| Teaching Guide | | | | |
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| Identifying Data | | | | 2023/24 |
| Subject (*) | Energy Resources | | Code | 610500012 |
| Study programme | Mestrado Universitario en Ciencias, Tecnoloxías e Xestión Ambiental (plan 2012) | | | |
| Descriptors | | | | |
| Cycle | Period | Year | Type | Credits |
| Official Master's Degree | 2nd four-month period | First | Optional | 3 |
| Language | SpanishGalicianEnglish | | | |
| Teaching method | Face-to-face | | | |
| Prerequisites | | | | |
| Department | Ciencias da Navegación e Enxeñaría MariñaFísica e Ciencias da TerraQuímica | | | |
| Coordinador | Cabeza Gras, Oscar | E-mail | oscar.cabeza@udc.es | |
| Lecturers | Cabeza Gras, Oscar<br>Romero Gómez, Manuel<br>Señaris Rodriguez, Maria Antonia | E-mail | oscar.cabeza@udc.es<br>m.romero.gomez@udc.es<br>m.senaris.rodriguez@udc.es | |
| Web | | | | |
| General description | This subject shows the energy actuallity from three aspects: 1. Traditional energy sources. 2. Clean and renovable energy sources. 3. Technology, energy save and future developments. | | | |

| Study programme competences / results | |
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| Code | Study programme competences / results |
| A17 | Coñecer a problemática asociada coa enerxía e as súas fontes, as tecnoloxías máis empregadas actualmente e as de futuro. |
| A18 | Coñecer as implicacións económicas dos problemas ambientais, os instrumentos de política económica e os principais indicadores ambientais. |
| B2 | Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornas novas ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo. |
| B3 | Que os estudantes sexan capaces de integrar coñecementos e enfrontarse á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e suizos. |
| B4 | Que os estudantes saiban comunicar as súas conclusións e os coñecementos e razóns últimas que as sustentan a públicos especializados e non especializados dun modo claro e sen ambigüedades. |
| B6 | Ser capaz de analizar datos e situacións, xestionar a información dispoñible e sintetizala, todo iso a un nivel especializado. |
| B8 | Comprender, a un nivel especializado, as consecuencias do comportamento humano na contorna ambiental. |
| C4 | Expresarse correctamente, tanto de forma oral coma escrita, nas linguas oficiais da comunidade autónoma. |
| C6 | Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida. |
| C7 | Desenvolverse para o exercicio dunha cidadanía aberta, culta, crítica, comprometida, democrática e solidaria, capaz de analizar a realidade, diagnosticar problemas, formular e implantar solucións baseadas no coñecemento e orientadas ao ben común. |
| C9 | Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse. |
| C10 | Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida. |
| C11 | Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade. |

| Learning outcomes | |
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| Learning outcomes | Study programme competences / results |

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| The past and present use of traditional energy sources will be analyzed. There will be different energy scenarios and the need for and possibility of developing energy infrastructures. The different energy markets and the current possibilities of saving energy will be analyzed. The most relevant aspects of the different renewable energies will be described, with an impact on the possibilities of savings and improvements in the energy efficiency they can produce. Finally, alternative energy technologies and their possible future development will be addressed | AC17<br>AC18 | BC2<br>BC3<br>BC4<br>BC6<br>BC8 | CC4<br>CC6<br>CC7<br>CC9<br>CC10<br>CC11 |
| Know the sources of clean and renewable energy: wind, solar photovoltaic, solar thermal, undimutrix, tidal and nuclear fusion. It analyzes the current state of the subject and its evolution, as well as its future perspectives. The study documents are renewed annually. | AC17<br>AC18 | BC2<br>BC3<br>BC4<br>BC6<br>BC8 | CC4<br>CC6<br>CC7<br>CC9<br>CC10<br>CC11 |
| Energy saving and management. New systems under study for the storage and generation of energy. | | BC2<br>BC3<br>BC4<br>BC6<br>BC8 | |

| Contents | |
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| **Topic** | **Sub-topic** |
| Part I:<br>Traditional Energy Sources: | Energy. Means. Transport, storage and distribution. Energy transformations. Power plants: Coal. Petroleum. Natural gas. Hydroelectric. |
| Part II:<br>Energy scenarios. Introduction to renovable energies | Coverage of primary and final energy demand. Wind power. High temperature solar and photovoltaic energy. Solar panels. Energy from the sea (tidal and wave). State of technology and types of devices. Nuclear power by fusion. Projects and perspectives. |
| Part III:<br>Energy saving and improvement in its efficiency.<br>Alternative energy technologies and future developments. | Hydrogen and fuel cells, batteries, innovations in fossil fuels, ultracapacitors, solar energy through satellites, etc. |

| Planning | | | | |
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| **Methodologies / tests** | **Competencies / Results** | **Teaching hours (in-person & virtual)** | **Student?s personal work hours** | **Total hours** |
| Introductory activities | A17 C4 C6 C7 C9 C10 C11 | 1 | 1 | 2 |
| Guest lecture / keynote speech | A18 B3 B4 B6 B8 | 9 | 18 | 27 |
| Multiple-choice questions | B2 B6 | 1 | 4 | 5 |
| Seminar | A18 B2 B6 C6 | 4 | 8 | 12 |
| Case study | A17 A18 B3 B6 C4 C7 C9 | 4 | 8 | 12 |
| Supervised projects | A17 A18 B2 B3 B4 B6 C4 C6 C9 | 2 | 14 | 16 |
| Personalized attention | | 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 | |
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| **Methodologies** | **Description** |

