



IDENTIFYING DATA

Physical oceanography I

Subject	Physical oceanography I			
Code	V10G061V01302			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Roson Porto, Gabriel			
Lecturers	Roson Porto, Gabriel			
E-mail	groson@uvigo.es			
Web				
General description	Knowledge of the main physical processes in the ocean as well as their relevant climatological causes.			

Competencies

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.

Learning outcomes

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	
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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. Fundamentals 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
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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			
Lecturing	Exams	0 A5		C5	D1	
Seminars	Seminars	0	B1	C3	D1	
				C4		
				C5		
Autonomous problem solving	Exam and seminars	0		C3	D1	
				C4		
				C5		
Objective questions exam	Exam in a non specified date.	20		C3		
Problem and/or exercise solving	Deliverable questions in seminars	30	B1	C4		
Essay questions exam	Official exam	50 A5	B1	C5	D1	

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.

Assesment of classroom lectures:

One no official exam (no free up of contents) during the course in a no previously specified date. (weight 20%)

Official Exam (weight 50%)

Assesment of Seminars:

individual memories of seminars (weight 30%).

Delivery of seminar report must be up to 7 days after the seminar. See delivery calendar at <http://facultadeccdomar.webs.uvigo.es/index.php/es/alumnado-actual/calendario-escolar>.

After that deadline, delivery is not accepted (in this case mark will be 0).

Repeat students are also required to delivery seminar reports .

Students are required to pass (mark >=5) both official exam and seminar reports in order to pass the whole matter.

Both non official exam and seminar reports will be kept for the second opportunity.

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

SENDIÑA, I Y . PÉREZ MUÑOZURI, 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.,

TOMCZAK, 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/V10G060V01602

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 no official exam (en), the official exam (eo) and the average mark of the seminars, both in first and second opportunity, accordingly with:

$$n = 0,2*en + 0,5*eo + 0,3*se$$

The official exam as well as average mark of the seminars must be passed separately. If not (i.e. if $se < 5$ or $eo < 5$) the following formulae replaces the former one:

$$n = 0,2*en + 0,2*eo + 0,1*se$$

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

All methodologies would be maintained.

* Teaching methodologies modified

In the case of on line teaching, two resources will be set up, the remote campus <https://campusremoto.tv.uvigo.es/> and the on line teaching platform <https://faitic.uvigo.es/>, as well as other resorts that will help students to access to the contents of the matter.

* Non-attendance mechanisms for student attention (tutoring)

Personal attention will be arranged through the virtual office 2308 (Gabriel Rosón). Password: SeguroqueaprueboOF1 , as well as via email, only through the institutional student domain @alumnos.uvigo.es. Emails send via non institutional domain will not answered.

Tutoring schedule will be increased from monday to friday from 10 to 18 h.

* Modifications (if applicable) of the contents

Not applicable

* Additional bibliography to facilitate self-learning

In order to make learning easier, all additional bibliography will be uploaded in the online platform faitic if necessary.

* Other modifications Not applicable

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%] Not applicable

* Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%] Not applicable

* New tests Not applicable

* Additional Information

In this unusual situation, students are required to face this matter with a responsible and honest behaviour.
