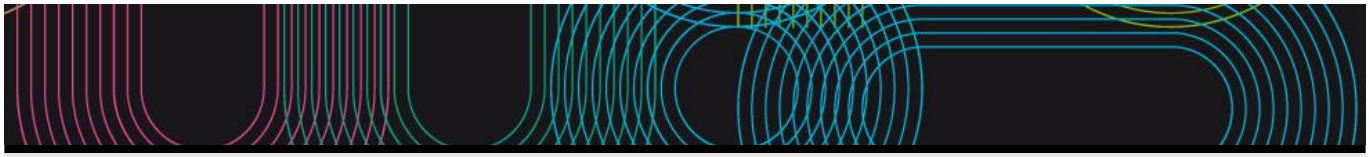

(*)Facultade de Ciencias do Mar

Grado en Ciencias del Mar

Subjects			
Year 4th			
Code	Name	Quadmester	Total Cr.
V10G061V01401	Marine contamination	1st	6
V10G061V01402	Ocean Dynamics	1st	6
V10G061V01403	Applied marine geology	1st	6
V10G061V01404	Marine and coastal management	1st	6
V10G061V01405	Fisheries	1st	6
V10G061V01406	Basin Analysis	2nd	6
V10G061V01407	Fish and shellfish biology	2nd	6
V10G061V01408	Economics and legislation	2nd	6
V10G061V01409	Geographic analysis methods	2nd	6
V10G061V01410	Modelling	2nd	6
V10G061V01411	Marine microbiology and parasitology	2nd	6
V10G061V01412	Marine genetic resources	2nd	6
V10G061V01413	Remote sensing	2nd	6
V10G061V01981	Internships	2nd	6
V10G061V01991	Final Year Dissertation	2nd	12

IDENTIFYING DATA

Marine contamination

Subject	Marine contamination			
Code	V10G061V01401			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	#EnglishFriendly Galician English			
Department				
Coordinator	Beiras García-Sabell, Ricardo			
Lecturers	Beiras García-Sabell, Ricardo Delgado Núñez, Cristina			
E-mail	rbeiras@uvigo.gal			
Web	http://www.ecotox.es			
General description	Main pollutants, sources, environmental distribution, toxic effects. Marine environmental legislation. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results

Code	
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
C8	Know the main pollutants, their causes and effects in the marine and coastal environment.
C11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
4. Know how to design an integrated study of evaluation of pollution in a coastal ecosystem, including the variables to measure and the samples to collect.	A2 A3 A4 A5	B2 B3 B4	C8 C11	D1 D2 D5
5. To get familiar with the study and the management of the waste water effluents in regard to the uses of the surface water bodies, with particular attention to estuaries and marine waters.	A2 A3 A4 A5	B2 B3 B4	C8 C11	D1 D2 D5
6. To get familiar with the instruments of management and control of the human actions with impact on the coastline, and basic notions of the legislation involved in pollution control, within the autonomic, state and international administrations	A2 A3 A4 A5	B2 B3 B4	C8 C11	D1 D2 D5

Contents

Topic

Basic concepts	1. Introduction. Pollution, anthropogenic process. Pollution: deleterious effects. Environmental Quality Criteria and Standards. PBT substances. Sources, distribution and fate of pollutants in the marine compartments.
Urban and agriculture pollutants	2. Organic pollution. Sources: liquid wastes. Estimating the organic load in wastewaters and receiving waters: BOD, COD, TOC. Excess of organic matter: hypoxia and annoxia. 3. Pollution by excess of inorganic nutrients. Nitrogen and phosphorus in the marine environment; anthropogenic sources. Eutrophication and hypereutrophication. Detergents. 4. Microbial pollution. Pathogenic microorganisms present in marine waters. Microbiological analysis of water and shellfish. Self-depuration of natural waters. Disinfection of wastewaters.
Industrial pollutants	5. Hydrocarbons. Oil. Polycyclic Aromatic Hydrocarbons. Sources and weathering of oil in the sea. Effects on marine organisms. Oil spills, lessons learnt. 6. Organohalogenated pollutants. Organochlorine pesticides: sources and levels in the marine compartments; bioaccumulation and biomagnification. Toxicity. Polychlorinated biphenyls (PCBs). Polybrominated campounds (PBDEs); sources and levels in the marine compartments; toxicity. Dioxins and dibenzofurans. 7. Trace metals I. Background levels and enrichment factors. Distribution in the oceans. Mercury: Sorces, distribution, bioaccumulation and biomagnification. Toxicity. Methylmercury. 8. Trace metals II. Copper, lead, cadmium. Sources, concentrations in marine compartments, toxicity. Trobutyltin (TBT).
Ecotoxicology	9. Distribution of pollutants in the environment. Fugacity models. Environmental persistence and half-life. Biodegradation. Chemical speciation and bioavailability of metals. 10. Bioaccumulation. Toxicokinetics. Uptake, accumulation and biotransformation of pollutants in the organisms. Bioconcentration factor (BCF). First order kinetic bioaccumulation models. Thermodynamic bioaccumulation models, Kow. 11. Molecular and cellular responses to pollutants: biomarkers. Biotransformation and elimination of toxic chemicals. Lisosomal alterations. Metallothioneins and stress proteins. Cytochrome P450. Enzymatic alterations. 12. Lethal and sublethal toxicity. Basic principles of toxicology. Dose:response curves. LC50/EC50 and toxicity threshold. Time and other factors affecting toxicity. Effects on reproduction and development. Effects on the bioenergetics and growth. 13. Effects of pollution at population and community levels. Changes in the presence and abundance of populations. Bioindicators by presence and ausence. Biological indices in communities.
Manage¡ing and assessing marine environmental quality	14. Integrative assessment of marine pollution. Coastal pollution monitoring programs. Integration of chemical and biological methods. Use of wild organisms as bioindicators and laboratory bioassays. The mussel watch approach 15. Ecotoxicological bioassays. requirements and methodological aspects. Liquid phase: copepod survival, Seaurchin Embryo Test (SET). Solid phase: amphipod survival, bivalve burrowing. In situ bioassays. 16. Protection of the marine environment. I. Control at the point source discharges. Identification of priority pollutants. Evaluation of the ecological risk. Regulation of new chemical products. REACH. Regulation of complex effluents. 17. Protection of the marine environment. II. Control of the levels of pollutants in receiving waters. Sediment and Water Quality Criteria and standards. International legislation. Water Framework Directive. Marine Strategy Framework Directive.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	20	40	60
Seminars	12	28	40
Studies excursion	4	0	4
Laboratory practical	15	30	45
Objective questions exam	1	0	1

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

Methodologies	
	Description
Lecturing	The theoretical contents that will be evaluated in two calls, one exam along the course and another at the end.
Seminars	The basic scheme of the seminars consists in the following: 1. preparation by the student of a questionary and a practical case available through TEMA. 2. handing over the questionary to the teacher at the beginning of the seminar. 3. resolution and discussion of the case in common with the teacher. Attendance is mandatory.
Studies excursion	Field trip to a supposedly polluted zone with basic sampling material for sediments, water and biota. Collection of representative samples with support of the professor for further analysis in laboratory. Attendance is mandatory.
Laboratory practical	The practices consist in a field trip to an impacted site in the Port of Vigo, and the collection of environmental matrices (water sub-superficial with oceanographic bottle, sediment with *draga Vain *Veen dredge) and native mussels , with object to realize a series of observations, chemical analyses and biological essays in the laboratory, including the solids in suspension, phosphates, BOD5 and faecal microorganisms in water, organic matter, presence of indicator species and ecotoxicological bioassays with the sediments. After the days of laboratory the data obtained are shared in the TEMA platform, and individual memories must be ellaborated and handed over to the teacher by the date of the final exame. Attendance is mandatory.

Personalized assistance	
Methodologies	**Description**
Lecturing	Power point presentations in the classroom; personal assitance in my office at tutorial times. To better optimize the procedure, the student is requested to contact the teacher in advance by email, with reasonable anticipation.
Laboratory practical	Practical work in the laboratory. Students who wish may attend personal tutorials to resolve doubts and/or uncertainties, mainly at the times indicated on the faculty website and/or on the MOOVI platform. To better optimize the procedure, the student is requested to contact the teacher in advance by email, with reasonable anticipation.
Seminars	Questionaire ellaboration and discussion. Students who wish may attend personal tutorials to resolve doubts and/or uncertainties, mainly at the times indicated on the faculty website and/or on the MOOVI platform. To better optimize the procedure, the student is requested to contact the teacher in advance by email, with reasonable anticipation.

Assessment						
	Description	Qualification	Training and Learning Results			
Lecturing	Multiple choice questions exame. Two tests will be designed: one with 30% along the course and another final with 40% coinciding with the call for 1st opportunity.	70	A2 A3 A4 A5	B2 B3 B4	C8 C11	D1 D2 D5
Seminars	Mandatory presence in the seminars. Delivery of the corresponding individual questionnaires	15	A2 A3 A4 A5	B2 B3 B4	C8 C11	D1 D2 D5
Laboratory practical	Mandatory presence in the practices and an individual report	15	A2 A3 A4 A5	B2 B3 B4	C8 C11	D1 D2 D5

Other comments on the Evaluation

Global assessment option: The application for this evaluation option must be submitted in the time and manner determined by the Center, which will be published prior to the academic start. Given the experimental nature of the practices and seminars, attendance at them is mandatory to be eligible for this evaluation option. **Failure to attend the practices, with no justified cause invalidates this possibility, as well as the opportunity for extraordinary evaluation (2nd opportunity).**

2nd opportunity assesment: All tests performed in continuous evaluation may be recovered at the 2nd opportunity, manteining the corresponding percentage indicated above.

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

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

Students are strongly advised to fulfil an 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

Beiras, R., **Marine Pollution**, 1, Elsevier, 2018

Clark, R,B., **Marine Pollution**, 5ª ed., Clarendon Press. Oxford, 2001

Walker C.H. et al.,, **Principles of ecotoxicology**, 4th ed., Taylor & Francis, 2012

E. Law, **Aquatic pollution**, 4a, Wiley, 2017

Beiras, R. e Pérez, S, **Manual de métodos básicos en contaminación acuática**, ECIMAT, 2013

Complementary Bibliography

Kennish, M.J., **Estuarine and marine pollution**, CRC Press, 1997

Recommendations

Subjects that it is recommended to have taken before

Chemistry applied to the marine environment I/V10G061V01304

Chemistry applied to the marine environment II/V10G061V01309

IDENTIFYING DATA				
Ocean Dynamics				
Subject	Ocean Dynamics			
Code	V10G061V01402			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Roson Porto, Gabriel			
Lecturers	Roson Porto, Gabriel Souto Torres, Carlos Alberto			
E-mail	groson@uvigo.es			
Web	http://https://mar.uvigo.es/			
General description	Equations of the ocean and its solutions. The student will learn about the seven ocean equations and their main solutions, from the ocean waves scale to the planetary scale, like Rossby waves and Sverdrup and Stommel models. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
C4	Know, analyze and interpret the physical properties of the ocean according to current theories, as well as to know the most relevant sampling tools and techniques.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Expected results from this subject	Training and Learning Results			
Basic understanding of the role of the ocean in the global climate dynamics.	A4 A5	B3	C4	D1 D2

Contents	
Topic	
Development of the ocean equations.	1.1 f plane approximation. 1.2 Beta plane approximation. Problems. 1.3 Continuity equation, deduction and interpretation. 1.4 Gauss theorem. 1.5 Momentum equation. Pressure forces. Viscous forces. Coriolis acceleration. Application and simplifications. 1.6 Energy conservation equation and salt conservation equation. 1.7 Equation of state. Approximations. 1.8 Recapitulation. 1.9 Problems.

Wavelike solutions of the equations	Wave kinematics. Dispersion relation. 2.1 Wavelike solutions I: Wave's dynamics. Short waves (deep water waves) and long waves (shallow water waves) approximations. Pressure and particles movement. Stokes drift. Problems. 2.2 Inertial movement and forced inertial movement. 2.3 Wavelike solutions II: Planetary waves. Kelvin waves. Rossby waves. Poincaré Waves. 2.4 Wavelike solutions III. Internal waves. Dynamics of internal waves with and without rotation. Stratified Internal waves.
Non wavelike solutions of the equations.	3.1 Geostrophic currents. Thermal wind equations. Sverdrup relation. 3.2 Barotropic currents. Problems 3.3 Ekman's surface and bottom layer and Ekman theory. Ekman's transport. Problems 3.4 Barotropic wind forced oceanic circulation. Ekman's pumping. Vertically integrated equations. Sverdrup and Stommel model's. Vertical structure. Problems 3.5 Baroclinic currents. Theory and applications. Problems. 3.6 Stratification in the ocean. Static stability and friction. Problems. 3.7 Eighth equation: Vorticity conservation. Applications.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	36	0	36
Seminars	16	8	24
Problem solving	0	46	46
Problem and/or exercise solving	3	20	23
Objective questions exam	1	20	21
*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 developing the theory for 36 hours.
Seminars	Guided problem solving during 8 clases of 2 hours.
Problem solving	During this activity related problems or exercises are proposed. Student have to develope their adequate or correct solutions through rutine exercising, application of formulas, algorithms or procedures of transformation of available information, as well as give result interpretation. It is often used as a complement of master lessons.

Personalized assistance	
Methodologies	**Description**
Lecturing	PERSONAL ATTENTION WILL BE MADE. TUTORIAL TIME: TU-WE-TH 11-13 . 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 and ONLY via institutional email @alumnos.uvigo.es.
Seminars	PERSONAL ATTENTION WILL BE MADE. TUTORIAL TIME: TU-WE-TH 11-13 . 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 and ONLY via institutional email @alumnos.uvigo.es.
Problem solving	PERSONAL ATTENTION WILL BE MADE. TUTORIAL TIME: TU-WE-TH 11-13 . 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 and ONLY via institutional email @alumnos.uvigo.es.
Tests	**Description**

Objective questions exam	PERSONAL ATTENTION WILL BE MADE. TUTORIAL TIME: TU-WE-TH 11-13 . 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 and ONLY via institutional email @alumnos.uvigo.es.
Problem and/or exercise solving	PERSONAL ATTENTION WILL BE MADE. TUTORIAL TIME: TU-WE-TH 11-13 . 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 and ONLY via institutional email @alumnos.uvigo.es.

Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	Final test.	40	A4 A5	B3	C4	
Seminars	Seminars test.	40	A4 A5	B3	C4	D1 D2
Problem and/or exercise solving	Intermediate exam	10	A4	B3	C4	D1
Objective questions exam	Intermediate exam	10	A5			D2

Other comments on the Evaluation

Every report must be filed no later than 7 days after the seminar, and none will be evaluated if sent after that timeframe and the grade will be 0.

When a student files his/her report his status in this subject will change to presented.

The final grade of the subject will be the sum of 40% of the final (official) test (ot), 40% of an intermediate test (ie), and a 20% from the seminars test (st), according to the formula:

N=0.4*ot+0.2*ie+0.4*st

The grade in the official test must be at least 5 (from 0 to 10).

CONTINUOUS EVALUATION of the education in the classroom:

Intermediate test half course (1 hour, 40% divided between 20% problems and 20% objective questions). The test will take place during the theoretical classes, and be part of the faculty s test s schedule.

SEMINARS CONTINUOUS EVALUATION.

Seminars individual report s (20%). The students must assist to the seminars, and do the reports again, the following, year if they don t pass the subject.

The seminars and partial test qualification s will be saved for the second opportunity.

Final oficial test (3 hours, 40%).

GLOBAL EVALUATION PROCEDURE: For the students choosing this modality, there will be a global oral evaluation test, in the language chosen by the student, the same day of the official test according to the faculty s schedule. This test will be public and the audio and video will be recorded. The application for this evaluation option must be submitted in the time and manner determined by the Center, which will be published prior to the academic start.

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.

The tests' classroom, date and time will be published at the Marine Sciences' website:

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

Sources of information

Basic Bibliography

Gabriel Rosón, **Las Ecuaciones del océano: Teoría y problemas resueltos.**, 9788481588477, Universidade de Vigo, Servicio de Publicaciones, 2020

CUSHMAN-ROISIN, B., **Introduction to Geophysical Fluid Dynamics. Physical and Numerical Aspects**, 9780120887590, Ray Henderson & Deirde Cavanaugh. U.S.A., ACADEMIC PRESS, 2009

POND, S., G.L.PICKARD, **Introductory Dynamical Oceanography**, 9780750624961, Pergamon Press. Oxford, Butterworth-Heinemann, 1983

Periáñez, Raúl, **Fundamentos de oceanografía dinámica**, 8447212351, Secretariado de Publicaciones de la Universidad de Sevilla, UNIVERSIDAD DE SEVILLA, 2010

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Modelling/V10G061V01410

Subjects that it is recommended to have taken before

Physical oceanography I/V10G061V01302
Physical oceanography II/V10G061V01307

IDENTIFYING DATA

Applied marine geology

Subject	Applied marine geology			
Code	V10G061V01403			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Gago Duport, Luís Carlos			
Lecturers	Alejo Flores, Irene Diz Ferreiro, Paula Francés Pedraz, Guillermo Gago Duport, Luís Carlos Gil Lozano, Carolina Pérez Arlucea, Marta María			
E-mail	duport@uvigo.es			
Web	http://webc10.webs.uvigo.es/gl/			
General description	This course analyzes the implications of marine geology in evaluating geological risks, environmental impact, coastal conservation, and mineralogical and geochemical aspects associated with the extraction of mineral resources. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results

Code	
A1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
B5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
C12	Acquire knowledge about processes and products related to internal and external geological cycles.
C13	Acquire the basic sedimentological, geochemical and geophysical techniques and methodologies used in identification, use and sustainability of the natural resources of coastal and marine environmets.
C14	Know basic concepts and events of global change obtained from geological records.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
1. Know the main applications of the Marine Geology regarding natural resources, risks, environmental problems and associated to the Global Change.	A1 A2 A3 A5	B1	C13 C14	D1
2. Know the main coastal and submarine geological risks and his consequences. Purchase the capacities for the design of measures of adaptation in prevention of risks.	A1 A2 A3 A5	B5	C13	D1

3. Know and modeling the antrophic impacts on coastal and marine environments and the methodology of regeneration, restoration and protection.	A1 A2 A3 A5	B5	C12 C14	D1
4. Know the main geological resources of the half marine and his training, as well as the basic strategies of exploration and exploitation. Other applications: methods on CO2 capture.	A1 A2 A3	B1 B5	C12 C13	D1
5. Realisation of technical reports	A3	B1 B4 B5	C14	D1

Contents	
Topic	
1. Geological risks associated with the marine and coastal environment. (6 hours).	Introduction 1.1. Definition and types of geological risks. 1.2. Coastal and submarine risks linked to internal geodynamics. 1.3. Coastal and submarine risks linked to external geodynamics. 1.4. Sea level changes.
2. Seawater as a source of resources and environmental control. (4 hours).	2.1. Physicochemical and compositional characteristics of seawater. 2.2. Urey's equation: the terrestrial thermostat and the stability of the ocean's pH. 2.3 Processes for obtaining salts: sequential evaporation of seawater. Desalination and brine recovery plants. 2.4. Practical example: Recovery of lithium from seawater: reality or utopia?
3. Genesis, exploration and exploitation of marine geological resources (8 hours).	3.1 Fossil hydrocarbons: oil, gas and gas hydrates. 3.2 Submarine mining: manganese nodules and crusts. Metallic polisulfides. 3.3 Exploration of the ocean floor: geohabitats. 3.4 Exploration of the oceanic subsoil in IODP expeditions.
Seminars.	Seminar I. Stratigraphic control in oil exploration wells (6 hours). Seminar II. Geological capture of atmospheric CO2. (2 hours). Seminar III. Techniques for mineralogical and geochemical analysis of marine sediments. (2 hours). Seminar IV. Practical case: aquifer salinization models on the coast of Almería (4 hours).
Field trips.	Two field trips to analyse flood risk and anthropic effects along different Galician coastal areas (16 hours).
Laboratory practices.	Laboratory practices: Crystallization processes applied to the formation of marine mineral resources. (4 hours.).

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	18	45	63
Seminars	14	37	51
Laboratory practical	4	4	8
Studies excursion	16	0	16
Objective questions exam	2	0	2
Problem and/or exercise solving	0	2	2
Report of practices, practicum and external practices	0	4	4
Report of practices, practicum and external practices	0	4	4
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Presentation of the theoretical contents about the subject under study, theoretical bases and/or guidelines of a work, an exercise that the student body has to develop.
Seminars	Activity focused on work on specific topics, complementary to the theoretical classes, which may involve solving exercises on practical cases.
Laboratory practical	Realization of experiments on crystallization the laboratory. They are used as a laboratory analogues to understand the precipitation of minerals in the marine environment. They are clinical/experimental practices of compulsory attendance.

Studies excursion	Coastal flood risks and data collection. Human action on coasts. Analysis of the geological context. These are activities considered clinical/experimental and, therefore, attendance is mandatory.

Personalized assistance	
Methodologies	**Description**
Seminars	Personalized attention will be provided through tutoring carried out in person or through the use of the virtual campus. Tutoring will be arranged at the request of the student, and will be focused on resolving doubts about the contents of the seminars.
Laboratory practical	Conducting crystallization experiments applied to the formation of marine minerals. The student can go to personalized tutoring. These will be arranged at the request of the student and will be focused on resolving doubts about the work done in the laboratory
Studies excursion	The student who wishes may go to tutorials. These will be arranged at the student's request and focused on resolving doubts about the fieldwork.
Tests	**Description**
Objective questions exam	Attention of doubts
Problem and/or exercise solving	Attention of doubts
Report of practices, practicum and external practices	Attention of doubts
Report of practices, practicum and external practices	Attention of doubts

Assessment

	Description	Qualification	Training and Learning Results			
Seminars	The activity of the seminars is focused on the development of specific topics, complementary to the theoretical classes, which may involve solving exercises on practical cases. Attendance at the seminars is mandatory in order to access the continuous assessment.	0	A2 A3 A5			D1
Laboratory practical	Crystallization processes and their application to the formation of marine mineral resources are analyzed using experimental techniques. Attendance is mandatory and active participation is evaluated.	5	A3		C13	D1
Studies excursion	Some of the most relevant aspects described in the theoretical program are analyzed through the geological trips through different points of the Galician coast. It is a clinical/experimental activity and, therefore, mandatory attendance is required.	0	A3		C13 C14	D1
Objective questions exam	Part of the theoretical proof-practical.	35	A1 A3 A5	B1	C12 C14	
Problem and/or exercise solving	Reports of the seminars	35	A2 A3	B1 B4	C12	D1
Report of practices, practicum and external practices	Report of the practices	5	A2 A3	B1 B4	C12 C13 C14	D1
Report of practices, practicum and external practices	Reports of the fieldwork	20	A2 A3 A5	B1 B4 B5	C12	D1

Other comments on the Evaluation

- Attendance at practices, seminars and field trips is mandatory.

- In case of non-attendance at any of the seminars, the corresponding report cannot be submitted.

-A number of absences of more than 20% in seminars will interrupt the c**ontinuous evaluation proces**s.

-Students who have not attended in their entirety - except for justified reasons - laboratory practices or field trips, given their clinical/experimental nature, will not be able to opt for the evaluation of these activities. (art. 14 Reg. aval. 2023).

-**In the global evaluation**, the final exam -in any of the calls- may include any theoretical and/or practical aspects that

have been explained during the course, both in theoretical classes and in seminars. Practices of a clinical/experimental nature (laboratory practices and field trips) may not be the subject of global evaluation. (art. 14 Reg. aval. 2023).

Evaluation at the first opportunity

To pass the subject by continuous assessment, it will be necessary to reach 40% of the maximum score in seminars, practices and field trips, as a necessary condition to take the objective question exam, which will contribute 35% of the remaining grade.

Second chance evaluation

The exam will have the same characteristics and fulfill the same requirements as **the global assessment of the first opportunity**

Exam dates and classes can be consulted on the website of the Faculty of Marine Sciences.

Individualized tutoring.

Tutoring schedules of subject teachers can be consulted on the MOOVI platform.

"Responsible and honest behavior is required of the students taking this subject. If any form of fraud (copying or plagiarism) aimed at falsifying the level of knowledge and skills achieved in any type of test is considered inadmissible, report the work. Fraudulent behavior may result in suspension of the subject for an entire course. An internal record of these actions will be kept so that, in case of recidivism, the rector can request the opening of a disciplinary file"

Sources of information

Basic Bibliography

Beatley, T., **An Introduction to coastal zone management**, 2º ed, Island Press, 2002

Burns, R. (Ed.), **Marine Minerals. Reviews in Mineralogy, vol 6,**, Mineralogical Society of America, 1979

Craig, J.R., Vaughan, D.J. & Skinner, B.J., **Recursos de la Tierra y el Medio Ambiente**, 4º ed., Pearson Education, 2012

Hsu, Chang Samuel., and Paul R. Robinson, **Handbook of Petroleum Technology**, 2ª ed., Springer International, 2017

Chester, Roy,, **Marine Geochemistry,**, 2ª ed., Oxford: Blackwell Science, 2000

Earney, P.C.E., **Marine Mineral Resources**, Taylor and Francis, 2012

Complementary Bibliography

Couper, A, **The Times Atlas and Encyclopaedia of The Sea**, Times Book Ltd, 1989

Cronan, D.S., **Handbook of Marine Mineral Deposits,**, CRC Press,, 1999

Seibold, E.; Berger, W.H., **The sea floor. An introduction to marine geology,**, 2ª ed., Springer, 2017

Keller, E.A., Blodgett, R.H, **Riesgos Naturales: Procesos de la Tierra como riesgos, desastres y catástrofes,**, Pearson Educación, 2007

Recommendations

Subjects that continue the syllabus

Basin Analysis/V10G061V01406
Geographic analysis methods/V10G061V01409

Subjects that are recommended to be taken simultaneously

Marine and coastal management/V10G061V01404

Subjects that it is recommended to have taken before

Coastal and marine sedimentary habitats/V10G061V01207
Geological oceanography I/V10G061V01303
Geological oceanography II/V10G061V01308

IDENTIFYING DATA				
Marine and coastal management				
Subject	Marine and coastal management			
Code	V10G061V01404			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Galician			
Department				
Coordinator	Méndez Martínez, Gonzalo Benito			
Lecturers	Méndez Martínez, Gonzalo Benito			
E-mail	mendez@uvigo.es			
Web	http://https://mar.uvigo.es/			
General description	In this matter presents a multidisciplinary vision of the coastal and marine zone, identifying the conflicts and risks associated to these areas. They enter the main tools for the management of these two environments as well as the administrative context-legislative in that it is framed the coastal and marine management.			

