, properties and behaviour**, 2, The Open University. Pergamon Press,

Horwitz W., Latimer G.W., **Official methods of analysis of AOAC International**, 18, AOAC International, cop.,

Miller J.N., Miller J.C., **Estadística y Quimiometría para Química Analítica**, Prentice-Hall,

Burriel F., Lucena F., Arribas S., Hernández J., **Química Analítica Cualitativa**, 14, Paraninfo,

Recommendations

Subjects that continue the syllabus

Subjects that it is recommended to have taken before

Chemical oceanography I/V10G060V01304

Other comments

It is assumed that the students, at the beginning of the subject, have the following knowledge in Chemistry:

- Formulation and chemical nomenclature
- Calculation of concentrations
- Balance of basic chemical reactions and stoichiometric ratios.

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

IDENTIFYING DATA				
Principles of marine microbiology				
Subject	Principles of marine microbiology			
Code	V10G060V01404			
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	Longo González, Elisa			
E-mail	elongo@uvigo.es			
Web				
General description	Basic introduction to marine microorganisms and their place in the living world. We study the used methods in marine microbiology, especially those based on molecular biology . The subjet explores the major metabolic pathways by which microbes obtain energy and carbon for celular growth, with especial attention to physiology and diversity of bacteria and arqueas. Their role in diverse hábitats and in ocean processes are included			

Competencies	
Code	
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
CE11	To manage the use of littoral and coastal region and their resources in a sustainable way
CE12	To be able to operate the instrumental techniques applied to sea
CE13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE20	To find and evaluate marine resources of various kinds
CT1	Analysis and synthesis ability
CT2	Organization and planning skills
CT6	Problem management and solving skills

Learning outcomes			
Learning outcomes	Competences		
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. Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences	CB2 CB4		
Organization and planning skills To find and evaluate marine resources of various kinds Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work	CB3 CB4		
To be able to operate the instrumental techniques applied to sea	CB2	CE12 CE13 CE17 CE20	CT1 CT6
New	CB2 CB3 CB4	CE11 CE20	CT1
New	CB2 CB3 CB4	CE11 CE20	CT1 CT2 CT6

Contents
Topic
Topic 1.- Estructure and funtion of procariote cell Estructure and size of procariote cell

Topic 2.- Methods in Microbiology. Viable but not culturable cells.	Methods in culture cultured and non cultured cell
Topic 3.- Sampling methods and microbiological techniques	Determination of the size of microbial poblations and molecular techniques
Topic 4.- Microbial metabolism and phyisiological diversity. Distribution and diversity of marine bacteria	Phototrofism, organotrofism and litotrofism. bacteria of marine habitats
Topic 5.- Distribution and diversity of marine arqueas	Arqueas of marine habitats
Topic 6.-Biogeoquemical cicles.	Carbón, nitogen and other biogemical cicles
Topic 7.- Interaction of microorganisms and others organisms	Simbiosis, methabiosis and other relationships

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	30	30	60
Laboratory practical	17	8.16	25.16
Collaborative Learning	0.5	0	0.5
Seminars	1.5	0	1.5
Essay questions exam	0.6	27	27.6
Objective questions exam	0.9	20.6397	21.5397
Problem and/or exercise solving	0.6	10.2	10.8
Essay questions exam	0.3	0	0.3
Objective questions exam	0.3	0	0.3
Problem and/or exercise solving	0.3	0	0.3
Objective questions exam	0.5	0	0.5
Essay	1.5	0	1.5

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

Methodologies

	Description
Lecturing	The practices following the protocols previously exposed platform topic (which the student has to take to the lab) will be mandatory. Will be a test in the laboratory, on the last day of practices, which counted 15% in the final grade of the course. Also the valuation shall take into account the skills and the student skills in the laboratory that can be up to 5% of the note. Content of the practices of the subject: Practice 1. Preparation of media Practice 2. Methods of growing of microorganisms and obtention of pure culture Practice 3. Bacterial count Practice 4.-study of ayeast grwth curve Practice 5-bioluminescent bacteria Practice 6.-bacterial identification Practice 7.-conservation of microorganisms
Laboratory practical	It is Explained the fluorescence staining technique. The protocol is displayed in a video and preparations will be shown. We will discuss their use and application. At the end there will be a type test to assess students understanding. The note of the seminar will be maximum 4% of final note and only scored students attending.
Collaborative Learning	(*)O profesor-a organiza, asesora e supervisa as actividades integradas de aprendizaxe colaborativo a desenvolver en grupos de tres ou catro alumnos-as. Ao final se avaliarán os resultados obtidos mediante unha proba escrita.
Seminars	Students will develop a brief compression in team and individual work on bacterial movement. Groups will be formed. After the group work and discussion a summary/group of no more than 1 page will be delivered to computer. The group will propose a test question. The evaluation will be about: teamwork; Exhibition spokesman; Contributions to the general discussion; Questions; Overview. This activity will only score students attending and the maximum score is 5% of the final grade

Personalized assistance

Methodologies	Description
Laboratory practical	Students will be served in a personalized manner the hours of tutoring from the teacher, who is 10-13 h, Monday and Tuesday, attention individual provided that is not another priority activity. The student who wish, can go to personalized tutoring to solve doubts, mainly at the times indicated. To optimize time, it is necessary that the student contact the teacher in advance.

