UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2023/24
Subject (*)	Wind, Hydraulic and Marine Systems		Code	730547005d
Study programme	Máster Universitario en Eficiencia Enerxética e Sustentabilidade (a distancia)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	First	Obligatory	4.5
Language	SpanishGalician			
Teaching method	Non-attendance			
Prerequisites				
Department	Enxeñaría Industrial			
Coordinador	Méndez Sanmartín, Cristian	E-mail	cristian.mendez@udc.es	
Lecturers	Chouza Gestoso, Jesus Diego Méndez Sanmartín, Cristian	E-mail	jesus.chouza@udc.es cristian.mendez@udc.es	
Web	cas-saml.udc.es/login?service=https%3A%2F%2Fcampusvirtual.udc.gal%2Flogin%2Findex.php			
General description	Fundamentals of wind, hydraulic and marine energy conversion. Structure, elements and characteristics of wind, hydraulic and marine generators. Calculation methods of generated energy. Methodology for the design of wind, hydraulic and marine farms, as well as the analysis of impacts. Systems evaluation: technological, economic and legal aspects.			

Study programme competences	
Code	Study programme competences
A7	CE7 - Have knowledge of the fundamentals, potential, technology, applications and regulations of renewable energy sources
A8	CE8 - Analyze and include renewable energies in different facilities
A13	CE13 - Analyze, apply and optimize energy use systems
A14	CE14 - Design and analyze wind systems
B2	CB7 - That students know how to apply the knowledge acquired and their ability to solve problems in new or little-known environments within broader (or multidisciplinary) contexts related to their area of study
B5	CB10 - That students have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous
B9	CG4 - Extract, interpret and process information, from different sources, for use in the study and analysis
B11	CG6 - Acquire new knowledge and skills related to the professional field of the master's degree
B16	CG11 - Evaluate the application of emerging technologies in the field of energy and the environment
C2	CT2 - Master the oral and written expression and comprehension of a foreign language
C3	CT3 - Use the basic tools of information and communication technologies (ICT) necessary for the exercise of their profession and for learning throughout their lives
C5	CT5 - Understand the importance of entrepreneurial culture and know the means available to entrepreneurs
C6	CT6 - Gain life skills and healthy habits, routines, and lifestyles
C7	CT7 - Develop the ability to work in interdisciplinary or transdisciplinary teams, to offer proposals that contribute to sustainable environmental, economic, political and social development
C8	CT8 - Value the importance of research, innovation and technological development in the socioeconomic and cultural progress of society

Learning outcomes			
Learning outcomes	Study programme competences		
Allow access to knowledge of the influence that the different processes and systems used have on the Environment, as well as the mechanisms to limit said influence	AC7	BC2 BC5 BC9 BC11 BC16	
Know the different techniques and technological processes for the transformation of wind, hydraulic and marine energy into electrical energy	AC8 AC13	BC9 BC11	CC2 CC6

Train the student in the techniques for the study and development of wind, hydraulic and marine energy projects that can be used in the professional field		BC11	CC3 CC5 CC7 CC8
Provide the student with the knowledge and skills necessary to be able to carry out specific tasks in the field of wind, hydraulic and marine energy within the scope of companies in the sector	AC7 AC8	BC2 BC11	CC6 CC8
Know the fundamentals that govern the behavior of the wind from a physical point of view, and familiarize the student with the conversion process of wind, hydraulic and marine energy	AC7 AC8 AC13 AC14	BC2 BC5	CC7
Know the elements and devices of a wind, hydraulic and marine generation system, as well as its characteristics and operating principles	AC7 AC8 AC13 AC14	BC2 BC5	CC7
Learn to determine the response of a wind system, especially from the point of view of energy generation, as well as determine the factors that influence said response and its impact on the conversion into electrical energy	AC7 AC8 AC13 AC14	BC2 BC5 BC11	CC5 CC8

