



Teaching Guide

Teaching Guide				
Identifying Data				2023/24
Subject (*)	Energy Storing Systems		Code	730547018d
Study programme	Máster Universitario en Eficiencia Enerxética e Sustentabilidade (a distancia)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	3
Language	SpanishGalician			
Teaching method	Non-attendance			
Prerequisites				
Department	Enxeñaría Industrial			
Coordinador	Casteleiro Roca, José Luis	E-mail	jose.luis.casteleiro@udc.es	
Lecturers	Casteleiro Roca, José Luis	E-mail	jose.luis.casteleiro@udc.es	
Web				
General description	This subject aims to give the student the theoretical knowledge of the various types and functions of the Energy Storage systems used today.			

Study programme competences / results

Code	Study programme competences / results
A13	CE13 - Analyze, apply and optimize energy use systems
B1	CB6 - Possess and understand knowledge that provides a foundation or opportunity to be original in the development and/or application of ideas, often in a research context
B4	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to specialized and non-specialized audiences in a clear and unambiguous way
B6	CG1 - Search and select alternatives considering the best possible solutions
B10	CG5 - Boost creativity
B13	CG8 - Apply theoretical knowledge to practice
C1	CT1 - Express themselves correctly, both orally and in writing, in the official languages of the autonomous community
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

Learning outcomes

Learning outcomes	Study programme competences / results		
Learn about potential energy storage systems	AC13	BC1 BC13	CC1 CC3
Know the kinetic energy storage systems	AC13	BC6 BC13	CC3 CC5
Know the electrical and magnetic energy storage systems	AC13	BC4 BC6	CC3
Learn about chemical energy storage systems	AC13	BC1 BC10	CC5
Learn about storage systems with compressed air	AC13	BC4 BC10	CC1

Contents

Topic	Sub-topic
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Contents described in the verification report	Need for energy storage. Potential energy storage. Kinetic energy storage. Storage of electrical and magnetic energy. Chemical energy storage. Energy storage with compressed air.
Topic 1: Need for energy storage	1.1. The binomial generation-consumption 1.2. Problems of load variation in the power stations
Topic 2: Potential energy storage	2.1. Operating principle 2.2. Storage reservoirs. Pump stations
Topic 3: Kinetic energy storage	3.1. Operating principle 3.2. Inertial storage disks
Topic 4: Energy storage with engines	4.1. Operating principle 4.2. Compressed air
Topic 5: Electrical energy storage	5.1. Operation principle of a battery 5.2. Operation principle of a fuel cell (Hydrogen)

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student's personal work hours	Total hours
Workshop	B1 B6 B10	4	25	29
Workbook	A13 B6 B13	9	15	24
Mixed objective/subjective test	B4 B6 C1	2	0	2
Laboratory practice	B4 B10 C3 C5	9	10	19
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
Workshop	Realization of an individual work of a specific subject of the subject and sharing in a group to share knowledge. Later the works will be joined in a common one that will be presented in class by groups.
Workbook	Keynote speech complemented with the use of audiovisual media and the introduction of some questions to students, in order to transmit knowledge and facilitate learning. The order of the topics covered will not have to be the one described in the teaching guide. In addition, there will be topics that can be seen together on the development of others, and the division between them may not be strict.
Mixed objective/subjective test	It consists in carrying out an objective test of approximately 3 hours, in which the acquired knowledge will be evaluated.
Laboratory practice	Performing laboratory practice as far as possible; or, failing that, solving exercises and specific problems in the classroom, from the knowledge explained.

Personalized attention	
Methodologies	Description
Workshop	The student has the relevant meetings of personalized tutorials, to resolve the concerns arising from the matter.

Assessment



Methodologies	Competencies / Results	Description	Qualification
Laboratory practice	B4 B10 C3 C5	Some tasks established in the subject, within the framework of this methodology	10
Workshop	B1 B6 B10	Accomplishment of an individual and group work, as well as its exhibition in class	30
Mixed objective/subjective test	B4 B6 C1	Exam type objective test	60

Assessment comments

As part of the "Laboratory practice" may include aspects such as attendance, personal work, attitude, etc., to help to pass the subject.

The "Mixed test" will be divided into a multiple choice and some questions.

It is necessary to exceed 15% of the score in the "Mixed test" to pass, as well as to approve the works proposed in "Workshop".

Students with recognition of part-time dedication and academic waiver of attendance exemption, second establishes the "NORMA QUE REGULA O RÉXIME DE DEDICACIÓN AO ESTUDO DOS ESTUDANTES DE GRAO NA UDC (Arts. 2.3; 3.b e 4.5) (29/5/212)", will be evaluated in the same way, allowing one more week of margin in the assignments.

For the second opportunity, there will be no second deadline for assignments, and the evaluation will be done in a similar way to the first opportunity.

The evaluation criteria of the early December call will be the same as those of the second opportunity of the previous year.

The fraudulent completion of tests or assessment activities, once verified, will directly imply that the student will be qualified with "suspension" (numerical grade 0) in the corresponding call for the academic year, whether the offense is committed at the first opportunity as in the second For this, your qualification will be modified in the first opportunity report, if necessary.

In case the student commits an infraction in the subject (according to the Student Disciplinary Regulations): the student will be graded with a "fail" (numerical grade 0) in the corresponding exam session, whether the infraction is committed at the first or second opportunity. For this, the student's grade will be modified in the first opportunity report, if necessary.

Sources of information

Basic	
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



Recommendations on sustainability and the environment Students will be taught the importance of ethical principles related to the values of sustainability so that they can apply them not only in the classroom, but also in their personal and professional behaviour. To help achieve an immediate sustainable environment and meet the objective of action number 5: "Healthy, environmentally and socially sustainable teaching and research" of the "Green Campus Ferrol Action Plan": The delivery of the documentary work carried out in this subject:- It will be requested in digital format and/or in computer support.- It will be done through Moodle, in digital format without the need to print it.- If it is necessary to do them on paper: o No plastics will be used. o Double-sided printing will be used. o Recycled paper should be used. o Drafts should not be printed. Sustainable use of resources and prevention of negative impacts on the natural environment should be made. Recommendations on Gender Equality and respect for diversity- According to the different regulations applicable to university teaching, the gender perspective must be incorporated in this subject (non-sexist language will be used, bibliography of authors of both sexes will be used, the intervention of male and female students in class will be encouraged...).- We will work to identify and modify sexist prejudices and attitudes, and we will influence the environment to modify them and promote values of respect and equality.- Situations of gender discrimination will be detected and actions and measures to correct them will be proposed.- The full integration of students who, for physical, sensory, mental or socio-cultural reasons, experience difficulties in gaining suitable, equal and beneficial access to university life will be facilitated.

(*)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.