Training and Learning Results	
Code	
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
B5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
C13	Acquire the basic sedimentological, geochemical and geophysical techniques and methodologies used in identification, use and sustainability of the natural resources of coastal and marine environmets.
C14	Know basic concepts and events of global change obtained from geological records.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D3	Understanding the meaning and application of the gender perspective in different fields of knowledge and in professional practice with the aim of achieving a more just and equal society.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Expected results from this subject	Training and Learning Results			
Knowledge and critical assessment of the sources of information for coastal and sea planning and management	A2 A3	B1 B4		D1 D3
Elaborate land use/cover maps	A4	B4 B5	C13 C14	
Capacity to understand the application of the corresponding sectorial legislations	A3 A4	B1 B4 B5		D3 D5
To know and evaluate the legal uses of the coastal and marine areas	A4	B5		D1 D5
To understand the sustainable use of the resources	A3	B5		D5
To evaluate the environmental impacts in the coastal and marine zones				D1 D3 D5

Contents	
Topic	
1. Processes and state of the coastal environments	1.1. Processes and state of the coastal environments 1.1.1. Global change problems.
2. Management of the coastal space	2.1. Criteria of management 2.2. Experiences

3. Tools and Technics for the planning and management of the sea	3.1. Methodologies 3.2. Technics
4. Intervention instruments in the coast and marine areas	4.1. The Law of the Coast 4.2. Urbanistic Legislation applicable to the protection of the seaboard 4.3. Protection of natural areas, elements and species of interest 4.4. Use and conservation of the coastal spaces for turistic uses. 4.5. Management of port spaces 4.6. The management of the installations and spaces for the aquaculture
5. Evaluations of impact	5.1. Basic concepts 5.2. Evaluation of projects 5.3. Evaluation of plans and programs
6. Jurisdictional Waters and territorial sea	6.1. Basic concepts and international norms 6.2. Methodologies 6.3. The Spanish rule 6.4. Examples of application

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	23	46	69
Seminars	14	30	44
Studies excursion	8	11	19
Practices through ICT	7	9	16
Problem and/or exercise solving	2	0	2

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

Methodologies

	Description
Lecturing	Theoretical contents. Concepts, etc.
Seminars	7 Seminars on subjects related with the Theory: preparation of bibliographic works and exhibition
Studies excursion	Field trip to A Lanzada isthmus for the observation of natural environments and human modifications, impacts, management, etc.
Practices through ICT	P1-Legal territorial boundaries P2-Evaluation of environmental impact

Personalized assistance

Methodologies	Description
Seminars	7 seminars of 2 hours in which the lecturer will enter a subject and the students will work on a questionnaire. All the questions will be solved in the seminars. There will be personal tutorials for the preparation of the oral and written presentations in previously schedulled sesions.
Lecturing	23 classes of 1 hour. Students will have access to tutorials, mainly in the indicated schedules. It is advisable that the student contact the lecturer by e-mail.
Practices through ICT	7 hours, in the computer room and/or in cabinet. They will aproach different subjects applied of coastal management, where the students will have to solve problems posed during the practice. The doubts and questions will be addressed during the practice.
Studies excursion	Field practices on the isthmus of A Lanzada. Attention in the field the day of the field trip.

Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	The evaluation will consist of a written exam. To be approved, the student need to obtain a minimum of 4.5 points on the condition that the global average reaches 5 points.	40	A2 A3	B1		D1 D3 D5
Seminars	Assistance is compulsory. To be approved, the student need to obtain a minimum of 4.5 points on the condition that the global average reaches 5 points.	30	A3 A4	B4	C13 C14	D1 D3 D5
Studies excursion	Delivery of a memory of field/questionnaire	10	A3	B1	C13 C14	D1 D3 D5

Practices through ICT	Assistance is compulsory. To pass the proofs, the students will need to obtain a minimum of 4.5 points on the condition that the global average reaches 5 points. The students will present the required tests, memoires, etc. the same day at the end of the practice.	20	A4	B5	D1 D3 D5

Other comments on the Evaluation

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

The students are required a responsible and honest behaviour. Any form of fraud (i.e. copies and/or plagiarism) directed to alter the level of knowledge or skill reached by the student/to in any type of proof, report or work designed with this purpose is consider inadmissible. The fraudulent behaviours will suppose the suspension of the subject during a complete course. An internal file containing these irregular behaviors will be started, and subsequently the lecturer would be able to request the opening of a disciplinary file in the rectorship.

The global evaluation will be carried out by means of a single test of all the contents of the subject with theoretical questions and practical exercises.

The second chance evaluation will be carried out through specific tests of each one of the failed parts (theory, seminars, practices and field trip).

Global assessment option: The application for this evaluation option must be submitted in the time and manner determined by the Center, which will be published prior to the academic start. Given the experimental nature of the practices, attendance at them is mandatory to be eligible for this evaluation option. **Failure to attend the practices, with no justified cause invalidates this possibility, as well as the opportunity for extraordinary evaluation (2nd opportunity).**

Sources of information

Basic Bibliography

Barragán Muñoz, J.M.,, **Las áreas litorales de España. Del análisis geográfico a la gestión integrada**, Ed. Ariel,

Doménech, J.L., Sardá, R., Carballo, A., Villasante, C.S., Barragán, J.M., Borja, A., Rodríguez, M.J, **Gestión integrada de zonas costeras**, AENOR ediciones,

Masselink, G. y Gehrels, R., **Coastal environments and global change**, Wiley,

Gómez Orea, D. y Gómez Villarino, A., **Evaluación de impacto ambiental**, MP,

Complementary Bibliography

Barragán Muñoz, J.M., **Coastal management and public policy in Spain**, Ocean and Coastal Management,

Comisión Europea, **Programa de demostración de la UE sobre la Gestión Integrada de las Zonas Costeras 1997-1999. Hacia una estrategia europea para la gestión integrada de las zonas costeras. Principios generales y opcio**, Luxemburgo, Oficina de Publicaciones Oficiales de las Comunidades Europeas,

Prada, A., Vázquez-Rodríguez, M.X., Soliño-Millán, M., **Desarrollo sostenible en la costa gallega**, CIEF, Centro de Investigación Económica y Financiera, Fundación Novacaixagalicia,

Barragán Muñoz, J.M., **Política, Gestión y Litoral: Una nueva visión de la Gestión Integrada de Áreas Litorales**, Tébar Flores,

Barragán Muñoz, J.M., **Medio Ambiente y desarrollo en áreas litorales**, Servicio de publicaciones de la U. Cádiz. ,

Gómez Orea, D., **Evaluación ambiental estratégica**, Mundiprensa,

Recommendations

Subjects that continue the syllabus

Geographic analysis methods/V10G061V01409

Subjects that are recommended to be taken simultaneously

Applied marine geology/V10G061V01403

Subjects that it is recommended to have taken before

Coastal and marine sedimentary habitats/V10G061V01207

IDENTIFYING DATA				
Fisheries				
Subject	Fisheries			
Code	V10G061V01405			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Spanish			
Department				
Coordinator	González Castro, Bernardino			
Lecturers	González Castro, Bernardino			
E-mail	bcastro@uvigo.es			
Web	http://https://moovi.uvigo.gal/course/view.php?id=11583			
General description	This course aims to serve as an introduction to the dynamics of exploited populations and to the basic methodologies used in their assessment and management.			

Training and Learning Results	
Code	
A1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
C11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Expected results from this subject	Training and Learning Results		
Understand the population processes that affect the dynamics of living resources		C11	D1 D5
Understand the basic methods of fisheries resource assessment	A1	C11	D1
Understand and apply basic methods of fitting mathematical models for parameter estimation, population dynamics and assessment of marine living resources	A1	C11	D1 D5
Develop skills to use basic fisheries computer programs	A1	C11	

Contents	
Topic	
Characterization of marine fisheries resources	Types of resources. Marine areas of interest in the exploitation of resources. Degree of exploitation of marine living resources.
The fishing process	Fishing gears, boats and methods. Selectivity of fishing gears
The unit stock	Population and stock. Population parameters. Characterization of management units. Estimation of abundance of exploited stocks
Reproduction	Maturation and fecundity. Estimation of maturity. Age and size of first maturity. Estimation of fecundity.
Recruitment	Estimation of recruitment. Stock-recruitment relationship. Population dynamics and stock-recruitment relationships.
Age and growth	Concept of cohort. Determination of age. Length-weight relationship. Allometry and isometry. Condition indices. Mathematical expressions of growth. Age-length keys.
Growth parameters	The von Bertalanffy growth model. Estimation of growth parameters: length-frequency analysis, separation of cohorts, size-at-age analysis, length increments analysis. Conversión of length to age.
Mortality	Survivorship curves. Mortality rates. Natural and fishing mortalities. Fishing effort. Capturability. Catch: Catch equations, Catch rates. Estimation of total, natural and fishing mortalities. Estimation of catchability.

Population dynamics and assessment models of fish stocks	Cohort Analysis: Virtual Population Analysis, Pope's Cohort Analysis. Biomass dynamic models. Yield and biomass per recruit models.
Fisheries Management	Biological reference points. Harvest strategies. Harvest tactics. International organizations and resource management.
Methodologies of parameter estimation	Estimation with Excel. Estimation with FiSAT. Application of an age-structured model of harvested populations.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	32	60	92
Laboratory practical	4	4	8
Practices through ICT	12	17	29
Problem solving	4	12	16
Essay questions exam	2	0	2
Problem and/or exercise solving	1	0	1
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	Oral presentation of the contents of the subject using the blackboard and computer presentations.
Laboratory practical	Size selectivity of a dredge for shellfish resources.
Practices through ICT	Learning and application of numerical methodologies for resolution of parameters and resolution of quantitative problems related to the contents of the subject. Learning and use of basic programs used in the evaluation of marine living resources. Simulation of the dynamics of an exploited population and calculation of Reference Points for fisheries management.
Problem solving	Solution of numerical problems related to the methods explained in the lectures and practices.

Personalized assistance

Methodologies	Description
Lecturing	It will available mainly in the tutoring schedule, except for unforeseen circumstances. It is recommended that the student contact the teacher about when to carry out the tutoring. Tutoring hours: Thursday, from 11:00 to 13:00 h and from 16:00 to 18:00 h and Friday, from 11:00 to 13:00 h. Outside of these hours according to availability of the teacher.
Laboratory practical	It will available mainly in the tutoring schedule, except for unforeseen circumstances. It is recommended that the student contact the teacher about when to carry out the tutoring. Tutoring hours: Thursday, from 11:00 to 13:00 h and from 16:00 to 18:00 h and Friday, from 11:00 to 13:00 h. Outside of these hours according to availability of the teacher.
Practices through ICT	It will available mainly in the tutoring schedule, except for unforeseen circumstances. It is recommended that the student contact the teacher about when to carry out the tutoring. Tutoring hours: Thursday, from 11:00 to 13:00 h and from 16:00 to 18:00 h and Friday, from 11:00 to 13:00 h. Outside of these hours according to availability of the teacher.
Problem solving	It will available mainly in the tutoring schedule, except for unforeseen circumstances. It is recommended that the student contact the teacher about when to carry out the tutoring. Tutoring hours: Thursday, from 11:00 to 13:00 h and from 16:00 to 18:00 h and Friday, from 11:00 to 13:00 h. Outside of these hours according to availability of the teacher.

Assessment

	Description	Qualification	Training and Learning Results		
Lecturing	There will be 3 written exams in which the theoretical contents of the subject will be evaluated	70	A1	C11	D1 D5
Laboratory practical	Written examination on the contents of the laboratory practices.	5	A1	C11	D1 D5
Practices through ICT	Written examination on the contents of the computer room sessions.	10	A1	C11	D1 D5
Problem solving	Written exam in which the ability to apply the population parameter estimation and evaluation methodologies explained in the theoretical and practical classes will be assessed.	15	A1	C11	D1 D5

Other comments on the Evaluation

Students who choose to take the global assessment will not be able to take any test (of any part ofthe subject), corresponding to continuous assessment, that is done after the date indicated by the Dean's Office to express the type of assessment chosen.

1) Continuous evaluation

The subject will be considered passed if the sum of the scores of the different tests to be taken is equal to or greater than 5 points, otherwise the whole of the Second Opportunity exam will have to be taken.

1.1- Evaluation of the theory

The evaluation of the "master classes" will be carried out in three written exams throughout the course, two of them within the hours of theory of the subject and one on the date of the First Opportunity exam. In each of the first two exams, all the theoretical contents prior to 5 calendar days from the date of the test will be evaluated, whether or not they have been previously evaluated. The first test is worth 2.0 points and the second 3.5. The 3rd exam, to be carried out on the date of the overall evaluation of the First Opportunity, will have a value of 1.5 points and will cover the entire theory.

1.2- Evaluation of Practices

The evaluation of the "Laboratory Practices" will be carried out at the same time as the first exam of the "Lectures". It will have a maximum score of 0.5 points.

The evaluation of the "ICT-supported practices" will be carried out on the date assigned for the final evaluation of the First Opportunity. Its maximum score will be 1.0 points.

1.3- Evaluation of Problems

It will be carried out on the date of the First Opportunity final exam. The value of this part of the matter will be 1.5 points.

2) Overall evaluation

It will be carried out through a written exam with three parts: theory (maximum score=7), practices (maximum score=1.5) and problems (maximum score=1.5). The subject will be considered approved if the sum of the scores of the different parts of the exam is equal to or greater than 5 points. In the First Opportunity, only those students who have chosen this type of evaluation at the time will be able to carry it out.

In the Second Opportunity, it can be done by all students who have not passed the subject in the First Opportunity (whether in the continuous or global evaluation modality).

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

King, M., **Fisheries biology, assessment and management**, Blackwell Publishing, 2007
Sparre, P. y Venema, S. C., **Introduccón a la evaluación de recursos pesqueros tropicales. Part 1**, FAO, 1997
Jennings, S.; Kaiser, M. J. and Reynolds, J. D., **Marine Fisheries Ecology**, Blackwell Science, 2001

Complementary Bibliography

Hilborn, R. and Hilborn, U., **Overfishing. What everyone needs to know**, Oxford University Press, 2012

Recommendations

Subjects that it is recommended to have taken before

Statistics/V10G061V01107
Marine Ecology/V10G061V01206

Other comments

To carry out the exams the student must have a calculator able to perform linear regression.

