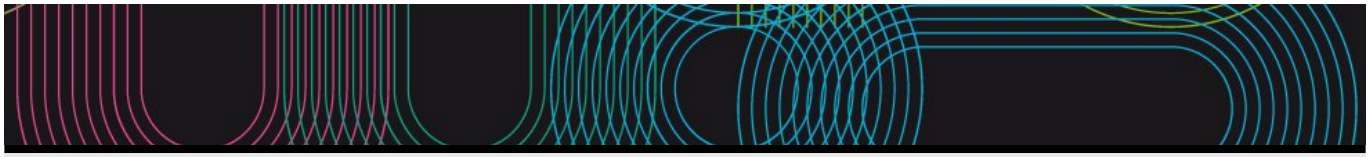

IDENTIFYING DATA				
Environmental physics				
Subject	Environmental physics			
Code	O01G261V01911			
Study programme	Grado en Ciencias Ambientales			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Gómez Gesteira, Ramón			
Lecturers	Castro Rodríguez, María Teresa de Gómez Gesteira, Ramón			
E-mail	mggesteira@uvigo.es			
Web				
General description	The environmental physics describes the basic physical principles of the environment from the atmosphere to the ocean.			

Training and Learning Results	
Code	
A3	Students will be able to gather and interpret relevant data (normally within their field of study) that will allow them to have a reflection-based considered opinion on important issues of social, scientific and ethical nature.
A4	Students will be able to present information, ideas, problems and solutions both to specialist and non-specialist audiences.
B2	Students will acquire and apply teamwork abilities and skills.
C1	To know the physical, chemical and biological foundations linked with the environment and its technological processes
C3	To be familiar with the temporal and spatial dimensions of environmental processes.
C4	Ability to integrate the experimental data found in field and/or lab work with theoretical knowledge.
D1	Capacity of analysis, organization and planning.
D3	COral and written communication in the native language and foreign
D5	Ability of problem solving and decision making
D9	Team of interdisciplinary nature

Expected results from this subject					
Expected results from this subject	Training and Learning Results				
AIR1. Knowledge and understanding of the basic concepts of the processes of the environmental physics			C1 C3		
RA2. Develop skills to handle databases and resolve practical problems.	A3 A4	B2	C4	D1 D3 D5 D9	

Contents
Topic

Subject 1. Preliminaries	1.1. The system Earth. 1.2. The atmosphere 1.2.1. Atmospheric layers 1.2.2. Composition of the atmosphere. 1.2.3. Global wind circulation 1.3 Comparison between ocean and atmosphere 1.3.1. Density 1.3.2. Specific heat 1.3.3. Optical properties. 1.4. The ocean 1.4.1. Ocean layers 1.4.2. Buoyancy, stability and Brunt-Väisälä frequency
Subject 2. Thermodynamics	2.1. Introduction 2.2. Laws of the Termodinámica 2.2.1. First Law of the Termodinámica. 2.2.2. Second Law of the Termodinámica. 2.2.3. Third Law of the Termodinámica. 2.3. Latent heat 2.4. Transfer of thermal energy 2.4.1. Conduction 2.4.2. Radiation 2.4.3. Convection 2.4.4. Change of state
Subject 3. Earth□s energy budget	3.1. Introduction 3.2. Sun radiation 3.3. Incoming and outgoing radiation 3.4 Greenhouse effects 3.5. Earth□s energy budget 3.6. Variations in the Solar constant 3.7. Ocean energy budget
Subject 4. The equations of movement	4.1 Introduction 4.2 Fundamentals 4.3 Conservation of momentum 4.3.1 The gradient of pressure 4.3.2 The fictitious forces on Earth 4.3.3 Gravity 4.3.4 Friction forces 4.3.5 Conservation of momentum equations in components 4.4 Conservation of mass 4.5 Turbulence
Subject 5. Atmospheric stability	5.1. Introduction 5.2. The hypsometric equation 5.3. Adiabatic gradients of temperature 5.4. The humidity 5.5. The potential temperature 5.6. Virtual temperature 5.7. Saturate adiabatic lapse
Subject 6. Geostrophic currents	6.1 Introduction 6.2 Hydrostatic balance 6.3 Geostrophic currents 6.3.1 Baroclinic and barotropic conditions 6.3.2 Sea level inclination 6.3.3 Equations of movement 6.3.4 Practical calculation of geostrophic currents 6.3.5 Limitations
Subject 7. Oceanic currents generated by the wind	7.1 Introduction. 7.2 Equations of movement. 7.3 Wind induced transport. 7.4 Coastal upwelling. 7.5 Upwelling index. 7.6 Upwelling areas.