Seminars	Students will be served in a personalized manner the hours of tutoring from the teacher, who is 10-13 h, Monday and Tuesday, attention individual provided that is not another priority activity. The student who wish, can go to personalized tutoring to solve doubts, mainly at the times indicated. To optimize time, it is necessary that the student contact the teacher in advance
Lecturing	
Collaborative Learning	

Assessment

	Description	Qualification	Evaluated Competencess		
Essay questions exam	(*)LECCIÓN MAXISTRAL. Unha segunda proba incluirá preguntas de desenvolvemento.	30	CB2 CB3 CB4	CE11	CT1
Objective questions exam	(*)LECCIÓN MAXISTRAL. Os contidos teóricos expostos na aula durante o curso avaliaranse mediante tres tipos de probas, a realizar no exame final. A primeira proba incluirá preguntas obxectivas. Indícase na columna adxunta o peso desta e as seguintes probas, na nota final da materia	10	CB2 CB3 CB4	CE11 CE12 CE13 CE20	CT2
Problem and/or exercise solving	(*)LECCIÓN MAXISTRAL. A terceira proba consistirá na resolución de exercicios.	16	CB2 CB3		CT1 CT6
Essay questions exam	(*)PRÁCTICAS. A segunda proba incluirá preguntas de desenvolvemento.	10	CB2 CB3	CE17	CT2
Objective questions exam	(*)PRÁCTICAS. Os contidos tratados en laboratorio avaliaranse mediante tres tipos de probas, a realizar ao termo da semana de prácticas. A primeira proba incluirá preguntas obxectivas.	10	CB2 CB3	CE12 CE17 CE20	CT2
Problem and/or exercise solving	(*)PRÁCTICAS. A terceira proba incluirá resolución de problemas.	12	CB2 CB3		CT6
Objective questions exam	(*)SEMINARIO I. Aprendizaxe Colaborativo. Os contidos traballados avaliaranse ao final do seminario mediante unha única proba de preguntas obxectivas.	6	CB3 CB4		CT1 CT2
Essay	(*)SEMINARIO II. Os contidos traballados avaliaranse mediante un traballo en grupo, a realizar durante o seminario.	6	CB4		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

Sources of information

Basic Bibliography

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

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

Complementary Bibliography

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

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

Recommendations

Subjects that continue the syllabus

Marine microbiology and parasitology/V10G060V01906

IDENTIFYING DATA				
Marine zoology				
Subject	Marine zoology			
Code	V10G060V01405			
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	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	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
CE2	To know and understand the essential facts, concepts, principles and theories related to oceanography
CE4	To know the basic techniques to sample the water column, organisms, sediments and sea bottom, as well as the surveying methods for dynamic and structural variables
CE5	Basic knowledge of research methodology in oceanography
CE6	Ability to identify and understand the problems in the field of oceanography
CE17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
CE18	To transmit writing, verbal and graphical information for audiences of various types
CT1	Analysis and synthesis ability
CT2	Organization and planning skills
CT3	Written and oral communication in the official languages of the University
CT8	Teamwork ability
CT11	Ability to learn independently and continuously
CT15	Ability to apply knowledge in practice
CT16	Research skills

Learning outcomes		
Learning outcomes		Competences
Handle vocabulary, codes and inherent concepts to the marine zoology	CB1	CE1
Know and comprise the essential facts, concepts, principles and theories related with the marine zoology.	CB1	CE2
Know the basic techniques of sampling of the fauna in the column of water, and diverse types of fund		CE4
Basic knowledge of the methodology of investigation in marine zoology		CE5
Capacity to identify and understand the problems related with the marine zoology		CE6
Know work in campaigns and in laboratory of responsible way and sure, promoting the tasks in team	CB2	CE17
Transmit information of form written, verbal and graphic for audiences of diverse types	CB2 CB4	CE18
Capacity of analysis and synthesis	CB3	CT1

Capacity of organisation and planning		CT2
Oral communication and writing in the official tongues of the University	CB4	CT3
Capacity to work in one instrument		CT8
Capacity to learn of autonomous and continuous form	CB5	CT11
Capacity to apply the knowledges in practice		CT15
Skills of investigation		CT16

