



Teaching Guide

| Identifying Data | | | | | 2023/24 | |
|--------------------------|--|-------|----------|-----------------------------|-----------|--|
| Subject (*) | Energy Storing Systems | | | Code | 730547018 | |
| Study programme | Máster Universitario en Eficiencia Enerxética e Sustentabilidade | | | | | |
| Descriptors | | | | | | |
| Cycle | Period | Year | Type | Credits | | |
| Official Master's Degree | 2nd four-month period | First | Optional | 3 | | |
| Language | SpanishGalician | | | | | |
| Teaching method | Face-to-face | | | | | |
| Prerequisites | | | | | | |
| Department | Enxeñaría Industrial | | | | | |
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| 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 |
|-------|-----------|
| | |



| | |
|---|--|
| 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 |
|---------------------------------|------------------------|--------------------------------------|-------------------------------|-------------|
| Laboratory practice | B4 B10 C3 C5 | 9 | 10 | 19 |
| Workshop | B1 B6 B10 | 4 | 25 | 29 |
| Mixed objective/subjective test | B4 B6 C1 | 2 | 0 | 2 |
| Guest lecture / keynote speech | A13 B6 B13 | 9 | 15 | 24 |
| 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 |
|---------------------------------|--|
| 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 objective/subjective test | It consists in carrying out an objective test of approximately 3 hours, in which the acquired knowledge will be evaluated. |
| Guest lecture / keynote speech | 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. |

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.