IDENTIFYING DATA				
Basin Analysis				
Subject	Basin Analysis			
Code	V10G061V01406			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	García Gil, María Soledad			
Lecturers	Diz Ferreiro, Paula García Gil, María Soledad Pérez Arlucea, Marta María			
E-mail	sgil@uvigo.es			
Web	http://http://webs.uvigo.es/c10/webc10/			
General description	This matter allows the introduction to the analysis of sedimentary basins and of the interpretation of the history of his filling using technical multidisciplinary. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
B5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
C13	Acquire the basic sedimentological, geochemical and geophysical techniques and methodologies used in identification, use and sustainability of the natural resources of coastal and marine environmets.
C14	Know basic concepts and events of global change obtained from geological records.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Expected results from this subject	Training and Learning Results			
Transmit information of form written, verbal and graphic for audiences of diverse types	A4 A5	B1 B5	C14	D1
Caracterice and mapping of marine bottoms, marine sub-bottoms and coastal areas-continental	A3	B4 B5	C13	D1 D5
Interpretation of paleoceanographic proxies	A3 A4	B1 B5	C14	D1

Contents	
Topic	
SUBJECT 1. INTRODUCTION TO THE ANALYSIS OF BASINS	1.1. Definitions. Sedimentary basins. Classification 1.2. Origin and evolution of the oceanic basins 1.3. Interest and applications of the analysis of basins
SUBJECT 2. EXTERNAL AND INTERNAL FACTORS CONTROLLING THE EVOLUTION OF THE SEDIMENTARY BASINS	2.1. Tectonics, Climate, Supply and Sea-level changes 2.2. Sequential stratigraphy: Types of sections, 3D architecture of facies and correlation criteria
SUBJECT 3. DATING METHODS	3.1. Introduction to dating methods.
SUBJECT 4. SEISMIC STRATIGRAPHY	4.1. Sedimentary discontinuity surfaces: Criteria of recognition 4.2. System tracks in the cycle of se-level oscillation 4.3.Sequences and models of sequences.
SUBJECT 5. PALEOCEANOGRAPHY AND PALAEOCLIMATOLOGY	5.1. Palaeoceanography and plaeoclimatology proxies 5.2. Natural mechanisms of climatic and oceanographic changes

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	18	36	54
Case studies	20	0	20
Seminars	14	14	28
Presentation	0	48	48

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

Methodologies

	Description
Lecturing	Presentations of the theoretical concepts that allow the students to adquire or improve the skills to perform the analysis of sedimentary basins. This involves the relationship of multidisciplinary theoretical concepts. The classes will be of 1h. It can be possible to get 1 extra point in the final mark by participation in classroon discussions.
Case studies	Each student will have several real seismic profiles corresponding to a sedimentary basin. They will have to perform the interpretation of each one and to perform a resumen of each practical. (Assistance and reports are mandatories, 30% of the mark)
Seminars	The contents of the master sessions will be practiced with different exercises (recognition of sedimentary basins types in different marine contexts, stratigraphic surfaces. (Assistance and reports are mandatories, 30% of the mark)
Presentation	It is mandatory that each student will have to elaborate an individual report explaining the evolution of the basin based on the interpretation of the seismic records worked on in the practicals. (30% of the mark)

Personalized assistance

Methodologies	Description
Lecturing	Students that wish it will be able to attend to personalized tutorials to resolve doubts, mainly in the indicated schedules. To optimize time, it is necessary that the student to contact with the lecturer previously. The tutorials will be able to be individual or in group in accordance with the schedules of the lecturer: Prof. Soledad García Gil (Tuesday and Thursday: 11 - 14 h) that would be modified according to educational needs.
Seminars	Students that wish it will be able to attend to personalized tutorials to resolve doubts, mainly in the indicated schedules. To optimize time, it is necessary that the student to contact with the lecturer previously. The tutorials will be able to be individual or in group in accordance with the schedules of the lecturer: Prof. Soledad García Gil (Tuesday and Thursday: 11 - 14 h) that would be modified according to educational needs.
Case studies	Students that wish it will be able to attend to personalized tutorials to resolve doubts, mainly in the indicated schedules. To optimize time, it is necessary that the student to contact with the lecturer previously. The tutorials will be able to be individual or in group in accordance with the schedules of the lecturer: Prof. Soledad García Gil (Tuesday and Thursday: 11 - 14 h) that would be modified according to educational needs.
Presentation	Students that wish it will be able to attend to personalized tutorials to resolve doubts, mainly in the indicated schedules. To optimize time, it is necessary that the student to contact with the lecturer previously. The tutorials will be able to be individual or in group in accordance with the schedules of the lecturer: Prof. Soledad García Gil (Tuesday and Thursday: 11 - 14 h) that would be modified according to educational needs.

Assessment

	Description	Qualification	Training and Learning Results			
Case studies	Sequential seismic analysis of a sedimentary basin from the interpretation of seismic records and profiles.	30	A3	B4	C14	D1
Seminars	Reports of Seminars	40	A5	B1 B5	C14	D1 D5
Presentation	Each student will have to elaborate an individual report explaining the evolution of the basin based on the interpretation of the seismic records worked on in the practicals. (30% of the mark)	30	A3	B4	C14	D1

Other comments on the Evaluation

Continuous assesment option

The student will be evaluated continuously and based on the delivery of the reports corresponding to the case studies, seminars and practicals in the percentages described. Given the experimental nature of the seminars and practicals, attendance is compulsory.

Attendance and participation in the discussions of the theoretical classes can mean 1 extra point in the final mark.

Global assesment option

The same percentages indicated above will be maintained. However, given the experimental nature of the seminars and practicals, non-attendace without justification invalidates this option, as well as the extraordinary evaluation.

The application for this evaluation option must be submitted in the time and manner determined by the Center, which will be published prior to the academic start.

Other considerations

Dates and times for reports will be published in https://mar.uvigo.es/alumnado/asignaturas-y-horarios/

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

Rogers, J.W. y Santosh, M., **Continents and supercontinents**, 1, Oxford University Press, 2004

Allen, P.A. y Allen, J.R., **Basin Analysis: Principles and Application to Petroleum Play Assessment**, 3rd, Wiley-Blackwell, 2013

Bradley, RS, **Paleoclimatology (Third Edition) Reconstructing Climates of the Quaternary**, 1, Academic Press, San Diego, 2015

Shanmugam, G., **Deep-Water Processes and Facies Models: Implications for sandstone petroleum reservoirs**, 1, Elsevier, 2006

Treitel, S. y Helbig, K., **Handbook of Geophysical Exploration: Seismic Exploration**, 1, Elsevier, 2011

Huneke, H. y Mulder, T., **Deep-Sea Sediments**, 1, Elsevier, 2010

Catuneanu, O., **Principles of Sequence Stratigraphy**, 1, Elsevier, 2006

Ruddiman WF, **Earth's Climate: Past and Future. Third Edition.**, 3, W. H. Freeman and Company, New York, 2014

Complementary Bibliography

Leeder, M.R. y Pérez-Arlucea, M., **Physical processes in Earth and environmental sciences**, 1, Wiley, 2006

Recommendations

Subjects that it is recommended to have taken before

Coastal and marine sedimentary habitats/V10G061V01207
Sedimentology/V10G061V01205
Geological oceanography II/V10G061V01308

IDENTIFYING DATA				
Fish and shellfish biology				
Subject	Fish and shellfish biology			
Code	V10G061V01407			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Galician			
Department				
Coordinator	Domínguez Martín, José Jorge			
Lecturers	Domínguez Martín, José Jorge Kim , Sin-Yeon			
E-mail	jdguez@uvigo.es			
Web	http://jdguez.webs.uvigo.es/			
General description	This is a special Zoology which studies the main fish and shelfish in the spanish coast. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
B5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
C9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
C10	Know the biological diversity and functioning of marine ecosystems.
C11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Expected results from this subject	Training and Learning Results			
Ability to apply knowledge in practice	A1 A2 A3 A4 A5	B2 B4 B5	C9 C10 C11	D1 D2
Research skills.	A1 A2 A3 A4 A5	B2 B4 B5	C9 C10 C11	D1 D2
Identification of fish and shellfish. Knowledge of the external and internal morphology of fish and shellfish. Knowledge of the distribution, habitat and lifestyles of fish and shellfish. Knowledge of reproduction and life cycles of fish and shellfish. Management of fishery resources and shellfish. Biological bases necessary for the study of Fisheries and Aquaculture.	A1 A2 A3 A4 A5	B2 B4 B5	C9 C10 C11	D1 D2

Contents	
Topic	
Introduction	Fish and shellfish in the tree of life Shellfish species Fish species Life-cycle strategies
Biology of Molluscs	General characteristics of molluscs Classification
Biology of bivalves	External morphology: shell, mantle and foot Habits and life styles: soft bottom excavators, fixed surface inhabitants, surface free inhabitants. Feeding and growth. Digestion, circulation, respiration, excretion. Nervous system and sense organs. Reproduction. Embryonic and larval development. Classification.
Commercial bivalves	Mytilus galloprovincialis Cardium edule Tapes decussatus Venerupis pullastra Ostrea edulis Pecten maximus Chlamys opercularis Chlamys varia
Biology of cephalopods	Distribution and habitat External morphology Habits and life styles. Locomotion and buoyancy. Migrations. Color and bioluminescence. Predators Feeding and growth. Digestion, circulation and gas exchange and excretion Nervous system and organs of the senses Reproduction Embryonic and larval development. Classification
Commercial cephalopods	Sepia officinalis Loligo vulgaris Illex coindetti Octopus vulgaris
Biology of crustaceans	General characteristics Classification Decapods Distribution and habitat External morphology Habits and life styles Locomotion Feeding and growth. Moult Nervous system and organs of the senses Excretion Reproduction and Embryonic and larval development
Commercial crustaceans	Palaemon serratus Palinurus elephas Homarus gammarus Necora puber Maja squinado Nephros norvegicus Pollicipes pollicipes
Biology of fishes	General characteristics Phylogeny, systematic and taxonomy General biology of fishes

Pelagic fishes	General characteristics Distribution and Habitat Feeding and growth Biological cycle Reproduction: nesting areas, larvae and larval mortality, absolute fertility Sardine Anchovy Herring Mackerel Horse Mackerel
Demersal fishes	Hake Cod Plueronectiforms Labrids Others
Oceanic pelagic fishes	Tuna: generalities Commercial tuna Buefin tuna Thunnus alalunga

Planning			
	Class hours	Hours outside the classroom	Total hours
Laboratory practical	20	40	60
Seminars	6	18	24
Lecturing	20	40	60
Problem and/or exercise solving	1	1	2
Objective questions exam	1	1	2
Essay questions exam	1	1	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Laboratory practical	Lab classes are organized according to the following scheme: at the beginning of each class, the theoretical concepts needed to understand the examples to be observed are briefly explained, and a script is given to the student in which these concepts are remembered, and the techniques to follow and the objectives to be achieved explained.
Seminars	The students must carry out an independent and supervised work that they will expose to their classmates. The work will be done accompanied by the teacher in three seminars, the first will propose the subject and will be directed to the students to seek information on the subject. In the second seminar we will discuss the content found by the students and clarify doubts, and in the third one the presentation will be oriented. The seminars will evaluate the independent work of the students. The topics of the work will be varied, and subjects suggested by the students are welcome.
Lecturing	In these classes the teacher will present the different topics of the program using different formats according to the subject to be studied, formats that will be: theory, case studies and / or general examples. The teacher can be supported by audiovisual and computer media, but in general, students do not need to handle them in class. Attendance to these classes, although is highly recommended for the proper follow-up of the course.

Personalized assistance	
Methodologies	**Description**
Lecturing	During them discussions are held on some of the most relevant topics. Tutoring: Mondays and Wednesdays from 12 to 2. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Laboratory practical	At the beginning of each practice, the theoretical concepts necessary for the understanding of the specimens to be observed are briefly explained. All issues that are raised during the practice are resolved. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.

Seminars	The working groups are chosen and the work topics discussed. They are tracked. A critical review and a general discussion of each work is done. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.

Tests	Description
Problem and/or exercise solving	The student has to complete and pass very short questions, with four possible answers and chose the correct ones.
Objective questions exam	The studen has to answer short questions in his/her own words, including specific and objective questions and some in the form of sintesis, refection and elabrotaion of well constructed arguments.
Essay questions exam	Here, the students have to develop a long topic, including an important amount of info, but being able to make it in a well explained and siinthetic way in order to offer a whole vision and including the important details of the topics, mainly being these different lyfe ccyles of fishes and invertebrates.

Assessment

	Description	Qualification	Training and Learning Results			
Laboratory practical	Exam	5	A1 A2 A3 A4 A5	B2 B4 B5	C9 C10 C11	D1 D2
Seminars	Written or expository work	5	A1 A2 A3 A4 A5	B2 B4 B5	C9 C10 C11	D1 D2
Lecturing	Exam	10	A1 A2 A3 A4 A5	B2 B4 B5	C9 C10 C11	D1 D2
Problem and/or exercise solving	Exam	20	A1 A2 A3 A4 A5	B2 B4 B5	C9 C10 C11	D1 D2
Objective questions exam	Exam	30	A1 A2 A3 A4 A5	B2 B4 B5	C9 C10 C11	D1 D2
Essay questions exam	Exam	30	A1 A2 A3 A4 A5	B2 B4 B5	C9 C10 C11	D1 D2

Other comments on the Evaluation

Parcial tests (laboratory, lecturing, problem solving and objective questions exam) will be conducted during official timetable during the course of the discipline. Lab classes, due to their experimental nature, are mandatory.

Global assesment option In the event that the global evaluation option is chosen, as long as the face-to-face requirements mentioned in the experimental activities are met, it will have to be requested during the period that the center stipulates for it, maintaining the % previously described for the different methodologies/tests.

Extraordinary evaluation (2nd chance) In the 2nd opportunity exam, another final exam is conducted that will compute in a similar way to the case of the 1st opportunity.

