



IDENTIFYING DATA

Physical Oceanography

Subject	Physical Oceanography			
Code	V10M153V01CF101			
Study programme	(*)Máster Universitario en Oceanografía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	1st
Teaching language				
Department				
Coordinator	Varela Benvenuto, Ramiro Alberto			
Lecturers	Álvarez Fernández, María Inés Castro Rodríguez, María Teresa de Gómez Gesteira, Ramón Varela Benvenuto, Ramiro Alberto			
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General description	Acquisition of basic knowledges for the understanding of the main physical processes that occur in the oceans, attending especially to the different scales space-temporary in which they operate said physical processes in the field of the physical oceanography.			

Competencies

Code	
A1	Students who have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with the first cycle, and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research context
A5	Students who have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous.
B1	The students will understand in a detailed and based form the theoretical and practical aspects and the work methodology of the oceanography
D1	The students will know and will be able to apply the scientific method in the academic and research fields.
D4	The students will be able to understand the need and obligation to perform a continuous training, to a large extent autonomous, for the scientific development, updating the knowledges, skills and attitudes of the professional competences along the life.

Learning outcomes

Expected results from this subject	Training and Learning Results
Acquire basic knowledges to understand the physical processes that occur in the ocean.	A1 A5 B1 D1 D4
Capacity to comprise the different scales space-temporary in which they operate the physical processes in the field of the physical oceanography.	A1 A5 B1 D1 D4
Use to level of initiation of the *Matlab	A5

Contents

Topic

Equation of state of seawater	Seawater physical properties. EOS-80 and TEOS-10 conventions.
Continuity equation	Boussinesq approximation, geostrophic balance, Ekman balance and transport.
Navier-Stokes equations	Understanding potential and total vorticity. Effects
Ocean vorticity	Main concept of wind waves. Classification of the oceanic waves.
Waves in the ocean	Tide origin. Tidal harmonic components
	Gravity waves in fluids. Deep and shallow water waves
CLIMATOLOGY	Electromagnetic radiation
	Simple heat balance in a water reservoir
HYDROGRAPHY	Surface distribution of salt and temperature
	Thermal and salt profiles in the water column
	Water masses. TS diagrams.
	Static and dynamic stability. The Richardson number
CURRENTS	Surface currents and the wind system. systems of winds. Western intensification.
	Geostrophic flow. Barotropic and baroclinic regimes. Dynamic topography.
	Ekman pumping. Convergences and divergences. Upwelling and downwelling.

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	18	10	28
Seminars	21	15	36
Autonomous troubleshooting and / or exercises	2	9	11

*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	Classical theoretical explanation/lecture.
Seminars	Real world examples questions and exercises to be solved with the teacher's help and by group discussion.
Autonomous troubleshooting and / or exercises	Exercises and problems to be solved individually at home

Personalized attention

Methodologies	Description
Master Session	Teacher's lecture on the corresponding subject, with a continuous interaction of the students to solve doubts about subjects of interest that can arise in this regard
Seminars	Resolution of exercises and problems (all they extracted from real situations)
Autonomous troubleshooting and / or exercises	Reports, exercises and complementary problems to be individually fulfilled

Assessment

Description	Qualification	Training and Learning Results
Master Session Examination	60 A1 B1 A5	D1 D4
Seminars Reports to be evaluated individually.	40 A1 B1 A5	D1 D4

Other comments on the Evaluation

Sources of information

VARELA R.A. y ROSÓN, G, **Métodos en Oceanografía Física**, Editorial Anthias,

PICKARD, G.L. y W. EMERY, **Descriptive Physical Oceanography**, Pergamon Press,

TOMCZAK, M. y J. STUART GODFREY, **Regional Oceanography: an introduction**, Pergamon,

BROWN, J., **Ocean circulation. Open University course Team**, Pergamon press,

Stewart, Robert., **Introduction to Physical Oceanography**, Texas A&M University,

Periáñez, Raúl, **Fundamentos de Oceanografía Dinámica**, Univ. de Sevilla,

Malek-Madani, Reza, **Physical Oceanography: A Mathematical Introduction with MATLAB**, Chapman and Hall/CRC,

Recommendations

Subjects that continue the syllabus

Atmosphere-Ocean Interaction/V10M153V01207

Physical Processes in the Ocean/V10M153V01101

Other comments

PREVIOUS REQUIREMENTS: The Educational Commission of the Master will study, for each student that do not proceed of the degree in Marine Science, the relevance that the student *course east Complement Formative in sight of his training and previous experience.
