Teaching Guide				
Identifying Data				2021/22
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		E-mail		
Lecturers	Cabeza Gras, Oscar Romero Gómez, Manuel Señaris Rodriguez, Maria Antonia	E-mail	oscar.cabeza@udc.es m.romero.gomez@udc.es 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.			
Contingency plan	1. Modifications to the contents There will not be any modification. 2. Methodologies *Teaching methodologies that are maintained All of them, but lectures will be on-line. *Teaching methodologies that are modified Laboratory practice will be done virtually. Data for analysis and representation will be given by the corresponding teacher. 3. Mechanisms for personalized attention to students Moodle, Teams and e-mail. 4. Modifications in the evaluation No modifications are contempled. *Evaluation observations: Exams will be made virtual using Moodle. 5. Modifications to the bibliography or webgraphy No modifications are contempled.			

Study programme competences	
Code	Study programme competences
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			
Learning outcomes	Study programme competences		
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 AC18	BC2 BC3 BC4 BC6 BC8	CC4 CC6 CC7 CC9 CC10 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 AC18	BC2 BC3 BC4 BC6 BC8	CC4 CC6 CC7 CC9 CC10 CC11
Energy saving and management. New systems under study for the storage and generation of energy.		BC2 BC3 BC4 BC6 BC8	

Contents	
Topic	Sub-topic
Part I: Traditional Energy Sources:	Energy. Means. Transport, storage and distribution. Energy transformations. Power plants: Coal. Petroleum. Natural gas. Hydroelectric.
Part II: 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: Energy saving and improvement in its efficiency. Alternative energy technologies and future developments.	Hydrogen and fuel cells, batteries, innovations in fossil fuels, ultracapacitors, solar energy through satellites, etc.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	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	
Methodologies	**Description**
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	
Methodologies	**Description**
Case study Seminar 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. A personalized attention is designed to clarify the student aspects contained in the subject, both in the maxistral session and in the seminars. It is voluntary, but very advisable, to attend tutorials.

Assessment			
Methodologies	**Competencies**	**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

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.

First Oportunity

- All activities, works and/or written test will be evaluated. Student must pass each of the three parts with 5/10 to be qualificated.

Second Oportunity

- Students must do all not passed activities/works and/or written test.
- If the student do not assist the minimum written above, they must do, individually, all activities proposed of the subject.

Students with partial dedication of assistance exencion.

- They must inform the teacher the first week of the saubject.
- First oportunity, They must do, individually, all activities proposed and the written tests.
- Second oportunity, they must repeat the not passed activities.

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

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
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.

(*)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.