Others considerations

Date, time and place of exams (1º & 2º opportunity) will be published in the official web of Marine Sciences Faculty:

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

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

Sources of information

Basic Bibliography

C.P.J. Hickman, **Principios integrales de Zoología**, 14, McGraw-Hill, 2009

Complementary Bibliography

Recommendations

Subjects that it is recommended to have taken before

Marine zoology/V10G061V01210

IDENTIFYING DATA				
Economics and legislation				
Subject	Economics and legislation			
Code	V10G061V01408			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish			
Department				
Coordinator	Amigo Dobaño, Josefina Lucy			
Lecturers	Amigo Dobaño, Josefina Lucy			
E-mail	lamigo@uvigo.es			
Web	http://https://mar.uvigo.es/			
General description	Approach to the main variables that allow to realise basic analyses of situation and evolution of the economy.			

Training and Learning Results	
Code	
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C3	Describe how works the global ocean circulation, its forcings and its climate implications.
C7	Apply to the marine and coastal environment the principles and methods used in Chemistry.
C8	Know the main pollutants, their causes and effects in the marine and coastal environment.
C9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
C10	Know the biological diversity and functioning of marine ecosystems.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Expected results from this subject	Training and Learning Results		
Capacity to identify problems related with the marine resources, his consideration from the economic perspective and interpretation of the possible necessary results for the management of the same.	A3 A5	C3 C7 C8 C9 C10	D1 D2
Capacity to develop works or brief reports in the field of the marine resources	A5	C3 C7	D1 D2

Contents	
Topic	
I. INTRODUCTION. BASIC APPEARANCES	1. The Spanish Economy. 2. The Spanish economy in the European or world-wide context 3. Income and Distribution
II. The PRODUCTIVE ACTIVITIES	4. Primary activities. 5. Energetic sector. 6. Industry. 7. Service sector
III. ANALYSIS OF THE MARINE ENVIRONMENT. The FISHING	8.-Institutional appearances and juridical frame 9- Analysis of the Market

Planning			
	Class hours	Hours outside the classroom	Total hours
Seminars	14	33	47
Practices through ICT	15	37	52
Lecturing	23	28	51

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

Methodologies	
	Description
Seminars	In the seminars, will realise fundamentally tasks of preparation and exhibition of works on appearances related with the temario.
Practices through ICT	Formulation and resolution of problems and/or exercises related with the matter. The student has to develop the solutions.
Lecturing	Exhibition by part of the professor of the contents of the matter. Realisation of partial examinations.

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

Assessment					
	Description	Qualification	Training and Learning Results		
Seminars	Workshops of work. Will be able to use the seminars for exhibitions and realisation of partial proofs. Results of learning: -Comprise to handle necessary economic concepts for the management of the marine resources. -Capacity to identify problems relate with the marine resources, economic treatments and interpretation of results.-Comprise to handle necessary economic concepts for the management of the marine resources. -Capacity to identify problems relate with the marine resources, economic treatments and interpretation of results.	30	A3	C3 C7 C8 C9 C10	D1 D2
Practices through ICT	Study of cases. Empirical analysis. Possibility to realise and present works. Results of learning: -Comprise to handle necessary economic concepts for the management of the marine resources. -Capacity to identify problems relate with the marine resources, economic treatments and interpretation of results.	30	A5	C3 C7 C8 C9 C10	D1 D2
Lecturing	-Comprise and handle necessary economic concepts for the economic analysis and the management of the marine resources. -Capacity to identify problems relate with the marine resources, economic treatments and interpretation of results.	40		C3 C7 C8 C9 C10	

Other comments on the Evaluation

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

Global assessment option: The application for this evaluation option must be submitted in the time and manner determined by the Center, which will be published prior to the academic start. Given the experimental nature of the practices, attendance at them is mandatory to be eligible for this evaluation option. **Failure to attend the practices, with no justified cause invalidates this possibility, as well as the opportunity for extraordinary evaluation (2nd opportunity).**

2nd Evaluation Opportunity (JULY): The student will be evaluated by taking an exam on the content of the subject and also by delivering a practical activity.

Sources of information

Basic Bibliography

Complementary Bibliography

GARCÍA DELGADO, J.L.; MYRO; R:(Dirs), **Lecciones de Economía Española**, duodécima, 2015

GARCIA DELGADO, J.KL; MYRO, R., **Economía Española. Una Introducción**, 2012
GARCÍA DE LA CRUZ, J.M.; RUESGA BENITO, S. (coord.), **Economía española. Estructura y regulación**, 2014
GARZA, M.D., Coord., **La actividad pesquera a escala mundial**, 2008
VARELA, M., COORD., **Unha estratexia marítima para Galicia**, 2010
GONZÁLEZ LAXE, F., **Lecciones de Economía Pesquera**, 2008
J. Surís y M. Varela, **Introducción a la Economía de los Recursos Naturales**, Cívitas, 1995
INSTITUTO NACIONAL DE ESTADÍSTICA Anuario estadístico de España, España en cifras, otras publicacion, **www.ine.es**, 2016
EUROSTAT Anuarios e Informes, **http://epp.eurostat.ec.europa.eu**, 2016
FAO Informes anuales agricultura, pesca, alimentación, **www.fao.org**, 2016

Recommendations

IDENTIFYING DATA

Geographic analysis methods

Subject	Geographic analysis methods			
Code	V10G061V01409			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Torres Palenzuela, Jesús Manuel Fontán Bouzas, Ángela			
Lecturers	Fontán Bouzas, Ángela Torres Palenzuela, Jesús Manuel			
E-mail	afontan@uvigo.gal jesu@uvigo.es			
Web	http://www.tgis.uvigo.es			
General description	Introduction to the physical principles of the Teledetection and his Oceanographic Applications. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results

Code	
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
B5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
C1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
C4	Know, analyze and interpret the physical properties of the ocean according to current theories, as well as to know the most relevant sampling tools and techniques.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Learn to use programs of Treatment of Images of Satellite in marine applications.	A2 A3	B1 B2	C1 C4	D1 D2
Work with thermal images, optical and of microwaves in studies of *batimetría coastal, currents and oceanic twists, classification of covers in coastal zone, algorithms of colour and follow-up of poured of hydrocarbons.	A4 A5	B3 B4 B5		

Contents

Topic

1.-INTRODUCTION To THE Objective TELEDETECTION Pretend with this first subject enter to the student in the world of the teledetection and the paper that this plays in the modern oceanography.	1.1.- Teledetection in Oceanography 1.2.- Brief history of the space observation of the oceans 1.3.- Possibilities for the oceanography 1.4.- Temporary and space scales of the phenomena of interest.
2.- PHYSICAL PRINCIPLES OF THE Objective TELEDETECTION In this unit pretends that the student know the principles of the physics of the electromagnetic radiation, his interaction with the atmosphere and the ocean, as well as the spectral characteristics of the covers.	Contents 2.1.- Radiation and electromagnetic spectrum. 2.2.- Terms and units of measure. 2.3.- Principles of the electromagnetic radiation. 2.4.- *Caractrísticas Spectral of the covers. 2.5.- Interaction of the atmosphere with the radiation. 2.5.1.- Absorption. 2.5.2.- Dispersion. 2.5.3.- Broadcast.
3.- ELEMENTS OF A SYSTEM OF Objective TELEDETECTION: In this unit enters to the student in the characteristics that define to a sensor and space platform and airlifted as well as the steps required from the capture of an image by a sensor until his application and utilisation by part of an user. Finally they describe the most used satellites.	Contents: 3.1. System of reception of images Elements of the system Platform and sensor Orbits Resolution of a sensor Types of sensors Platforms *satelitales and airlifted. Photography *aerea and *Drones
4.- *ANALISIS And DIGITAL TREATMENT OF Objective IMAGES: In this unit establish the principles of visual and digital interpretation as well as the processing of the information with the object to delete errors (correction), improve some appearance of the information obtained (enhance) or obtain other parameters from the data of radiance (transformations). Finally it will enter to the student in the digital classification and the integration of information in systems of geographic information.	Contents: 4.1. Visual analysis 4.1.1. Criteria of Interpretation 4.2. Digital treatment 4.2.1. Digital image 4.2.2. Corrections 4.2.3. It enhance 4.2.4. Transformations
5.- APPLICATIONS - Colour of the Ocean - Temperature - Poured and Pollution - Red Tides and Phytoplankton - Oceanic Circulation - polar Thaw - Studies of Choral - fluvial Feathers	Aims: In this last unit enumerate the applications of the teledetection in meteorology and study of the oceans. In each one of these applications makes a description of the physical principles that make it possible, as well as the interpretation of the results obtained and the sensors used.

Planning

	Class hours	Hours outside the classroom	Total hours
Practices through ICT	20	10	30
Seminars	7	15	22
Lecturing	15	40	55
Mentored work	4	10	14
Problem and/or exercise solving	1.7	5	6.7
Presentation	0.3	10	10.3

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

Methodologies	
	Description
Practices through ICT	The methodology that uses in the practical is the one of study directed.
Seminars	It will make a follow-up *individualizado of technicians and contents for the development of the works scheduled . His main aim is to clear the concepts that have been explained in the class of theory or resolve any of the problems of the practical classes.
Lecturing	The lesson *magistral is the method mainly employee, using in the measure of the possible the lesson had a conversation.
Mentored work	The/The student, of individual way or in group, elaborates a document on the thematic of the matter or prepares seminars, investigations, memories, essays, summaries of readings, conferences, etc.

Personalized assistance	
Methodologies	**Description**
Lecturing	The lesson *magistral is the method mainly employee, using in the measure of the possible the lesson had a conversation. The student that wish it will be able to attend to *tutorías personalised to resolve doubts, mainly in the schedules that indicate . To optimise the time, is necessary that the student contact with the professor with *antelación sufficient
Practices through ICT	The methodology that uses in the practical is the one of study directed.
Seminars	It will make a follow-up *individualizado of technicians and contents for the development of theworks scheduled . His main aim is to clear the concepts that have been explained inthe class of theory or resolve any of the problems of the practical classes.
Mentored work	It will be evaluated the work by means of an oral presentation, a theoretical work and a specific practice

Assessment						
	Description	Qualification	Training and Learning Results			
Practices through ICT	The methodology that uses in the practices is it of study directed. They are of mandatory assistance.	15	A2 A3 A4	B2 B3 B4	C4	D2
Seminars	It Will realize a tracking *individualizado of techniques and contents stop the development of the works scheduled. The seminars are of mandatory assistance.	10	A2 A3	B2 B3	C1 C4	D1 D2
Lecturing	The lesson *maxistral is the method mainly employee, using in the measure of the possible to lesson *dialogada. Some activities will be of mandatory assistance. The students will receive previous notifications stop this assistance through **moovi.	5	A2 A3 A4	B1 B3	C1 C4	D1 D2
Mentored work	IT/The student, of individual way or in group, elaborates a document envelope to thematic of the subject or prepares seminars, investigations, memories, essays, summaries of readings, conferences, etc. This work and his presentation can be substituted by a theoretical and practical proof in assessment of the professor.	30	A2 A4 A5	B2 B3 B4 B5	C4	D1
Problem and/or exercise solving	The problems are related with the capacity of the student purchased in the practices and the theory. They are of mandatory character.	30	A2 A5	B2 B3 B4	C4	D1
Presentation	Exhibition by part of the students in front of it teaching and/or a group of students of one fear on contents of the subject or of the resulted of one work, exercise, project... Can be carried out of individual way or in group.	10	A2 A3 A4	B1 B4 B5	C4	D1

Other comments on the Evaluation

Continuous evaluation:

The realization of works (30%) and his exhibition (10%) can be substituted by a theoretical and practical examination with the percentage sum 40% of the final note. This option will be valued pole professor to surpass the subject.To surpass the subject, demands that the global qualification of each of the modules by separate was not inferior to 4 points. Incidentally, in the case of the work *tutelado, is necessary that, at least join of the parts (Vectorial Analysis or RásterAnalysis) have an equal or upper qualification to 5 points so that it can do average with the another part, which has to have an equal or upper qualification to the 4 points.

Any Lactures will have compulsory attendance given the practical content of the same. This will notify with sufficient advance

The date, hour and place of realization of the proofs of evaluation, as well as the mandatory activities will be published in the web of Moovi of the subject.

Global evaluation and Extraordinary Announcement:

The application stop this option of evaluation #have present in the time and form that determine the Centre, that will be published with *anterioridade to the academic beginning.

Given the experimental character of the activities, the assistance to the same is mandatory for power opt the this option of evaluation.

To no assistance to practices, lectures with compulsory attendance and seminars, without cause justified invalidates this possibility, as well as the opportunity of extraordinary evaluation (2ª opportunity).

So much the practical how the seminars, supervised work and the final evaluation owe to had approved with a 40% of the partial note of each, In case of fail the second opportunity (extraordinary announcement) will realize with an examination of objective questions and an examination of problems with the percentage sum of the no surpassed proofs.