Planning			
	Class hours	Hours outside the classroom	Total hours

Lecturing	26	70	96
Seminars	14	38	52
Objective questions exam	1	0	1
Objective questions exam	1	0	1

*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 explanation of the environmental physical processes.
Seminars	Analysis of practical exercises to know them, interpret them, diagnose them, generate hypothesis and propose procedures for their resolution. This will serve to see the application of theoretical concepts to the reality.

Personalized assistance

Methodologies	Description
Seminars	Seminars (maximum group of 20 people) will be programmed at the end of each subject to do practical exercises. Additionally, a battery of questions to analyze the most important concepts of each subject will be provided to the students. Students must do these bulletins in an individual way. The practical activities will be able to be individual or in couples. Some practical activities will begin in the seminars and then the student must finalized them byself. Tutorial classes will be on Mondays between 16:00 and 18:00 h.

Assessment

	Description	Qualification	Training and Learning Results
Seminars	Seminars (maximum group of 20 people) will be programed at the end of each subject to do practical exercises . Additionally, a battery of questions to analyse the most important concepts of each subject will be provided to the students. The student´s skill to solve practical activities will be evaluated by means of these questions and the practical exercises. The AR1 learning outcome will be assessed.	40	A3 B2 C4 D1 A4 D3 D5 D9
Objective questions exam	Questions of brief answer that #analyze the knowledge purchased pole student in each subject. To evaluate the result of the learning AIR1.	30	C1 C3
Objective questions exam	Questions of brief answer that #analyze the knowledge purchased pole student in each subject. To evaluate the result of the learning AIR1.	30	C1 C3

Other comments on the Evaluation

"The preferred assessment method is Continuous Evaluation. Students who wish to have a Global Evaluation (100% of the grade based on the official exam) must inform the course instructor via email or through the Moovi platform within one month from the start of the course."

Attendance to lectures, particularly seminars, is mandatory for in-person classes.

The course is divided into two independent blocks. To pass the course, students must achieve a minimum of 4.5 in each block. In order to pass each block, students must obtain a minimum grade of 5 in short answer tests and problem-solving, which will be averaged.

Students who are unable to attend various teaching methods due to justified reasons must provide proper justification from the beginning of the course. Evaluation will be carried out through complementary assignments proposed by the professor, depending on the circumstances.

Exam Dates:

Final Exam: September 27, 2023, at 16:00

End of Semester Exam: April 02, 2024, at 16:00

July Exam Session: July 3, 2024, at 16:00

In case of any errors in the transcription of the exam dates, the official dates approved and published on the notice board and the Center's website shall prevail.

For the July exam session, 60% of the grade will be based on an exam covering the syllabus, and 40% will be based on the grade obtained in seminars, which will be carried forward until this session. For the final exam session, students who choose to take the exam at the end of the course will be evaluated solely based on the exam (which will account for 100% of the grade).

Sources of information

Basic Bibliography

P. Hughes & N.J. Manson, **Introduction to environmental physics. Planet Earth, life and climate**, CRC Press Taylor & Francis group, 2014

G.S. Campbell & J.M. Norman, **An introduction to environmental biophysics**, 2, Springer- Verlag, 1998

J.L. Monteith & M.H. Unsworth, **Principles of environmental physics. Plants, animal and the atmosphere**, 4, Academic Press (Elsevier), 2013

E. Boeker & R. vanGrondelle, **Environmental Physics: Sustainable energy and climate change**, 3, John Willey and Sons, 2011

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Energy and energy sustainability/O01G261V01505
Environmental engineering/O01G261V01502
Meteorology/O01G261V01912
Environmental modelling and simulation/O01G261V01504

Subjects that it is recommended to have taken before

Physics: Physics II/O01G261V01201
Physics: Physics I/O01G261V01101
Mathematics: Mathematics II/O01G261V01202
Mathematics: Mathematics I/O01G261V01104