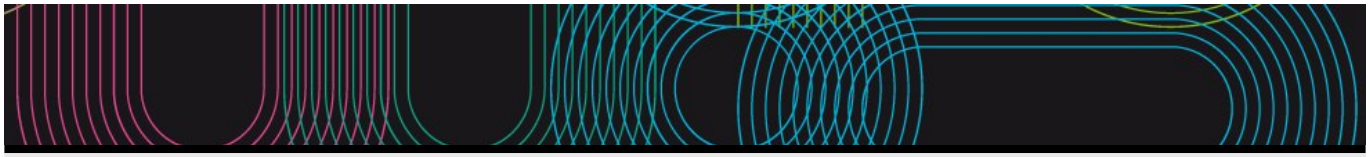

IDENTIFYING DATA				
Physical oceanography I				
Subject	Physical oceanography I			
Code	V10G061V01302			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Roson Porto, Gabriel			
Lecturers	Roson Porto, Gabriel Sánchez Carnero, Noela Belén			
E-mail	groson@uvigo.es			
Web	http://https://mar.uvigo.es/			
General description	Knowledge of the main physical processes in the ocean as well as their relevant climatological causes. 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	
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.
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.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.

Expected results from this subject	Training and Learning Results			
Basic knowledge of the climatological processes and the meteorological phenomena, with special attention to his influence on the oceanic processes.	A5	B1	C3 C5	D1
Descriptive knowledge of the main physical processes in the ocean			C3 C4	D1
Descriptive knowledge of the oceanic circulatory systems.		B1	C3 C4 C5	D1

Contents
Topic

I. BASIC CLIMATOLOGY	I.1. Description of the atmosphere: composition, temperature and density with height. I.2. Electromagnetic radiation. Black body emission. Characteristics of solar and terrestrial radiation. I.3. Radiative budget. Albedo and absorption. The greenhouse effect. Energetic latitudinal disequilibrium of the Earth. General movements of air masses, planetary convective cells. I.2. Fundaments of Meteorology: atmospheric pressure; vertical and horizontal structure. Surface maps: isobaric systems. Accelerations in isobaric systems; geostrophic equilibrium; horizontal and vertical circulation.
II. HYDROGRPHY AND WATER MASSES	II.1. TEMPERATURE II.1.1. Surface distribution. II.1.2. Temperature of the water column. Differences among three regions: Mixing layer, seasonal thermocline, main thermocline, deep waters. II.1.3. Upwelling. Ekman spiral. Ekman Transport. Types of upwelling. Downwelling. II.2. SALINITY II.2.1. Conservative and no conservative components. Absolute and practical salinity. II.2.2. Surface distribution and it relationship with balance precipitation + runoff - evaporation. Estuaries and estuarine circulation. Coupling estuarine circulation with upwelling and downwelling. II.3. MASAS DE AGUA Y DIAGRAMAS TS II.3.1. Water masses and water types. Abyssal circulation. Types of density variation in relation with water masses formation. The core method. Identification of water masses circulation. II.3.2. Equation of state of Seawater. Isopycnals. Density vertical profiles of by latitudes: The pycnocline. Density gradient and water masses stability. II.3.3. TS diagrams. Mixing of water types; caballing. Stability of water masses using TS diagrams.
III. DYNAMICS OF OCEAN CURRENTS	III.1. Surface currents and wind systems. The westward intensification. Eulerian and lagrangian currents. III.2. The subtropical and subpolar gyres. Equatorial currents. The Antarctic Circumpolar Current. III.3. Dynamic topography and geostrophic currents. Barotropic and baroclinic regimes. Helland-Hansen equation. III.4. Origin of the dynamic topography: cyclonic and anticyclonic winds. Convergences and divergences of the surface currents. Relationship with upwelling and downwelling. Ekman Pumping.
IV. REGIONAL OCEANOGRAPHY	IV.1. THE ANTARCTIC OCEAN. IV.2. THE ATLANTIC OCEAN. IV.3. THE MEDITERRANEAN SEA. IV.4. THE PACIFIC OCEAN. IV.5. THE INDIAN OCEAN.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	36	0	36
Seminars	16	8	24
Autonomous problem solving	0	46	46
Objective questions exam	1	3	4
Problem and/or exercise solving	0	20	20
Essay questions exam	4	16	20

*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 lessons
Seminars	Research work (obligatory attendance)
Autonomous problem solving	Exam

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, only via institutional account @alumnos.uvigo.es. Monday-Tuesday-Wednesday 10-12 h.
Seminars	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 , only via institutional account @alumnos.uvigo.es. Monday-Tuesday-Wednesday 10-12 h.
Autonomous problem solving	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, only via institutional account @alumnos.uvigo.es. Monday-Tuesday-Wednesday 10-12 h.
Tests	**Description**
Objective questions exam	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, only via institutional account @alumnos.uvigo.es. Monday-Tuesday-Wednesday 10-12 h.
Problem and/or exercise solving	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, only via institutional account @alumnos.uvigo.es. Monday-Tuesday-Wednesday 10-12 h.
Essay questions exam	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, only via institutional account @alumnos.uvigo.es. Monday-Tuesday-Wednesday 10-12 h.

Assessment

	Description	Qualification	Training and Learning Results			
Objective questions exam	It is part of the official examination	20			C3	
Problem and/or exercise solving	Deliverable questions in seminars	40		B1	C4	
Essay questions exam	Official exam	40	A5	B1	C5	D1

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

SENDIÑA, I Y . PÉREZ MUÑUZURI, V, **Fundamentos de meteorología,**, Universidad de Santiago de Compostela, Servizo de Publicacións e Intercambio Científico,

R.A. Varela y G. Rosón., **Métodos en Oceanografía Física**, Editorial Anthias Biblioteca INNOVA,

Complementary Bibliography

PICKARD, G.L. y W. EMERY, **Descriptive Physical Oceanography**, 6ª edition. Pergamon Press.320 p.,

TOMCZCAK, M. y J. STUART GODFREY, **Regional Oceanography: an introduction**, Pergamon. 422 p., http://www.es.flinders.edu.au/~mattom/regoc/pdfver,

ANGELA COULING and the Open University course Team., **Ocean circulation**, Pergamon press, 238 p.,

R. STEWART, **Introduction to Physical Oceanography**, Texas A&M University., http://www.uv.es/hegigui/Kasper/por%20Robert%20H%2,

Recommendations

Subjects that continue the syllabus

Physical oceanography II/V10G061V01307

Subjects that it is recommended to have taken before

Physics: Physics I/V10G061V01102
Mathematics: Mathematics I/V10G061V01104
Mathematics: Mathematics II/V10G061V01109
Physics: Physics II/V10G061V01203

Other comments

IMPORTANT MARKS:

The delivery of the individual seminar report for teacher assessment has a deadline of 7 days after the day when seminar took place. After that deadline no reports will be collected. In this circumstance, mark will be 0.

The delivery of any report by the student for teacher assessment implies student goes to PRESENTED mode automatically, regardless of the student sit for final exam.

The final mark of this matter will be an average of three marks (between 0 and 10): the partial exam (pe), the official exam (oe) and the average mark of the seminars, both in first and second opportunity, accordingly with: (se)

n = 0,2*pe + 0,4*oe + 0,4*se

The official exam as well as average mark of the seminars must be passed separately.

Repeat students should attend and deliver again seminars.