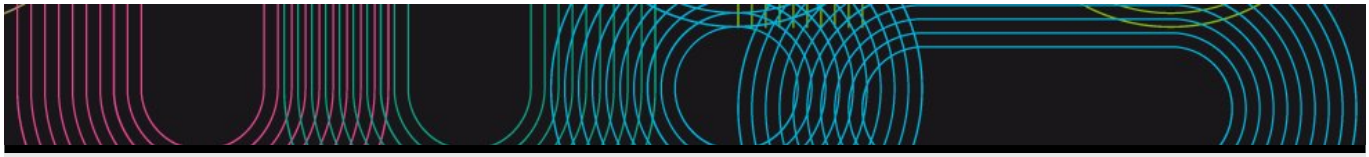

IDENTIFYING DATA				
Physical oceanography II				
Subject	Physical oceanography II			
Code	V10G060V01602			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Varela Benvenuto, Ramiro Alberto			
Lecturers	Souto Torres, Carlos Alberto Varela Benvenuto, Ramiro Alberto			
E-mail	rvarela@uvigo.es			
Web	http://www.gofuvi.org			
General description	This course, mostly a practical one, brings to the student knowledges of the fundamental methodologies used in physical oceanography			

Competencies	
Code	
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
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		
New			
The student should be able to do measurements of temperature, salinity, currents, light attenuation, waves and tides with the present available methodologies in physical oceanography	A3	C5 C12 C13	D15
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	D15
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.			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
Master Session	12	36	48
Seminars	15	30	45
Troubleshooting and / or exercises	10	10	20
Practice in computer rooms	7	14	21
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies

	Description
Master Session	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
Troubleshooting and / or exercises	Solving of real case scenarios presentacion de casos prácticos reales y su resolucion. Practical use of physical oceanography instruments: current meters, acoustic release, terminators, etc.
Practice in computer rooms	Many real case scenarios require some computer knowledge. Use of the Seabird suite of programs, ODV and Surfer mixed with Excel worksheets.

Personalized attention

Methodologies	Description

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.
Practice in computer rooms	Practices generally require the help of personal computers, with the sole exception of the first one which will be perfore on a ship. Data collected during the cruise will be used later. The students will be able to use and required to describe many instruments of common use in physical oceanography.
Troubleshooting and / or exercises	Exercises and practices will be continuously guided by a teacher, who will discuss and answer all the students questions on the matter. Individualised attention will be given on Tuesday, Wednesday and Thursdays from 12 to 14.

Assessment

	Description	Qualification	Training and Learning Results		
Master Session	Main course topics explained. Divided in 8 parts and a series of lectures concerning recent/important subjects in physical oceanography	70	A2 A3	C1 C4 C5 C6 C12 C13 C15 C38	D15
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)	30	A2 A3	C1 C4 C5 C6 C12 C13	D4 D15
Troubleshooting and / or exercises	Exercises will be discussed in groups and with the teacher at very instance of the process.	0			D4 D15
Practice in computer rooms	Physical oceanography instruments and software will be described and used. A 4 hours- long oceanographical cruise will be done.	0			D4 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. While the seminar works are individual, works from e memories of practical can be delivered of INDIVIDUAL form or *GRUPAL (with groups no upper to 5 students), always inside a term established in class. Any memory presented out of term will have an equal 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 of wrong form subtracts 1 point to the questionnaire. The works (memories of seminars and practical) consider apt or no apt, do not carry notice. If the note obtained by a student in the final examination is greater that the 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, calculated a final note using the proportion examination 70% questionnaires 30%. The questionnaires can repeat, 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, without averages neither others adjust.

The assessment of questionnaires keeps during two academic courses. Happened this term, the student will have to redo the questionnaires.

It requires the students who pursue this matter in a responsible and honest conduct. It is deemed inadmissible any form of fraud (i.e. copy and / or plagiarism) aimed to distort the level of knowledge or skill achieved by a student in any type of test, work or report designed for this purpose. This fraudulent conduct shall be punished with firmness and rigor that current regulations.

Sources of information

Basic/fondamental bibliography

KIRK, J.T.O. (2011) Ligth and photosynthesis in aquatic ecosystems. Cambridge University Press 401 pp.

PICKARD, G.L. and W. EMERY (2011). Descriptive Physical Oceanography. Sixth edition. Pergamon Press.320 pp.

VARELA, R. y ROSÓN, G. Métodos en Oceanografía Física. Biblioteca INNOVA Oceanografía Litoral, Ed. Anthias, 2008. 126 pp.

BEER, T. (1983) Enviromental Oceanography. An introduction to the behaviour of coastal waters. Pergamon Press, 261 pp.

DUXBURY, A.C. y A.B. DUXBURY (1994) An introduction to the world´s oceans. 3ª edition. W.C. Brown Publishers. 472 pags.

NEWMANN, G. and W.J. PIERSON Jr. (1966). Principles of Physical Oceanography. Prentice-Hall inc. 545 pp

PIPKIN y otros autores (2001). Laboratory exercises in oceanography. Third Edition. 253 pp.

STRAHLER, A.N. (1989) Geografía física. Editorial Omega. Barcelona. 767 pp.

Recommendations

Subjects that it is recommended to have taken before

Physics: Physics I/V10G060V01102
Physical oceanography I/V10G060V01503