



Teaching Guide

| 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 | E-mail | jesus.chouza@udc.es | |
| | Méndez Sanmartín, Cristian | | 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 / results

| Code | Study programme competences / results |
|------|--|
| 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 / results | | |
|---|---------------------------------------|------|--|
| 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 | <ul style="list-style-type: none"> -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 | <ul style="list-style-type: none"> -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. | <ul style="list-style-type: none"> Technologies: -Wave Energy -Tidal Energy -Saline gradient -Maremothermal |

| Planning | | | | |
|---------------------------------|------------------------------------|--------------------------------------|-------------------------------|-------------|
| Methodologies / tests | Competencies / Results | Teaching hours (in-person & virtual) | 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 / Results | 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

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| Basic | <ul style="list-style-type: none">- Mohamed A. El-Sharkawi. (2015). Wind Energy: An Introduction. . CRC Press.- José Luis Rodríguez 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 hidroeléctrica . 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.