



IDENTIFYING DATA

Physical oceanography II

Subject	Physical oceanography II			
Code	V10G061V01307			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Varela Benvenuto, Ramiro Alberto			
Lecturers	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.			
	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			
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.			
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.			
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			
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	C3	D1	
	A3	C4	D2	
	A4			
The student has to understand the principles and main uses of several advanced oceanographic instruments and its implications in current physical oceanography (i.e., current meters, CTD, High Frequency radars, Argo profilers, mooring lines)	A2	B1	C4	D1
	A3			D2
	A4			
The student should understand and distinguish the advantages and disadvantages of the several wind, wave and tide related energy systems available	A2	C3	D1	
	A3	C4	D2	
			D5	

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 Ocean Data View and the Seabird proprietary Seabird system.

A3 C4 D1
A4 D2

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	45	63
Seminars	14	28	42
Studies excursion	4.75	2	6.75
Practices through ICT	16	10.75	26.75
Objective questions exam	3	0	3
Essay questions exam	2.25	0	2.25
Problem and/or exercise solving	2.25	0	2.25
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	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 the different instruments (CTD, light, Lagrangian buoys, ADCP, etc) used in the physical oceanography. This cruise has compulsory character in the modality of continuous evaluation as well as in the modality of global evaluation
Practices through ICT	PPractices aiming to solve actual oceanographic problems using instruments and software such as Seabird data processing and Ocean Data View. These practical are compulsory in the modality of continuous evaluation as well as in the modality of global evaluation

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. Tutorial sessions will be also available by electronic means, videoconference or FAITIC forums if previously agreed
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 tasks to do, explain the different instruments and technique, and monitors the students' use of such instruments
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 exam 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)	20	A2 A3 A4	C3 C4 D5
Studies excursion	After the cruise a report is required and evaluated	5	A3	C4 D1
Objective questions exam	Three questionnaires of objective questions of individual resolution are requested during the course. All must be done in Moovi. The first proof consists in questions that are presented along the development of the theoretical lessons (10% of the total note) and can be completed anytime along the course before the final exam. The second questionnaire tests the knowledge obtained in the practices sessions (except the cruise which has its own report); it opens in Moovi at the end of the practices and remains opened until the examination of questions of development (15% of the total note). The last test values the global knowledges of the OFII subject and has to be done anytime after the end of the masterclasses but before the final examination (10% of the total qualification)	35		C4
Essay questions exam	Questions and exercises to value the understanding, capacity of analysis, synthesis and knowledges purchased. This exam must be approved with a minimum of 5 points out of 10	40	A2 A3	C4

Other comments on the Evaluation

It is necessary to obtain a minimal qualification of 5 in the final examination and in the questionnaires derived of the seminars to approve the subject. The questionnaires derived from the seminars can be repeated once, and the final qualification will be the average of the two instances. The cruise report, the questionnaires associated to the practices and the small questions presented in the theoretical lessons do not require a minimal qualification

Qualifications obtained in the objective questions tests are kept during two academic courses (the current one and the next). Happened this term, the student will have to redo the objective questionnaires.

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).**

The official exam dates can be obtained at: <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

- Kirk, J.T.O., **Light 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, G.L., **Introductory Dynamical oceanography**, 3, Pergamon Press, 1991
- Pickard, G.L y Emery, W., **Descriptive Physical oceanography**, 6, Pergamon Press, 2011
- Sverdrup, H.U.; Johnson, M.W y Fleming, R.H., **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 are recommended to be taken simultaneously

Geological oceanography II/V10G061V01308

Subjects that it is recommended to have taken before

Physical oceanography I/V10G061V01302