



## Teaching Guide

| Identifying Data         |  |        |   |         | 2023/24 |
|--------------------------|--|--------|---|---------|---------|
| Subject (*)              | Quality of the Electric Service  | Code   | 730547013d                                    |         |         |
| 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              | Méndez Sanmartín, Cristian   | E-mail | cristian.mendez@udc.es                        |         |         |
| Lecturers                | Graña Lopez, Manuel angel<br>Méndez Sanmartín, Cristian  | E-mail | manuel.grana@udc.es<br>cristian.mendez@udc.es |         |         |
| Web                      | <a href="https://moodle.udc.es/">https://moodle.udc.es/</a>  |        |   |         |         |
| General description      | In this subject studies the quality of the electrical service from the point of view of the legislation and rule at present valid. |        |   |         |         |

## Study programme competences

| Code | Study programme competences   |
|------|---|
| A1   | CE1 - Apply methodologies and regulations for efficient energy management   |
| B9   | CG4 - Extract, interpret and process information, from different sources, for use in the study and analysis           |
| B13  | CG8 - Apply theoretical knowledge to practice   |
| B15  | CG10 - Know the current legislation and regulations applicable to the renewable energy and energy efficiency sector   |
| C1   | CT1 - Express themselves correctly, both orally and in writing, in the official languages of the autonomous community |

## Learning outcomes

| Learning outcomes  | Study programme competences |                     |     |
|--|-----------------------------|---------------------|-----|
| The student will know how to analyze the different disturbances (frequency, amplitude or symmetry) that occur in an Electrical System, recognizing their causes, effects, indicators, forms of measurement and regulations that affect them, as well as the possible corrective measures to take into account. | AC1                         | BC9<br>BC13<br>BC15 | CC1 |

## Contents

| Topic                                  | Sub-topic  |
|--|--|
| Summary according to the degree report | <ol style="list-style-type: none"> <li>Quality of service.</li> <li>Waveform distortion.</li> <li>Impulses and oscillations.</li> <li>Voltage dips and interruptions.</li> <li>Temporary surges.</li> <li>Prevention methods.</li> </ol> |
| Introduction                           | Presentation of the subject<br>Previous knowledges   |
| Continuity of the supply               | Definition<br>Types of interruptions<br>TIEPI<br>NIEPI   |



|  |   |
|--|---|
| Quality of the product                   | <p>Frequency</p> <p>Overtages/Undervoltages</p> <p>Flicker</p> <p>Voltage unbalance</p> <p>Harmonic distortion</p> <p>Interharmonics</p> <p>Noise</p> <p>Interruptions</p> <p>Sags (dips)/Swells</p> <p>Transients</p>  |
| Quality of the attention to the consumer | <p>Definition</p> <p>Indexes of individual quality</p>  |
| ANNEXES                                  | <p>Basic regulations</p> <p>Electromagnetic compatibility.</p> <p>Measurement of the quality of supply.</p> <p>The Spanish electricity market.</p> <p>Contracting of the electricity supply.</p> <p>Measurement and billing of electric power.</p> <p>Claims.</p> <p>Connection systems for the neutral and the earth ground.</p> <p>Electrotechnical regulations.</p> <p>NOTE: The annexes are not subject of examination.</p> |

| Planning               |                  |                      |                               |             |
|------------------------|------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests  | Competencies     | Ordinary class hours | Student?s personal work hours | Total hours |
| Objective test         | B9 B13           | 0                    | 12                            | 12          |
| Workshop               | B9 B15           | 0                    | 10                            | 10          |
| Supervised projects    | A1 B9 B13 B15 C1 | 0                    | 50                            | 50          |
| Personalized attention |                  | 3                    | 0                             | 3           |