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| Introductory activities | Presentation of the different modules of the subject. Including the description of the Methodology, Program and Evaluation. |
| Guest lecture / keynote speech | Detailed explanation of the different aspects of the program. Computer Presentations and Whiteboard will be used for this. |
| Multiple-choice questions | Test type test on the contents explained in the lectures. |
| Seminar | Solving numerical problems, case studies or open discussion on a particular topic. |
| Case study | Experiments, calculations or procedures of treatment and analysis of data will be considered and developed, interpreting the results obtained. |
| Supervised projects | Individualized or paired work on the content of the subject |

| Personalized attention | |
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| **Methodologies** | **Description** |
| Case study<br>Seminar<br>Supervised projects | The tutored work will be proposed by the teachers, so that the students can carry out their account, always having at their disposal to the Professor who will guide them in the bibliographical search, revise the work and clarifies dubbed calenda that can be presented.<br>A personalized attention is designed to clarify the student aspects contained in the subject, both in the maxistral session and in the seminars.<br>It is voluntary, but very advisable, to attend tutorials. |

| Assessment | | | |
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| **Methodologies** | **Competencies / Results** | **Description** | **Qualification** |
| Case study | A17 A18 B3 B6 C4 C7 C9 | Quality in the realization of the different case studies presented. | 20 |
| Seminar | A18 B2 B6 C6 | Realization of the different talks demanded by the teacher (problems, discussiones criticisms...) | 20 |
| Supervised projects | A17 A18 B2 B3 B4 B6 C4 C6 C9 | Quality of the supervised projects proposed by the teacher | 20 |
| Multiple-choice questions | B2 B6 | Test exam about the different contents of the subject. | 20 |
| Guest lecture / keynote speech | A18 B3 B4 B6 B8 | Assistance and participation in the lectures. | 20 |
| Others | | | |

| Assessment comments |
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| A minimum of assistence to keynote speechs (75%) is mandatory to be evaluated. If he/she do not assist that percentage will be evaluated as "Not Presented".The final qualification will be the average of that obtained in each of the three parts of the subject.<br>First Oportunity<br>- All activities, works and/or written test will be evaluated. Student must pass each of the three parts with 5/10 to be qualificated.<br>Second Oportunity<br>- Students must do all not passed activities/works and/or written test.<br>- If the student do not assist the minimum written above, they must do, individually, all activities proposed of the subject.<br>Students with partial dedication of assistance exencion.<br>- They must inform the teacher the first week of the saubject.<br>- First oportunity, They must do, individually, all activities proposed and the written tests.<br>- Second oportunity, they must repeat the not passed activities.<br>The fraudulent realization of the different test or activities for evaluation will imply the qualification of 0 in the corresponding call. |

| Sources of information | |
|---|---|
| Basic | - M. Kaltschmitt et al. (2007). Renowable energy: technology foundations, economical and enviromental aspects. Holanda<br>- SABUGAL GARCIA, SANTIAGO y GOMEZ MOÑUX, FLORENTINO (2006). CENTRALES TERMICAS DE CICLO COMBINADO: TEORIA Y PROYECTO. Diaz de Sasntos<br>- García Alonso e Iranzo. (´1989). La energía en la economía mundial y en España. Madrid. Editorial AC<br>- IDAE (2000). impactos ambientales de la producción eléctrica. Madrid<br>- R.M. Mujal Rosas (2005). Fuentes de energía eléctrica. Barcelona<br>- IDAE (2004). Plan de Fomento de las Energías Renovables y Estrategia de Ahorro y Eficiencia Energética en España 2004-2012. Madrid<br>- Inega (varios). Balance Enerxético de Galicia . Santiago de Compostela |
| Complementary | - J.M. Escudero López (2004). Manual de energía eólica.... Madrid<br>- M. Perlado, G. Valverde (1984). La fusión nuclear. Principios y Tecnología. Madrid<br>- M. Alonso Abella (2005). Sistemas Fotovoltaicos. Introducción al diseño y dimensionado de instalaciones solares fotovoltaicas. Madrid<br>- R. Clare (1994). Tidal power, Trends and Developments. Londres<br>- J. W. Tester, E.M. Drake, M.J. Driscoll, M. W. Golay, W. A. Peters (2005). Sustainable Energy: Choosing among options. Boston |

| Recommendations |
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| Subjects that it is recommended to have taken before |
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| Subjects that are recommended to be taken simultaneously |
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| Subjects that continue the syllabus |
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| Other comments |
| This subject is within the Green Campus Deal of the Science Faculty and many contents are directly connected with its point 8 objective: "To incorporate a environmental dimension in the research and teaching activities". Works asked to students for this subject must:a. Be in virtual format majority.b. If it were necessary to print them:- Plastics will not be used.- Prints in double face type.- Usage of recycled paper.INCORPORATION OF THE GENDER PERSPECTIVE- As stated in the various applicable regulations for university teaching, the gender perspective must be integrated into this subject (using non-sexist language, using bibliography from authors of both genders, encouraging the participation of male and female students in classroom...).- Efforts will be made to identify and modify sexist biases and attitudes, and the environment will be influenced to change them and promote values of respect and equality.- Situations of gender discrimination should be identified, and actions and measures will be proposed to correct them. |