Other considerations

It requires of the students that study this subject a responsible behaviour and honest. It considers inadmissible any form of fraud (copy or *plaxio) aimed at falsifying the level of knowledges and skills reached in all type of proof, report or work. The fraudulent behaviours will be able to suppose suspend the subject during a complete course. It will carry an internal register of these performances so that, in case of recidivism, request the opening to the Rectorship of a disciplinary file

Sources of information

Basic Bibliography

Oceanografía y Satélites, Tebar, 2009

CRACKNELL, A.P. u HAYES, L.W.B., **Introduction to Remote Sensing**, Taylo & Francis, 1991

Complementary Bibliography

Recommendations

Subjects that are recommended to be taken simultaneously

Remote sensing/V10G061V01413

Other comments

The date, hour and place of realisation of the proofs of evaluation, will be published in the official web of the Faculty of Sciences of the Sea:
http://mar.uvigo.es/alumnado/examenes/

IDENTIFYING DATA				
Modelling				
Subject	Modelling			
Code	V10G061V01410			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Souto Torres, Carlos Alberto			
Lecturers	Souto Torres, Carlos Alberto			
E-mail	ctorres@uvigo.es			
Web	http://https://www.uvigo.gal/estudar/organizacion-academica/departamentos/fisica-aplicada			
General description	The student will learn how to operate an oceanographic numerical simulation model. In order to achieve this goal, besides the specifics of the simulation code, he/she will learn some basics of the operative system Linux, NetCDF file format and Matlab. This is an English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
C4	Know, analyze and interpret the physical properties of the ocean according to current theories, as well as to know the most relevant sampling tools and techniques.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Expected results from this subject	Training and Learning Results			
Theoretical and practical knowledge on numerical modelling in oceanography. The student will have capacity to understand the results of a numerical simulation, in what consists, which are the necessary forcings, etc. As well as be able to implement a numerical opensource model, to simulate the physics and the biogeochemistry.	A4 A5	B3	C4	D1 D2

Contents	
Topic	
Ocean equations.	Discretization and introduction of the ocean equations in the model.
Matlab.	Basics of Matlab coding (loops, conditional, input and output of data). Examples.
Numerical integration methods	Implicit and explicit methods. Runge-Kutta, Predictor-Corrector, Leap-Frog, etc.
NetCDF data files.	Structure of a NetCDF file: Global and local attributes, dimensions, data. Reading and writing of NetCDF files.
The ROMS model.	Introduction. Model input structure. Bathymetry, forcing and boundary condition.
Examples with ROMS.	Run and analysis of simple examples.
Nesting with ROMS.	Nested grids: Why and how. Structure, run and analysis of results.
Biogeochemical models.	Examples with simple biogeochemical models. NPDZ and N2P2Z2D2. The PISCES module.

Planning	Class hours	Hours outside the classroom	Total hours
Practices through ICT	20	20	40
Lecturing	18	18	36

Seminars	14	14	28
Presentation	5	5	10

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

Methodologies	
	Description
Practices through ICT	Using Linux as the operative system and Matlab as a tool, the student will learn to use the NetCDF data file format and the use of a numerical simulation model.
Lecturing	The equations of the ocean and different methods to solve those equations numerically with a computer code will be introduced to the student.
Seminars	Simple differential equations will be solved numerically, learning basic programming commands and some visualisation tools.

Personalized assistance	
Methodologies	**Description**
Lecturing	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Practices through ICT	Will be adapted to the timeframe determined by the Faculty's dean.
Seminars	The students will implement different programming codes to solve differential equations. The fulfillment of the aims fixed in the seminars will be evaluated.
Tests	**Description**
Presentation	The final work will be presented to all the other students and the teacher.

Assessment					
	Description	Qualification	Training and Learning Results		
Practices through ICT	The consecution of different goals (preparation of the input data, run of the model, preparation of graphics with the results, etc...) will be evaluated following a previously informed rubric and/or a test.	20		B3	D2
Seminars	Evaluarase a destreza en desenrrolo de distinto código computacional (integración numérica de ecuaciones diferenciais sinxelas, código de visualización, etc). The hability to develop of computational code will be tested (numercial integration of simple differential equations, visualization tools, etc).	40	A5		D1 D2
Presentation	The previous qualification will be given depending on a final presentation.	40	A4 A5	C4	D1

Other comments on the Evaluation

Global evaluation option.

In the case to opt by global evaluation, the student have to request it in the period and form marked by centre, that will be published previous to the start of the course. The proofs will take place the same official testing date, having more time for his development.

Extraordinary evaluation (2nd opportunity)

There will be the possibility of a standalone proof, in the form of a presentation of the work done, or to recover individually each one of the three sections of the first opportunity, with the same evaluation criteria.

Ethic Commitment

It requires of the students that *curse this matter a responsible and honest behaviour. It considers inadmissible any form of fraud (copy or plagiarism) directed to *falsear the level of knowledges and skills reached in all type of proof, report or work. The fraudulent behaviours *podrÃ*n suppose suspend the subject during a complete course. CarryÃ an internal register of these performances so that, in case of *reincidencia, request the opening to the rectorship of a disciplinary file

The date, hour and place of the proofs will be published in the Faculty's official webpage:

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

Sources of information

Basic Bibliography

Cushman-Roisin, Benoit and Beckers, Jean-Marie, **Introduction to Geophysical Fluid Dynamics. Physical and Numerical Aspects**, Academic Press, 2009

Complementary Bibliography

Recommendations

Subjects that it is recommended to have taken before

Ocean Dynamics/V10G061V01402

IDENTIFYING DATA

Marine microbiology and parasitology

Subject	Marine microbiology and parasitology			
Code	V10G061V01411			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish			
Department				
Coordinator	García Estévez, José Manuel			
Lecturers	García Estévez, José Manuel			
E-mail	jestevez@uvigo.es			
Web				
General description	It should be borne in mind that parasitism is the most widespread life strategy in nature. The study of the impact of parasitism can provide important information for better management and exploitation of resources. Thus, this subject describes the diversity of parasitic animals in all their manifestations and the adaptations of each species to its habitat, and studies parasite-host relationships: anatomy, morphology, biology, epidemiology, diagnosis and treatment. The Microbiology module will deal with aspects related to biological contamination, microbial pathogens in aquaculture and the biotechnological potential of marine microbiota.			

Training and Learning Results

Code	
A1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
C9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
C10	Know the biological diversity and functioning of marine ecosystems.
C11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Know and purchase skill in the technicians of diagnostic in Parasitology.	A2	B4	C11	D1
Understand the complexity of the biological cycles of the parasites of the marine environment like key appearance for the control of the parasitic diseases.	A4	B1	C9 C10	D5
Know the importance and the possible applications of the main parasites of the aquatic marine environment. Implications in public health and fihseries.	A3	B4	C11	D5
Know the main strategies of control of the parasitic illnesses	A2	B4	C11	D1
Know and know handle documentary sources related with the Parasitology of the aquatic environment	A1			D1 D2
Know the microbial activities in relation with the half biotic and abiotic	A2	B4	C11	D1
Know the main illnesses infectious diseases by marine microorganisms	A1	B4	C11	D1
Know interpret the origin and consequences of the microorganisms in the aquatic environment	A3	B4	C11	D1
Possess general notions on the interest applied of the microorganisms of the half marine	A3	B4	C11	D5

Contents

Topic	
BLOCK I. INTRODUCTION AND GENERAL CONCEPTS	I.1. Parasitology and Marine Parasitology. Concept of parasitism. Adaptations to the parasitism. Actions of the parasite on the host. Parasite specificity. Parasites and biological cycles. I.2.Ecological terms in Parasitology.
BLOCK II. PROTOZOA	II.1. Introduction to the study of the Protozoa parasites. Classification Protozoa. II.2. Dinoflagellates. Flagellates. Amoebae. Apicomplexa. Ciliates. II.3. Microsporidia. II.4. Myxosporidia. II.5. Protozoa of bivalve molluscs: Perkinsus, Haplosporidia, Marteilia.
BLOCK III. HELMINTHS AND ARTHROPODS	III.1. Plathelminths: Monogenea. Digenea. Cestoda. Turbellaria. III.2. Nemathelminths: Nematoda. Acanthocephala. III.3. Crustacea.
BLOCK IV. APPLICATIONS OF THE MARINE PARASITOLOGY	IV.1. The parasites as biological markers. IV.2. Applications of the parasites in the control of the fisheries: His employment in the differentiation of stocks. IV.3. Economic and hygienic importance of the marine parasites.
BLOCK V. MICROBIAL POLLUTION IN THE MARINE ENVIRONMENT	V.1. Types of pollutants biological that access to the marine aquatic environment. V.2. Causes and consequences of the biological pollution in coastal waters. V.3. Control and Monitoring of the biological pollution in coastal waters. V.4. Methods of quantification of Microorganisms indicators in waters and foods of marine origin.
BLOCK VI. INFECTIOUS ICTIOPATHOLOGY: PROCARIOTS and VIRUSES	VI.1. Host-pathogen environment interaction. VI.2. Pathogenicity and virulence factors. VI.3. Main pathogens in aquaculture and mariculture. VI.4. Microbiological diagnosis. VI.5. Prevention and treatment. Antibiotherapy. Alternative methods. Immunostimulation.
BLOCK VII. BIOTECHNOLOGICAL POTENTIAL OF THE MARINE MICROBIOTA	VII.1. Bioactive compounds of marine origin. VII.2. Molecular techniques applied to bioprospecting. VII.3. Bioremediation of marine pollutants. VII.4. Biofouling: Microbial process and antifouling treatments.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	20	30	50
Laboratory practical	20	50	70
Seminars	10	20	30
*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 teachers of the subject structure and/or explain the objectives and contents of each block. For their study, students have at their disposal the presentations seen in class and support cards for each topic, in the Moovi platform.
Laboratory practical	Their completion is mandatory in order to pass the subject. In them, the teacher gives an explanation of the theoretical foundations and protocols of the practices, supervising their execution and solving the doubts that the students may have. The practices will deal with useful techniques in the practice of the profession.
Seminars	Their realization is mandatory. In them, topics related to the theory and practices of the subject are discussed, elaborated and presented (individually or in groups). Topics will be proposed to be prepared by the students.

Personalized assistance	
Methodologies	**Description**
Lecturing	Any doubts that students may have will be answered in class or during tutoring hours. The student will be able to attend personalized tutorials to solve doubts, mainly in the schedules that are indicated and arranging an appointment with the professors previously, by e-mail.
Laboratory practical	They will be participative and will allow to establish personalized reinforcement actions. During the realization of the laboratory practices the teachers will give individualized attention to each student for the correct understanding of the experimental objectives and of the methodology or technique used.

Seminars	Elaboration and exposition by groups of students of topics related to the theory and practices of the subject. The student will be able to attend personalized tutorials to solve doubts, mainly in the schedules that are indicated and arranging appointment with the professors previously, by e-mail.

Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	The theoretical knowledge acquired by the student will be evaluated by means of different multiple-choice tests and short questions, organized in tests corresponding to the contents of Parasitology (20%) and Microbiology (20%).	40	A1 A2	B1	C9 C10 C11	D5
Laboratory practical	The knowledge acquired by the student in the practical classes will be evaluated by means of multiple-choice tests/short questions and resolution of exercises, organized in tests corresponding to the contents of Parasitology (20%) and Microbiology (20%). Attendance is mandatory to pass the course.	40	A3 A4	B1 B4	C9 C10 C11	D1 D5
Seminars	They are compulsory. The quality of the memory of the works presented, the quality of the exposition and the active participation in them will be valued (Parasitology 10%; Microbiology 10%).	20	A1 A4	B1	C10	D1 D2 D5

Other comments on the Evaluation

To pass the subject it will be necessary:

A) In continuous evaluation:

1) To attend the practices and seminars of the two modules of the subject.

2) Obtain a minimum grade of 5 points out of 10 in each of the activities (Theory, Practicals and Seminars) of the two modules that compose it. A minimum grade of 4 points will be admitted in a single activity for each module, as long as the final average of the subject equals or exceeds 5 points. If the subject is not passed in its entirety, the highest grade of the activities not passed will be reflected in the final grade.

In the second call: The grades of the tests passed in the first call will be kept for the second call, evaluating the students of the activities not passed.

B) In global evaluation:

1. The student will request it within the period established by the center.

2. The student will not be able to request the global evaluation if he/she has not carried out the practices and seminars of the subject whose attendance is obligatory.

3. Both in the first and in the second call, students who choose this type of evaluation will be evaluated of all the contents of the subject, having to obtain to pass the subject a minimum grade of 5 points out of 10 in each of the modules.

Students who take this subject are required to behave responsibly and honestly. Any form of fraud (copying and/or plagiarism) aimed at falsifying the level of knowledge and skills achieved in any type of test, report or work is considered inadmissible. Fraudulent conduct may result in the student being suspended from the course for a full academic year. An internal record of these actions will be kept so that, in case of recurrence, a disciplinary file may be requested from the rector's office.

The date, time and place of the evaluation tests will be published on the official website of the Faculty of Marine Sciences: http://mar.uvigo.es/alumnado/examenes

Sources of information

Basic Bibliography

Eiras, J.; Segner, H.; Wahli, T. & Kapoor, B.G., **Fish Diseases**, 2008

Rohde, K., **Marine Parasitology**, 2005

M.T. Madigan; J.M. Martinko; K.S. Bender; D.H. Buckley; D.A. Stahl & T. Brock, **Brock Biology of Microorganisms**, 14, 2015

J.M. Willey; L.M. Sherwood & C.J. Woolverton, **Prescott Microbiology**, 10, 2017

Munn, C. B., **Marine Microbiology Ecology and Applications. (2ª Edición)**, 2011

Patrick T.K. Woo & Kurt Buchmann, **Fish Parasites: Pathobiology and protection**, 2012

Complementary Bibliography

Goater, T.M.; Goater, C.M. & Esch, G.W., **Parasitism: The Diversity and ecology of animal parasites**, 2, 2013

L. Roberts J. Janovy, Jr. & S. Nadler, **Foundations of Parasitology**, 9, 2013
Williams, H. & Jones, A., **Parasitic Worms of Fish**, 1994
Woo, P.T.K., **Fish Diseases and Disorders. Volumen 1. (2ª Edición). Protozoan and Metazoan Infections.**, 2006
Noga, E. J., **Fish Disease. Diagnosis and treatment**, 2010
Loker, E.S. & Hofkin, B.V., **Parasitology: A Conceptual Approach**, 2015
Austin, B., **Infectious Disease in Aquaculture**, 2012
LeBoffe, M.J. & Pierce, B.E., **Microbiology: Lab Theory and Appplication**, 4, 2015

Recommendations

Other comments

When treating of a matter *optativa, that can be *cursada by all the students of the degree in Sciences of the Sea, do not consider necessary previous knowledges further of the purchased in the matters of Principles of Marine Microbiology (V10G061V01208) and Marine Zoology (V10G061V01210) already *cursadas previously.
The knowledges that the student purchases in the matter can be him of big utility and application in other disciplines, as they are the Biological Oceanography (V10G061V01306), *Pesquerías (V10G061V01405), Aquaculture (V10G061V01310) or the Biology of fish and seafoods (V10G061V01407).