Contents	
Topic	
LESSON 1: INTRODUCTION	Definition and objectives of the subject. General characteristics of the metazoa: definition and models of organisation
LESSON 2: PHYLUM PORIFERA. PHYLUM PLACOZOA.	PORIFERA: general characteristics, cell types and skeleton. Types of organisation. Reproduction and development. Systematic summary. PLACOZOA: Form and function.
LESSON 3: PHYLUM CNIDARIA	General characteristics. Polymorphism: The polyp and the medusa. Cell types. Reproduction. Systematic summary. Hydrozoa, Scyphozoa, Staurozoa, Cubozoa and Anthozoa: form and function.
LESSON 4: PHYLUM CTENOPHORA	General characteristics. (Corporal organisation) Form and function. Reproduction. Systematic summary
LESSON 5: The BILATERIA: INTRODUCTION. PHYLA ACOELOMORPHA, PLATYHELMINTHES, MESOZOA and NEMERTEA	Introduction to Bilateria. Phylum Acoelomorpha: Form and function. Phylum Platyhelminthes: General characteristics and classification; Turbellaria: form and function. Phylum Mesozoa: General characteristics and classification. Phylum Nemertea: General characteristics; (corporal organisation) form and function; reproduction and development; systematic summary.
LESSON 6. LOPHOTROCHOZOOA: THE LOWER PHYLA	Phyla Gnathostomulida, Rotifera, Acanthocephala, Cycliophora, Gastrotricha and Entoprocta: form and function.
LESSON 7: The LOPHOPHORATES.	General characteristics. Phylum Bryozoa: Form and function; reproduction and development; systematic summary. Phylum Brachiopoda: Form and function; reproduction and development; systematic summary. Phylum Phoronida: Form and function; reproduction and development.
LESSON 8: PHYLUM MOLLUSCA (I)	General characteristics. (Corporal organisation) Form and function. Classification. Synopses of the lower class (Caudofoveata, Solenogastra, Polyplacophora, Monoplacophora and Scaphopoda)
LESSON 9: PHYLUM MOLLUSCA (II)	Class Gastropoda: general characteristics; coiling; torsion; (corporal organisation) form and function; reproduction and development; systematic summary
LESSON 10: PHYLUM MOLLUSCA (III)	Class Bivalvia: general characteristics; (corporal organisation): form and function; reproduction and development; systematic summary
LESSON 11: PHYLUM MOLLUSCA (IV)	Class Cephalopoda: general characteristics; (corporal organisation): form and function; reproduction and development; systematic summary
LESSON 12: PHYLUM ANNELIDA (I)	General characteristics; metamerism; classification. Class Polychaeta: general characteristics; (corporal organisation): form and function; reproduction and development.
LESSON 13: PHYLUM ANNELIDA (II): The SIBOGLINIDAE. PHYLA ECHIURA and SIPUNCULA	The Siboglinidae: general characteristics; form and function; reproduction and development. Phylun Echiura: Form and function. Phylum Sipuncula: Form and function.
LESSON 14: ECDISOZOA: INTRODUCTION and LOWER PHYLA	Definition and systematic summary . Phyla Nematoda, Kinorhyncha, Priapulida, Loricifera and Tardigrada: form and function.
LESSON 15: PHYLUM ARTHROPODA	General characteristics. (Corporal organisation) Form and function. Classification. Subphylum Cheliceriformes: General characteristics; Classification. Merostomata and Pycnogonida: form and function.
LESSON 16: PHYLUM ARTHROPODA: SUBPHYLUM CRUSTACEA (I)	General characteristics. Classification. Class Malacostraca: (corporal organisation) form and function, life forms and classification (Phyllocarida, Hoplocarida and Eumalacostraca).
LESSON 17: PHYLUM ARTHROPODA: SUBPHYLUM CRUSTACEA (II)	Class Remipedia, Cephalocarida, Branchiopoda and Ostracoda: external anatomy and life forms.

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

Planning			
	Class hours	Hours outside the classroom	Total hours
Laboratory practical	20	20	40

Seminars	2	2	4
Mentored work	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 morphology of the main groups, using the usual microscopic techniques in Zoology
Seminars	Exposition of relevant subjects in the training in Marine Zoology and directly related with the practical tutorized work, to present doubts and to guide the students in the methodology to follow.
Mentored work	Realization of practical works in small groups. The works will include the following phases: sampling, sorting and identification of the samples; also a writing and exposition of the main results must be done.
Lecturing	Explanation by the professors of the different themes of the contents of 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 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
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

Assessment

	Description	Qualification	Evaluated Competencess		
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	CE1 CE17 CE18	CT1 CT3 CT11 CT15
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	CE1 CE4 CE5 CE6 CE17 CE18	CT3 CT8 CT11 CT15
Mentored work	The ability to work together autonomously in the laboratory will be evaluated (0,5 points). 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 point).	20		CE1 CE4 CE5 CE6 CE17 CE18	CT1 CT2 CT3 CT8 CT11 CT15 CT16
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	CB5	CE1 CE2 CE18	CT1 CT3 CT11

Other comments on the Evaluation

The update oficial calendar of the final exams can be found
at: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3
The final qualification of the subject is the sum of the mark obtained in each of the proposed methodologies, provided that the rating of each one of them exceed 40% of the mark.
In the July session the student must present only those methodologies not passed.
NOT EVALUATED qualification will be applicated to students who will not present or the final exam of theory or the practical exam.
The marks obtained in seminars and tutorized works will be kept for the next course.
Students are strongly requested to fulfill a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

Sources of information

Basic Bibliography

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

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

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

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

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

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

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Fish and shellfish biology/V10G060V01902

Subjects that are recommended to be taken simultaneously

Marine Ecology/V10G060V01401