



## IDENTIFYING DATA

### Marine Ecology

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

## Competencies

Code	
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
C10	Know the biological diversity and functioning of marine ecosystems.
C11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

## Learning outcomes

Expected results from this subject	Training and Learning Results			
Capacity to understand and analyse the basic processes of the interactions between organisms.	A2	B1	C10	D1
	A3		C11	
	A4			
	A5			

Capacity to understand the bases of diversity and the the factors controlling organization and structure of the ecosystems	A2 A3 A4 A5	B1	C10 C11	D1 D5
To design, analyze, interpret and present experimental results	A2 A3 A4 A5	B1 B2 B4	C10 C11	D1 D2
To use software typically used in Marine Ecology	A2 A3 A4 A5	B2 B4	C11	D1 D2
To use the basic bibliography related to the ecological concepts	A2 A3 A4 A5	B1 B2	C10 C11	D1

## Contents

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

## Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	30	60	90
Seminars	7	14	21
Laboratory practical	9	24	33
Problem and/or exercise solving	1	0	1
Project	3	0	3

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

<b>Methodologies</b>	
	Description
Lecturing	Lectures will be used to develop the fundamental contents of the matter
Seminars	<p>They use the seminars to work of form more personalised some contents of more complex assimilation, that require the utilisation of computer programs and to supply capacities of analysis of data that will be used by the students in the experimental work</p> <p>The contents of these seminars will be:</p> <p>Seminar 1: experimental and technical Design of sampling. Put in common of the approach of the experimental work.</p> <p>Seminar 2: Analysis of data I: analysis of variance in Ecology. Examples.</p> <p>Seminar 3: Analysis of data II. Practical application of the analysis of variance.</p> <p>Seminar 4: Analysis of data III. Analysis *multivariante in Ecology: analysis of *similaridad, *MDS. Practical case. Presentation of scientific results.</p>
Laboratory practical	<p>The experimental work consists in the design, taking of samples, experimentation, processed of samples, analysis of data, preparation and discussion of results and, finally, presentation of the same by part of the students. They will develop , therefore, all the phases of an investigation.</p> <p>The experimental work will make of form in groups of 5 people that will work of autonomous form, *tutelados by the *profesorado. The results of the work will present in format poster. The phase of laboratory of the experimental work only will make between 1 March and on 15 April and will have approximate length of a week.</p> <p>The sessions of seminars will tackle the necessary practical contents for the preparation of the work. The students of each experimental group will have to his disposal the laboratory of practices of Ecology in the dates that signal .</p> <p>With the end to guarantee the suitable organisation and development of the experimental work, urges to respect of strict form the following recommendations:</p> <ol style="list-style-type: none"> <li>1. All the members of each group of experimental work have to belong to the same group of seminars.</li> <li>2. The work of laboratory has to be made by all the members of the group, by what his constitution has to take into account the schedules of his members.</li> <li>3. In the *tutorías destined to make the design of the experiment as well as in the centred in the analysis and interpretation of results has to assist the whole of the members of the group.</li> </ol>

<b>Personalized assistance</b>	
Methodologies	Description
Laboratory practical	All planned methodologies in this matter contemplates a personalised attention through voluntary tutorials. The schedule of personalized tutorials is the following: Monday, Wednesday and Thursday from 9 to 11 h. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
Seminars	All planned methodologies in this matter contemplates a personalised attention through voluntary tutorials. The schedule of personalized tutorials is the following: Monday, Wednesday and Thursday from 9 to 11 h. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation.
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Tests	Description

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

### Assessment

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

### Other comments on the Evaluation

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

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

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

### Sources of information

#### Basic Bibliography

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

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

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

#### Complementary Bibliography

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## Recommendations

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### Subjects that continue the syllabus

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Biological oceanography I/V10G060V01502

Biological oceanography II/V10G060V01601

Marine contamination/V10G060V01701

Fishing/V10G060V01703

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## Contingency plan

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### Description

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=== EXCEPTIONAL MEASURES SCHEDULED ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

WAY NO FACE-TO-FACE

Theoretical Teaching

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

Seminars

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

Experimental work

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

MIXED MODEL (\*SEMIPRESENCIAL)

Theoretical Teaching

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

Seminars

- The seminars will be totally face-to-face and, if it was the case, said seminars will be able to unfold in two groups.
- Evaluation: it will make an examination of seminars that will require the use of \*R and \*Rstudio and will carry out a proof

\*evaluable during the development of the seminars. The relative contribution of both proofs to the final qualification will be of 15% (10% the final examination and 5% the proof \*evaluable).

#### Experimental work

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

□ It will make the experimental work in face-to-face way in the laboratory. The \*tutorías of follow-up of this experimental phase will make through the Remote Campus.

□ The evaluation will make of agreement to the described in the model of face-to-face teaching, but in this case each group will defend his work of oral form in front of the

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

#### Remote Campus \*Uvigo

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

does not proceed

\* additional Bibliography to facilitate the car-learning

does not proceed

\* Other modifications

=== ADAPTATION OF THE EVALUATION ===

do not contemplate modifications in the evaluation

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