IDENTIFYING DATA

Marine genetic resources

Subject	Marine genetic resources			
Code	V10G061V01412			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Presa Martínez, Pablo			
Lecturers	Presa Martínez, Pablo			
E-mail	pressa@uvigo.gal			
Web	http://https://moovi.uvigo.gal/			
General description	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. The "Marine Resources" appear with frequency in the profile of the Marine Sciences Degree. They are thus a fundamental object of academic study and of professional management. The central role of the marine biota has to be dealt from industrial, technological, physical-chemical, oceanographic and biological (Biochemical, Physiology, Genetics, Ecology, etc.) disciplines. The genetic "approach" is crucial in the management of the biological resources as much from the natural point of view (genetic conservation) as from the exploitation view from an intensive production (aquaculture). ¿Where is the point of elaborating a complex plan of exploitation on economic feasibility, technical and sociological viability if the resource lacks the sufficient genetic diversity to adapt to environmental challenge, to allow strategies of genetic selection or simply to keep it at its reproductive optimum?. Genetics plays as a central paper in the management of living resources, whose knowledge can not be obviated given the actual current easy going analyses of the genomes.			

Training and Learning Results

Code	
A1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
C1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
C9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
C10	Know the biological diversity and functioning of marine ecosystems.
C11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Cognitive (knowledge): comprehension of the concepts and the basic processes of genetic variability, genetic differentiation and evolutionm and divergence of the species in qualitative and quantitative genetic characters.	A1	B1	C1 C9	D2

Procedures/Instrumental (know-how): to obtain and to organise information; to design experiments and interpreting results; to apply molecular techniques to practical cases of management of marine genetic resources; to analyse and tp characterise DNA samples; to perform computational phylogenetic analyses.	A3	B2 B3 B4	C10 C11	D1
Transversal abilities: Critical reasoning; autonomous work and team work; capacity to carry knowledge into practice; computational analytical solvency; professional interpersonal communication.	A2	B1	C11	D5

Contents

Topic	
INTRODUCTION	Presentation of the subject. Evaluation of the level of genetic knowledge of the students. Analysis of the program. Taking of decisions on the process of learning and the system of evaluation of the course. Review of basic genetic concepts.
CHAPTER I. Genetic variability.	Origin and maintenance of the genetic variability. Mendelian analysis and relations between alleles. Genic interaction. Genetic analysis of the continuous variation and biometric methods of Quantitative Genetics. Genetic improvement in aquaculture.
CHAPTER II. Population genotyping.	Strategies of genotyping for populations. Types of molecular polymorphisms. Register and tabulation of the polymorphism.
CHAPTER III. Populational genetic structure.	The ideal population and the populational equilibrium. Systematic factors of change: mutation, migration, selection. Factors of random change or dispersive: drift and endogamy. Computational basis of populational structures.
CHAPTER IV. Management of marine genetic resources.	Structural genetics in fishery management. Genetic evaluation. Genetics and genomics in the management of fisheries. Genetic management in aquaculture. Genetic management of biological invasions.
PRACTICE 1. Identification of marine species with genetic markers diagnostic.	Amplificacion Of DNA, migration by electroforesis of PCR products, interpretation of genetic patterns. Bioinformatic analysis of interspecific allocation and phylogenetic inference. Scientific and industrial applications of the genetic assignment.
PRACTICE 2. Calculation of populational genetic structures of marine species.	Populational genotyping, tabulation of data. Bioinformatic computation of genetic structures and connectivity between fish stocks with Bayesian methods. Scientific and industrial applications of the genetic structure.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	18	25	43
Practices through ICT	8	4	12
Laboratory practical	12	6	18
Seminars	12	12	24
Problem and/or exercise solving	0	14	14
Report of practices, practicum and external practices	0	6	6
Presentation	1	10	11
Objective questions exam	2	16	18
Debate	2	2	4

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

Methodologies

	Description
Lecturing	The professor will present the conceptual basis of each subject and the strategies of the corresponding calculation process. The student will apprehend such concepts by means of the bibliographic query and daily exercises.
Practices through ICT	The students will analyse the experimental data of their previous practices in the laboratory, using specific software and on-line servers.
Laboratory practical	The educational guide of the practices will allow to develop several experiments for the genetic traceability of marine products and genotyping the populations for the calculation of the structure of fisheries.
Seminars	Students will solve out practical cases in the classroom, which are associated to each theoretical concept, analytical technique or biological situation of marine genetic resources.

Personalized assistance

Methodologies	Description
Practices through ICT	There will be a personalised attention according to the needs of each student

Lecturing	The questions or synchronous explanations are part of the participatory class.
Laboratory practical	The personalised guide will apply according to the needs of each student.
Seminars	Seminars allow to identifying the understanding or executive difficulties of each student in real time.
Tests	**Description**
Problem and/or exercise solving	The face-to-face virtual tutorship will be held syncronously or asyncronously, by email and by the virtual classroom of remote campus UVIGO, respectively.
Report of practices, practicum and external practices	A predesigned protocol will be presented during the lab. practices for the preparation of the final report.
Presentation	The rules of an efficient presentation will be discussed in order to work out an outstanding dissemination of the practical case assigned to each student.
Debate	

Assessment

	Description	Qualification	Training and Learning Results			
Problem and/or exercise solving	Daily execution of exercises from each class, for its conceptual apprehension; consists on problems, multiple questions or practical cases with simple mathematical applications.	20	A3	B2 B3	C9 C11	D2
Report of practices, practicum and external practices	Preparation of a report of the practice made, with illustrations of the proofs, statitistical tests performed and the conclusions.	20	A1	B4	C10	D1
Presentation	Presentation and defence in class of the practical case assigned. The teacher will evaluate the effort, the clarity of the presentation, the structure of the work and the argumentative level of the conclusions.	20	A2	B1 B4	C11	D1 D2 D5
Objective questions exam	Written exercise of short practical questions comprising the main phenomena studied in the course.	30	A1 A2 A3	B1 B2	C1 C11	D1
Debate	Active participation in classes, seminars and practices, with reasoning and scientific and ethical position on the exploitation of living marine resources.	10	A1 A3	B1	C10	D5

Other comments on the Evaluation

Continuous evaluation option (regular): the contents taught in the master classes and in the experimental and computer practices, will be evaluated respectively through the daily resolution of homework (electronic correction), the execution and attitude towards the practices (performance face-to-face), the final report of the practices (memory correction) and the oral defense of the practical case (on the established day of the last problems seminar). In addition, an exam of objective questions is proposed for all students with a weight of 30% of the final grade.

Global assessment option: for those students who were unable to follow the subject daily in person for personal or work reasons, an extraordinary written test will be given, coinciding on the date and place with the regular continuous assessment written exam. Given the experimental nature of the practices, attendance at them is mandatory to be eligible for this evaluation option.

Extraordinary evaluation option (2nd opportunity): it is carried out on the second date of July of the academic year and its requirements do not differ from the continuous evaluation or the global evaluation, that is, it is necessary to previously carry out the practices and they are maintained. the marks of the continuous evaluation obtained during the course, except those of the written exam of the first call.

The date, time and place of the evaluation tests will be published on the official website of the Faculty of Marine Sciences: http://mar.uvigo.es/alumnado/examenes/

Sources of information

Basic Bibliography

Hedrick, P.W., **Genetics of Populations**, 4th, Jones & Bartlet Publ, 2011

Avise, J., **Molecular Markers: Natural Hist ory and Evolution**, 2nd, Sinauer Associates Inc.,U.S., 1994

A. Moya y A. Fontdevila, **Introducción a la genética de poblaciones**, New edition, Sintesis Editorial, 2018

Matthew Hahn, **Molecular Population Genetics**, 1st, Oxford University Press Inc, 2018

Andy Beaumont , Pierre Boudry, Kathryn Hoare, **Biotechnology and Genetics in Fisheries and Aquaculture**, 2nd, John Wiley and Sons Ltd, 2010

Complementary Bibliography

Recommendations

Other comments

The students immatriculated in this subject would need to have previous knowledge on the nature of the hereditary material (DNA), i.e. structure, transmission rules and evolution, tackled in the subject Biology of the first course of the Degree. It is advisable to account for basic knowledge of calculation of probabilities, proofs of significance (e.g. the test of chi-square), and the concepts and calculations of regression and analysis of variance. The dynamics of fisheries and the marine biological cycles, are as well essential to understand the connectivity of the exploited fishery stocks.

IDENTIFYING DATA				
Remote sensing				
Subject	Remote sensing			
Code	V10G061V01413			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Torres Palenzuela, Jesús Manuel			
Lecturers	Torres Palenzuela, Jesús Manuel			
E-mail	jesu@uvigo.es			
Web	http://www.tgis.uvigo.es			
General description	Introduction to the physical principles of the Teledetection and his Oceanographic Applications. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
B5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
C1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
C4	Know, analyze and interpret the physical properties of the ocean according to current theories, as well as to know the most relevant sampling tools and techniques.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Expected results from this subject	Training and Learning Results			
Learn to use programs of Treatment of Images of Satellite in marine applications. Work with thermal images, optical and of microwaves in studies of *batimetría coastal, currents and oceanic twists, classification of covers in coastal zone, algorithms of colour and follow-up of poured of hydrocarbons.	A2 A3 A4 A5	B1 B2 B3 B4 B5	C1 C4	D1 D2

Contents	
Topic	
1.-INTRODUCTION To THE TELEDETECTION Objective Pretend with this first subject enter to the student in the world of the teledetection and the paper that this plays in the modern oceanography.	1.1.- Teledetection in Oceanography 1.2.- Brief history of the space observation of the oceans 1.3.- Possibilities for the oceanography 1.4.- Temporary and space scales of the phenomena of interest.

2.- PHYSICAL PRINCIPLES OF THE TELEDETECTION In this unit pretends that the student know the principles of the physics of the electromagnetic radiation, his interaction with the atmosphere and the ocean, as well as the spectral characteristics of the covers.	Objective Contents 2.1.- Radiation and electromagnetic spectrum. 2.2.- Terms and units of measure. 2.3.- Principles of the electromagnetic radiation. 2.4.- *Caractrísticas Spectral of the covers. 2.5.- Interaction of the atmosphere with the radiation. 2.5.1.- Absorption. 2.5.2.- Dispersion. 2.5.3.- Broadcast.
3.- ELEMENTS OF A SYSTEM OF TELEDETECTION: In this unit enters to the student in the characteristics that define to a sensor and space platform and airlifted as well as the steps required from the capture of an image by a sensor until his application and utilisation by part of an user. Finally they describe the most used satellites.	Objective Contents: 3.1. System of reception of images Elements of the system Platform and sensor Orbits Resolution of a sensor Types of sensors Platforms *satelitales and airlifted. Photography *aerea and *Drones
4.- *ANALISIS And DIGITAL TREATMENT OF IMAGES: In this unit establish the principles of visual and digital interpretation as well as the processing of the information with the object to delete errors (correction), improve some appearance of the information obtained (enhance) or obtain other parameters from the data of radiance (transformations). Finally it will enter to the student in the digital classification and the integration of information in systems of geographic information.	Objective Contents: 4.1. Visual analysis 4.1.1. Criteria of Interpretation 4.2. Digital treatment 4.2.1. Digital image 4.2.2. Corrections 4.2.3. It enhance 4.2.4. Transformations
5.- APPLICATIONS - Colour of the Ocean - Temperature - Poured and Pollution - Red Tides and Phytoplankton - Oceanic Circulation - polar Thaw - Studies of Choral - fluvial Feathers	Aims: In this last unit enumerate the applications of the teledetection in meteorology and study of the oceans. In each one of these applications makes a description of the physical principles that make it possible, as well as the interpretation of the results obtained and the sensors used.

Planning

	Class hours	Hours outside the classroom	Total hours
Practices through ICT	20	10	30
Seminars	7	15	22
Lecturing	15	40	55
Mentored work	4	10	14
Problem and/or exercise solving	1.7	5	6.7
Presentation	0.3	10	10.3

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

Methodologies

	Description
Practices through ICT	The methodology that uses in the practical is the one of study directed.

Seminars	It will make a follow-up *individualizado of technicians and contents for the development of the works scheduled . His main aim is to clear the concepts that have been explained in the class of theory or resolve any of the problems of the practical classes.
Lecturing	The lesson *magistral is the method mainly employee, using in the measure of the possible the lesson had a conversation.
Mentored work	The/The student, of individual way or in group, elaborates a document on the thematic of the matter or prepares seminars, investigations, memories, essays, summaries of readings, conferences, etc.

