

		Teaching Guide		
	Identifying D	ata		2022/23
Subject (*)	Energy Storing Systems		Code	770523019
Study programme	Mestrado Universitario en Eficiencia e Aproveitamento Enerxético		I	
		Descriptors		
Cycle	Period	Year	Туре	Credits
Official Master's Degre	ee 2nd four-month period	First	Optional	3
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Industrial			
Coordinador	Casteleiro Roca, José Luis E-mail jose.lui		jose.luis.castel	eiro@udc.es
Lecturers	Casteleiro Roca, José Luis	E-mail	jose.luis.castel	eiro@udc.es
Web				
General description	This subject aims to give students the	eoretical knowledge of vario	us types of Energy Stor	age systems used nowda

	Study programme competences / results			
Code	Study programme competences / results			
A13	Capacidad para analizar, aplicar y optimizar los sistemas de aprovechamiento energético.			
B3	Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a			
	menudo en un contexto de investigación.			
B5	B5 Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos			
	especializados y no especializados de un modo claro y sin ambigüedades.			
B6	Buscar y seleccionar alternativas considerando las mejores soluciones posibles.			
B10	Potenciar la creatividad.			
B13	Aplicar los conocimientos teóricos a la práctica			
C1	Adquirir la terminología y nomenclatura científico-técnica para exponer argumentos y fundamentar conclusiones.			
C3	Aplicar una metodología que fomente el aprendizaje y el trabajo autónomo.			
C5	Adquirir la capacidad para elaborar un trabajo multidisciplinar			

Learning outcomes			
Learning outcomes	Study	y progra	amme
	con	npetenc	es/
	results		
Knowing the Energy Storage Systems based on reservoirs	AJ13	BC6	CC3
		BC13	
Knowing the Energy Storage Systems based on inertial disks	AJ13	BC6	CC5
		BC10	
Knowing the Energy Storage Systems based on compressed air	AJ13	BC5	CC5
		BC6	
Knowing the Energy Storage Systems based on hydrogen	AJ13	BC3	CC1
		BC10	

Contents		
Торіс	Sub-topic	
	1.1. The binomial generation-consumption1.2. 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)

	Plannir	ng		
Methodologies / tests	Competencies /	Teaching hours	Student?s personal	Total hours
	Results	(in-person & virtual)	work hours	
Guest lecture / keynote speech	A13 B6 B13	9	15	24
Laboratory practice	B3 B10 C3 C5	9	10	19
Workshop	B3 B5 B6 B10	3	25	28
Mixed objective/subjective test	B5 B6 C1	3	0	3
Personalized attention		1	0	1
(*)The information in the planning table is for	guidance only and does no	t take into account the	heterogeneity of the stud	dents.

	Methodologies		
Methodologies	Description		
Guest lecture /	Keynote speech complemented with the use of audiovisual media and the introduction of some questions to students, in order		
keynote speech	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.		
Laboratory practice	Performing laboratory practice as far as possible; or, failing that, solving exercises and specific problems in the classroom,		
	from the knowledge explained.		
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.		
Mixed	It consists in carrying out an objective test of approximately 3 hours, in which the acquired knowledge will be evaluated.		
objective/subjective			
test			

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

		Assessment	
Methodologies	Competencies /	Description	
	Results		
Mixed	B5 B6 C1	Exam type objective test	60
objective/subjective			
test			
Laboratory practice	B3 B10 C3 C5	Some tasks established in the subject, within the framework of this methodology	10
Workshop	B3 B5 B6 B10	Accomplishment of an individual and group work, as well as its exhibition in class	30



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 40% 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.

	Sources of information		
Basic	Basic - Ter-Gazarian, A. (Andrei) (1994). Energy storage for power systems. Stevenage, Harts., U.K. : P. Peregrinus on		
	behalf of the Institution of Electrical Engineers		
Complementary	- Huggins, Robert (2010). Energy storage. New York: Springer		

Recommendations

Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus

Evaluation and Optimization of the Energy System Sustainability/770523020

Energy, Cooperation and Sustainability/770523016

Efficiency of Electric Systems/770523013

Quality of the Electric Service/770523014

Other comments

To help achieve an immediate sustainable environment and meet the objective of action number 5: "Healthy and sustainable environmental and social teaching and research" of the "Green Campus Ferrol Action Plan":1. The delivery of the documentary works that are made in this matter: 1.1. They will be requested in virtual format and / or computer support 1.2. They will be made through Moodle, in digital format without the need to print them

(*)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.