(\*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

| Methodologies       |   |
|---------------------|---|
| Methodologies       | Description   |
| Objective test      | Evaluation test where the student must demonstrate their level of learning in an objective manner.  |
| Workshop            | The student will be provided with the necessary teaching material to be able to develop the contents of the subject.  |
| Supervised projects | <p>Methodology designed to promote students' autonomous learning, under the tutelage of the teacher and in varied settings (academic and professional). It refers primarily to learning &amp;quot;how to do things.&amp;quot; It constitutes an option based on the assumption by students of responsibility for their own learning.</p> <p>This teaching system is based on two basic elements: the independent learning of the students and the monitoring of that learning by the teacher-tutor.</p> |

| Personalized attention |  |
|------------------------|--|
| Methodologies          | Description  |
| Supervised projects    | The teacher responds individually or in a group, to the questions or queries made by the students. |
| Objective test         |  |

| Assessment    |              |             |               |
|---------------|--------------|-------------|---------------|
| Methodologies | Competencies | Description | Qualification |
|               |              |             |               |



|                     |                  |  |    |
|---------------------|------------------|--|----|
| Supervised projects | A1 B9 B13 B15 C1 | Will be able to realise to varied cape works tutelados along the course, being his compulsory delivery and that treated on problems or practical suppositions related with the matter.<br><br>The works tutelados, are 50% of the final note of the matter, that will be added to the note obtained in the objective proof, whenever this was described with at least 3 points on 10 points. | 50 |
| Objective test      | B9 B13           | The proof can alternate ask type problem or theoretical questions, and represents 50% of the final note of the matter.   | 50 |

### Assessment comments

The evaluation of the subject will be carried out through the following tests:

Activities that can be carried out during the school period:

Supervised jobs:

Several tutored works may be carried out throughout the course, their delivery being mandatory and dealing with problems or practical cases related to the subject. The supervised works are 50% of the final mark of the subject, which will be added to the mark obtained in the objective test, provided that it is qualified with at least 3 points out of 10 points.

Final objective test:

On the dates officially set by the center, this final test will be carried out. The test can alternate problem-type questions or theoretical questions, and represents 50% of the final grade for the subject.

Note: the first opportunity and the second will be evaluated under the same criteria.

Additional conditions:

No Show Status:

Students who do not take the first or second chance objective test will be given the status of not taking part, regardless of the assessment of the possible activities carried out during the school period.

Early call:

Students who make an early call will be evaluated with 100% assessment by means of the objective test.

Academic exemption:

Students with academic exemption must carry out 100% of the compulsory activities in one of two different available schedules.

Fraudulent realization:

Students who fraudulently carry out any type of evaluation activity (both carrying out activities during the academic period and in the objective test), once verified, will be automatically qualified as failed (numerical grade 0) in the corresponding call for the academic year. Not being able to take the subject until the next call in the next academic year.

### Sources of information

|                      |  |
|----------------------|--|
| <b>Basic</b>         | Real Decreto 1955/2000, de 1 de diciembre, por el que se regulan las actividades de transporte, distribución, comercialización, suministro y procedimientos de autorización de instalaciones de energía eléctrica. (BOE nº 310, de 27 de diciembre de 2000). Orden ECO/797/2002, de 22 de marzo, por la que se aprueba el procedimiento de medida y control de la continuidad del suministro eléctrico. (BOE nº 89, de 13 de abril de 2002). Norma UNE-EN 50160: 2011, Características de la tensión suministrada por las redes generales de distribución. Norma UNE-EN 61000-4-30: 2015, Compatibilidad Electromagnética (CEM). Parte 4-30: Técnicas de ensayo y de medida. Métodos de medida de la calidad del suministro. |
| <b>Complementary</b> |  |

### Recommendations

#### Subjects that it is recommended to have taken before

Efficiency of Electric Systems/730547012d

#### Subjects that are recommended to be taken simultaneously

#### Subjects that continue the syllabus



## Other comments

PTo help achieve a sustained immediate 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" The delivery of documentary work carried out in this matter:&nbsp;1.1. They will be requested in virtual format and/or computer support.&nbsp;1.2. They will be done through Moodle, in digital format without the need to print them.&nbsp;1.3. If done on paper: - Plastics will not be used.&nbsp;- Double-sided prints will be made.&nbsp;- Recycled paper will be used.&nbsp;- The printing of drafts will be avoided.It will facilitate the full integration of students who, for physical, sensory, mental or sociocultural reasons, experience difficulties in correct, equal and beneficial access to university life.

(\*)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.