Personalized assistance

Methodologies	Description
Lecturing	The lesson *magistral is the method mainly employee, using in the measure of the possible the lesson had a conversation. The student that wish it will be able to attend to *tutorías personalised to resolve doubts, mainly in the schedules that indicate . To optimise the time, is necessary that the student contact with the professor with *antelación sufficient
Practices through ICT	The methodology that uses in the practical is the one of study directed.
Seminars	It will make a follow-up *individualizado of technicians and contents for the development of theworks scheduled . His main aim is to clear the concepts that have been explained inthe class of theory or resolve any of the problems of the practical classes.
Mentored work	It will be evaluated the work by means of an oral presentation, a theoretical work and a specific practice

Assessment

	Description	Qualification	Training and Learning Results
Practices through ICT	The methodology that uses in the practical is the one of study directed. They are of compulsory assistance.	15	A2 B2 C4 D2 A3 B3 A4 B4
Seminars	It will make a follow-up *individualizado of technicians and contents for the development of the works scheduled. The seminars are of compulsory assistance.	10	A2 B2 C1 D1 A3 B3 C4 D2
Lecturing	The lesson *magistral is the method mainly employee, using in the measure of the possible the lesson had a conversation. Some activities will be of compulsory assistance. The students will receive previous notifications for this assistance through *moovi.	5	A2 B1 C1 D1 A3 B3 C4 D2 A4
Mentored work	The/The student, of individual way or in group, elaborates a document on the thematic of the matter or prepares seminars, investigations, memories, essays, summaries of readings, conferences, etc. This work and his presentation can be substituted by a theoretical and practical proof in assessment of the professor.	30	A2 B2 C4 D1 A4 B3 A5 B4 B5
Problem and/or exercise solving	The problems are related with the capacity of the student purchased in the practices and the theory. They are of compulsory character.	30	A2 B2 C4 D1 A5 B3 B4
Presentation	Exhibition by part of the students in front of the educational and/or a group of students of a subject on contents of the matter or of the results of a work, exercise, project... Can carry out of individual way or in group.	10	A2 B1 C4 D1 A3 B4 A4 B5

Other comments on the Evaluation

Continuous evaluation:

The realisation of works (30%) and his exhibition (10%) can be substituted by a theoretical and practical examination with the great percentage *d 40% of the final note. This option will be valued by the professor to surpass the subject.
Some masterclasses will have *caracter *obigatorio given the practical content of the same. This will notify with sufficient *antelación through the web *Moovi to the students enrolled.

The date, hour and place of realisation of the proofs of evaluation, as well as the compulsory activities will be published in the web of *moovi of the subject.

Global evaluation and Extraordinary Announcement:

The application for this option of evaluation will have to present in the time and form that determine the Centre, that will be published prior to the academic start.

Given the experimental character of the activities, the assistance to the same is compulsory to be able to opt

to this option of evaluation.
The no assistance to practices, classes *obliatorias and seminars, without cause justified invalidates this possibility, as well as the opportunity of extraordinary evaluation (2ª opportunity).

So much the practices like the seminars, work *tutelado and the final evaluation have to have approved with 40% of the partial note of each one.&*nbsp; In case of suspense the second opportunity (extraordinary announcement) will make with an examination of objective questions and an examination of problems with the percentage adds of the no surpassed proofs.
Other considerations

Requires of the students that *curse this matter a responsible and honest behaviour. It considers inadmissible any form of fraud (copy or plagiarism) directed to *falsear the level of knowledges and skills reached in all type of proof, report or work. The fraudulent behaviours will be able to suppose suspend the subject during a complete course. It will carry an internal register of these performances so that, in case of *reincidencia, request the opening to the rectorship of a disciplinary file

Sources of information

Basic Bibliography

Oceanografía y Satélites, Tebar, 2009

CRACKNELL, A.P. u HAYES, L.W.B., **Introduction to Remote Sensing**, Taylo & Francis, 1991

Complementary Bibliography

Recommendations

Subjects that are recommended to be taken simultaneously

Geographic analysis methods/V10G061V01409

Other comments

The date, hour and place of realisation of the proofs of evaluation, will be published in the official web of the Faculty of Sciences of the Sea:
http://mar.uvigo.es/alumnado/examenes/

IDENTIFYING DATA				
Internships				
Subject	Internships			
Code	V10G061V01981			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Souza Troncoso, Jesús			
Lecturers	Souza Troncoso, Jesús			
E-mail	troncoso@uvigo.es			
Web				
General description	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. The external academic practices constitute an activity of formative nature realised by the university students and supervised by the Universities, whose aim is to allow to the same reinforce and complement the knowledges obtained ein his academic training, favouring the acquisition of capacities in view to prepare them for the exercise of professional activities (BOE 297, 10 December 2010).			

Training and Learning Results	
Code	
A1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
B5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
C1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
C2	Acquire basic knowledge of mathematics (differential and integral calculation) and statistics.
C3	Describe how works the global ocean circulation, its forcings and its climate implications.
C4	Know, analyze and interpret the physical properties of the ocean according to current theories, as well as to know the most relevant sampling tools and techniques.
C5	Formulate the mass, energy and moment conservation equations for geophysical fluids and solve them in basic oceanic processes.
C6	Acquire the fundamentals and terminology of chemical processes.
C7	Apply to the marine and coastal environment the principles and methods used in Chemistry.
C8	Know the main pollutants, their causes and effects in the marine and coastal environment.
C9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
C10	Know the biological diversity and functioning of marine ecosystems.
C11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
C12	Acquire knowledge about processes and products related to internal and external geological cycles.
C13	Acquire the basic sedimentological, geochemical and geophysical techniques and methodologies used in identification, use and sustainability of the natural resources of coastal and marine environmets.
C14	Know basic concepts and events of global change obtained from geological records.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.

D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
D3	Understanding the meaning and application of the gender perspective in different fields of knowledge and in professional practice with the aim of achieving a more just and equal society.
D4	Ability to communicate orally and in writing in Galician language.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
The practices are diverse and depending on the company where they are carried out, one or another competence will be achieved.	A1 A2 A3 A4 A5	B1 B2 B3 B4 B5	C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14	D1 D2 D3 D4 D5

Contents

Topic	
The contents of the external academic practices have to otain the following objectives:	a) Contribute to the integral training of the students complementing his theoretical and practical learning. b) Facilitate the knowledge of the methodology of work adapted to the professional reality in that the students will have to operate, contrasting and applying the knowledges obtained. c) Stimulate the development of technical capacities, methodological, personal and participatory. d) Obtain a practical experience that facilitate the insertion in the market of work and improve his future employability. e) Favour the values of the innovation, the creativity and the ventures.

Planning

	Class hours	Hours outside the classroom	Total hours
Practicum, External practices and clinical practices	150	0	150

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

Methodologies

	Description
Practicum, External practices and clinical practices	The formative project in that it concretises the realisation of each external academic practice will have to fix the educational aims and the activities to develop. The aims will establish considering the basic capacities, generic and/or specific that it has to be obtained by the student.

Personalized assistance

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

Assessment

Description	Qualification	Training and Learning Results

Practicum, External practices and clinical practices	The advisor of the collaborator entity will realise and will send to the academic advisor of the university a final report, to the conclusion of the practices, that will collect the number of hours realised by the student and in which it will be able to value the different appearances referred so much to the generic competitions how to the specific, foreseen in the corresponding formative project. The student will elaborate and will do delivery to the academic tutor of the University a final memory (1-2 pages), to the conclusion of the practices with the seen well of the tutor of the company. The academic advisor will evaluate the practices developed, according to the reports of the student and of the advisor of the Company, filling the corresponding report of assessment with the final note.	100

Other comments on the Evaluation

All the procedure can find in the BOE number 297 (10/11/2010) and in the guideline of External Practices of the Marine Sciences Faculty.

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

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

Other comments

It is very important to follow the instructions of the Tutor of the Company, realise all the activities that are requested to the student.
Adopt an attitude of collaboration in all the tasks entrusted from the start of the practice.

IDENTIFYING DATA				
Final Year Dissertation				
Subject	Final Year Dissertation			
Code	V10G061V01991			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	12	Mandatory	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician English			
Department				
Coordinator	Francés Pedraz, Guillermo			
Lecturers	Francés Pedraz, Guillermo			
E-mail	gfrances@uvigo.gal			
Web	http://webs.uvigo.es/facultadeccdomar/index.php/es/trabajo-fin-de-grado			
General description	The final degree project is a matter inside the plan of studies of the Degree of Marine Sciences. It is a personal work that each student will prepare in an autonomous form under the tutor's supervision and has to allow him to show of form integrated the acquisition of formative contents and the competitions associated with the title of Marine Sciences. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
B5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
C1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
C2	Acquire basic knowledge of mathematics (differential and integral calculation) and statistics.
C3	Describe how works the global ocean circulation, its forcings and its climate implications.
C4	Know, analyze and interpret the physical properties of the ocean according to current theories, as well as to know the most relevant sampling tools and techniques.
C5	Formulate the mass, energy and moment conservation equations for geophysical fluids and solve them in basic oceanic processes.
C6	Acquire the fundamentals and terminology of chemical processes.
C7	Apply to the marine and coastal environment the principles and methods used in Chemistry.
C8	Know the main pollutants, their causes and effects in the marine and coastal environment.
C9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
C10	Know the biological diversity and functioning of marine ecosystems.
C11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
C12	Acquire knowledge about processes and products related to internal and external geological cycles.
C13	Acquire the basic sedimentological, geochemical and geophysical techniques and methodologies used in identification, use and sustainability of the natural resources of coastal and marine environmets.
C14	Know basic concepts and events of global change obtained from geological records.

D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
D3	Understanding the meaning and application of the gender perspective in different fields of knowledge and in professional practice with the aim of achieving a more just and equal society.
D4	Ability to communicate orally and in writing in Galician language.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Application of the knowledge acquired throughout the Degree.	A1 A2 A3 A4 A5	B1 B2 B3 B4 B5	C1	D1 D2 D5
Application of the principles of the scientific method in work practices.	A1 A2 A3 A4 A5	B1 B2 B3 B4 B5	C1	D1 D2 D3 D4 D5
Use of information technologies to carry out bibliographic searches on a work topic.	A1 A2 A3 A4 A5	B1 B2 B3 B4 B5	C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14	D1 D2 D3 D4 D5
Work planning adapting to previously stipulated conditions and deadlines.	A2 A5	B2 B5		D1 D2
To work autonomously following procedures described in the bibliography or previously agreed with the supervisor.	A5	B2 B3 B4 B5		D1 D2 D3 D5
Interpretation of the results achieved.	A1 A2 A3 A4 A5	B1 B2 B3 B4 B5		D1 D2
To write a report about the work carried out and following the indicated guidelines.	A1 A2 A3 A4 A5	B1 B2 B3 B4 B5	C1	D1 D2 D3 D4 D5
Oral dissertation about the obtained results.	A1 A2 A3 A4 A5	B1 B2 B3 B4 B5		D1 D2 D3 D4 D5

Contents

Topic

Given its special nature, the subject does not have its own content, it will depend on the subject assigned to the student, who may choose any of the lines contained in the Faculty's TFG offer.

The following aspects will be considered:
- The structure of the TFG
- The writing of the TFG
- Inclusion of citations and how to cite
- The defense of the TFG
- Preparation of the presentation
- Formalization of the defense document

It has to have in consideration the rules of final degree projects of the Faculty, published in the web page , whereby assign the different kind of projects and the respective supervisors.

The works can be done and defended in Spanish, Galician and English. Both the language of performance and the language of presentation will be recorded in the individual record of each student.

Planning

	Class hours	Hours outside the classroom	Total hours
Presentation	1	10	11
Lecturing	2	2	4
Mentored work	0	282	282
Learning-Service	0	0	0
Essay	2	1	3

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

Methodologies

	Description
Presentation	The TFG must be defended in front of a tribunal formed by three professors of the degree, in the terms established in the regulations of the Faculty. http://mar.uvigo.es/index.php/es/alumnado-actual/trabajo-fin-de-grado
Lecturing	Two hours of class are reserved, where the coordinator of the subject of Final Degree Work will present the keys for the elaboration and defense of the TFG.
Mentored work	As a final result, a report adjusted to the conditions established in the regulations of the Faculty will be presented. http://mar.uvigo.es/index.php/es/alumnado-actual/trabajo-fin-de-grado
Learning-Service	Developing the TFG following the Learning-Service methodology is possible if tutors provide this this possibility. In this case, the dedication is 8 contact hours and 282 hours of personal work. This methodology replaces the classic tutored work.

Personalized assistance

Methodologies	Description
Mentored work	It will correspond to the tutor assigned for each final degree project supervise the student in the development of the work chosen. Students must attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimize the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Lecturing	The professor coordinator of the subject will be the responsible of the master sessions, in which will be able to give some advice to the students in reference to the structure, editorial, inclusion of references and how to obtain the final document for the defence in the special software application for this subject. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimize the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Learning-Service	It will correspond to the tutor assigned for each final degree project supervise the student in the development of the work chosen. Students must attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimize the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation

Assessment

Description	Qualification	Training and Learning Results

Essay	Evaluation by part of the tutor of the competitions developed by the student in the work and in the editorial of the final memory. Value: 30% Evaluation of the written memory and oral presentation by the tribunal. Value: 70% In the rule of final degree project of the Faculty you can find in detail all the procedure that has to adopt the student and his tutor, both for the written part and for the evaluation.	100	A1 A2 A3 A4 A5	B1 B2 B3 B4 B5	C1	D1 D2 D3 D4 D5

Other comments on the Evaluation

The final degree project is governed by the rule approved in the Marine Science Faculty, which is published in the web page of the centre (http://mar.uvigo.es/alumnado/trabajo-fin-de-grado/).

The Academic Commission of the final degree project, prior to the start of the work, will make public the criteria of evaluation that will use so much the tutor to issue his report like the court to evaluate the memory of the work and his defence.

They will make public in the web page all the terms that reach the presentation of the memories, the defences and the presentation of the reports by the tutors. These terms will be approved by the Academic Commission of the final degree project. In case that the student surpass the evaluation of the Tutor and do not surpass the court of evaluation will issue a justificative report. Once attended the recommendations of the report, said student will be able to go back to present the final degree project in the following period of evaluation.

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

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

Other comments

As in all subjects, personal effort is essential, as well as attending to the instructions of the tutor and delivering the report in the deanery within the deadlines set by the Academic Committee of TFG.

It is recommended to read carefully the regulations related to the elaboration and defense of TFG of the Center and all the related documentation that can be found in
http://mar.uvigo.es/index.php/es/alumnado-actual/trabajo-fin-de-grado