



IDENTIFYING DATA

Physical oceanography II

Subject	Physical oceanography II			
Code	V10G060V01602			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Varela Benvenuto, Ramiro Alberto			
Lecturers	Varela Benvenuto, Ramiro Alberto			
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General description	This course, mostly a practical one, brings to the student knowledges of the fundamental methodologies used in physical oceanography			

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
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C2	To know and understand the essential facts, concepts, principles and theories related to oceanography
C4	To know the basic techniques to sample the water column, organisms, sediments and sea bottom, as well as the surveying methods for dynamic and structural variables
C5	Basic knowledge of research methodology in oceanography
C6	Ability to identify and understand the problems in the field of oceanography
C12	To be able to operate the instrumental techniques applied to sea
C13	To acquire, evaluate, process and interpret oceanographic data within the theories currently in use
C15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
C38	Technical use of renewable energies
D4	Basic computing skills related to the field of study
D15	Ability to apply knowledge in practice

Learning outcomes

Expected results from this subject	Training and Learning Results		
The student should be able to interpret the meaning, implications and interrelationships of the main meteorological and oceanographic variables/parameters	A3	C1 C4 C5 C12 C13	
The student has to know how to calculate variables derived from the basic parameters such as speed of the sound, dynamic height, density, frequency of Brunt-Vaisala, stability and interpret them properly.	A2 A3	C1 C4 C12 C13 C15	D4 D15
The student has to understand the principles and main uses of several advanced oceanographic instruments and its implications in current physical oceanography (i.e., High Frequency radars, gliders, lines of data)	A2 A3	C1 C12 C13	D4 D15

The student should understand and distinguish the advantages and disadvantages of the several wave and tide related energy systems available

A2
A3
C1
C5
C6
C15
C38

The student has to be able to understand the complete process of treatment of pertinent data of oceanographic probes (CTD), and to use at an intermediate user level programs of generation of charts and analysis of the oceanographic information such as Surfer, Ocean Data View and the Seabird proprietary Seabird system.

C2
D4
D15

Contents

Topic

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

Planning

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

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

Methodologies

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

Personalized assistance

Methodologies	Description
Lecturing	Master class. Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Seminars	At the beginning of every seminar, the teacher will describe the objetives and purpose of the seminar. The students will have a guide on the TEMA platform describing all que exercises and questions required.The exercises can be solved individually or in small groups, but a personalised report is required. At the end of this seminar a 15 minute multiple option quest will be fulfilled.
Studies excursion	The teacher will describe the tasas to do, explain the different instruments and technic, and monitors the students' use of such instruments

Mentored work	The teacher presents several real problems to solve and offers guiding to its solution.
Tests	Description
Objective questions exam	A multiple option test to calibrate the students' knowledge, always closely related to what was done during seminars, classroom practical work, etc.
Essay questions exam	An examen to validate the general knowledge of the student.

Assessment					
	Description	Qualification	Training and Learning Results		
Seminars	During the seminars the student will be asked to solve several theoretical and practical subjects taken from real cruises/data. At the end of the seminar a questionnaire must be solved (and evaluated)	5	A2 A3	C1 C4 C5 C6 C12 C13	D4 D15
Studies excursion	After the cruise a report is required.	5	A3	C1 C4 C5 C6 C12 C13 C15	D15
Mentored work	After classroom work reports are required	5	A2 A3	C1 C2 C4 C5 C6 C15 C38	D4
Objective questions exam	Multiple option test to validate the student's knowledge.	20		C1 C2 C4 C5 C6 C12 C38	D15
Essay questions exam	A series of questions and problems presented to the students to judge its knowledge.	65	A2 A3	C1 C2 C4 C12 C13 C38	D15

Other comments on the Evaluation

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

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

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

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

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any

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

Sources of information

Basic Bibliography

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

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

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

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

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

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

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

Complementary Bibliography

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

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

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

Recommendations

Subjects that it is recommended to have taken before

Physical oceanography I/V10G060V01503

Contingency plan

Description

The plan of development and evaluation described contemplates the case of a normal development of the theoretical and practical classes in a face-to-face context. If by exceptional circumstances this context varies, having to take into account mixed or telematic teaching, we will proceed as follows:

1. Mixed teaching. The master classes will be issued in direct with the means that the University of Vigo supply, guaranteeing in all the cases the opportunity to be able to make questions or consult doubts.
2. If the face-to-face or mixed teaching is not possible, we will prepare the necessary videos to cover the theoretical classes, the seminars and the practices and will put them at student's disposal.

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

Reports of seminars and memories of practices: 30%

Questionnaires: 30%

Examination: 40%

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