Contents	
Topic	**Sub-topic**
Fundamentals of wind energy conversion. Characteristics. wind systems	-Current Situation of the Wind Sector -Environmental impact of a wind farm -Wind Resource Analysis -Wind turbines: typologies and their components -Design of Wind Farms -Assembly of Wind Farm -Offshore Wind Energy
Fundamentals of hydraulic energy conversion. Characteristics. Hydraulic systems	-Types of mini hydroelectric plants -Design of a hydroelectric exploitation -Civil works installations -Electromechanical equipment -Economic, administrative and environmental factors
Fundamentals of marine energy conversion. Characteristics. Power generated. Systems evaluation.	Technologies: -Wave Energy -Tidal Energy -Saline gradient -Maremothermal

Planning				
Methodologies / tests	**Competencies**	**Ordinary class hours**	**Student?s personal work hours**	**Total hours**
Problem solving	A7 A8 A13 A14 B2 B5 C7	20	18	38
Supervised projects	A7 A8 B2 B5 B9 B11 B16 C2 C3 C5 C8	12	17.5	29.5
Seminar	A7 B5 B16 C5 C6 C7	2	1	3
Mixed objective/subjective test	A7 A13 B2	4	10	14

Online forum	A7 A8 A13 A14 B2 B5 B9 B11 B16 C2 C3 C5 C6 C7 C8	12	13	25
Personalized attention		3	0	3
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Problem solving	Assumptions or problems related to the subject will be proposed
Supervised projects	The realization of one or several projects of wind, hydraulic or marine energy installations will be proposed, for which a report and an exhibition will have to be presented.
Seminar	They will consist of conferences given by professionals from the sector
Mixed objective/subjective test	Al final del cuatrimestre, en las fechas determinadas por el calendario del Máster, se realizará una prueba objetiva en la que se evalúen los conocimientos adquiridos en la materia, tanto de las clases como de los seminarios
Online forum	The contents of the syllabus will be reviewed during classes to expose the main concepts that allow the student to carry out problems and related works.

Personalized attention	
Methodologies	Description
Supervised projects	The professor will be available during tutorial hours to answer questions or make any clarifications that may arise throughout the course, both in person, in teams, or by email.

Assessment			
Methodologies	Competencies	Description	Qualification
Problem solving	A7 A8 A13 A14 B2 B5 C7	During the course, problems will be proposed that the students have to solve during the timetable of one of the classes to be evaluated.	20
Supervised projects	A7 A8 B2 B5 B9 B11 B16 C2 C3 C5 C8	The students will propose the scope of their work, totally related to the subject matter, and must be approved by the teacher in order to begin its execution.	30
Mixed objective/subjective test	A7 A13 B2	On the official dates set by the Master's calendar, an objective test was carried out	50

Assessment comments

It will be carried out in the official calls. However, throughout the course, a personalized follow-up will be carried out, assessing the degree of achievement of the objectives by the students. Direct monitoring of the subject is recommended so that a continuous evaluation of the achievement of the objectives is possible. - The evaluation criteria will be the same for the 1st and 2nd opportunity and the extraordinary calls. similar tests. -The practical tests will consist of solving a questionnaire placed in moodle, the student will do it connected to the TEAMS platform with the camera connected at all times focusing on the desktop, the time to complete the test is limited. - The fraudulent performance of the tests or evaluation activities, once verified, will directly imply the qualification of suspense in the call in which it is committed: the student will be qualified with "suspense" (numerical note 0) in the corresponding call of the academic year, whether the commission of the offense occurs on the first opportunity or on the second. For this, their qualification will be modified in the first opportunity certificate, if necessary.

Sources of information	
Basic	- Mohamed A. El-Sharkawi. (2015). Wind Energy: An Introduction. . CRC Press. - José Luis Rodriguez Amenedo, Juan Carlos Burgos, Santiago Arnalte. (2003). Sistemas Eólicos de Producción de Energía Eléctrica. . Rueda. - IDEA. (). Análisis del recurso. Atlas eólico de España. https://www.idae.es/sites/default/files/documentos/publicaciones_idae/documentos_11227_e4_atlas_eoli - Celso Penche.Manual de pequeña hidráulica como llevar a buen fin un proyecto de minicentral hidroéle (1998). Manual de pequeña hidráulica como llevar a buen fin un proyecto de minicentral hidroélectrica . Bruselas. Comisión Europea - ESHA (). Guide on How to Develop a Small Hydropower Plant . . https://www.canyonhydro.com/images/Part_1_ESHA_Guide_on_how_to_develop_a_small_hydropower_plant.pdf
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.