



## IDENTIFYING DATA

### Power lines and electric energy transmission

|                     |   |           |      |            |
|---------------------|---|-----------|------|------------|
| Subject             | Power lines and electric energy transmission  |           |      |            |
| Code                | V12G320V01703   |           |      |            |
| Study programme     | Degree in Electrical Engineering  |           |      |            |
| Descriptors         | ECTS Credits  | Choose    | Year | Quadmester |
|                     | 6   | Mandatory | 4th  | 1st        |
| Teaching language   | Spanish   |           |      |            |
| Department          |   |           |      |            |
| Coordinator         | Fernández Otero, Antonio  |           |      |            |
| Lecturers           | Fernández Otero, Antonio  |           |      |            |
| E-mail              | afotero@uvigo.es  |           |      |            |
| Web                 | <a href="http://faitic.uvigo.es">http://faitic.uvigo.es</a>   |           |      |            |
| General description | <p>(*)O obxectivo desta materia é proporcionar ao alumno os coñecementos necesarios para ser capaz de planificar, xestionar, deseñar e calcular as instalacións eléctricas de alta tensión que constitúen a estrutura básica das redes de transporte e distribución da enerxía eléctrica.</p> <p>Nunha primeira parte da materia, desenvólvese o cálculo e deseño das devanditas instalacións de alta tensión, empezando polas liñas eléctricas de alta tensión, tanto aéreas como subterráneas para a continuación, abordar a descrición das instalacións de transformación e/ou *interconexión coñecidas como subestacións eléctricas.</p> <p>Unha segunda parte do programa dedícase á análise das redes eléctricas de alta tensión en condicións de falta e a tratar os conceptos básicos de coordinación de illamento ligados cos problemas de *sobretensións que se producen neste tipo de sistemas.</p> <p>Finalmente, nun último tema introdúcense os aspectos básicos do transporte da enerxía eléctrica mediante sistemas de corrente continua.</p> |           |      |            |

## Competencies

|      |   |
|------|---|
| Code |   |
| B3   | CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations. |
| C23  | CE23 Ability to calculate and design of power lines and electricity transmission.   |
| D1   | CT1 Analysis and synthesis.   |
| D2   | CT2 Problems resolution.  |
| D6   | CT6 Application of computer science in the field of study.  |
| D10  | CT10 Self learning and work.  |
| D16  | CT16 Critical thinking.   |
| D17  | CT17 Working as a team.   |

## Learning outcomes

|                                    |                               |     |                                     |
|------------------------------------|-------------------------------|-----|-------------------------------------|
| Expected results from this subject | Training and Learning Results |     |                                     |
| New                                | B3                            | C23 | D1<br>D2<br>D6<br>D10<br>D16<br>D17 |

**Contents**

## Topic

|   |  |
|---|--|
| 1. Introduction to the electric power systems | 1) Structure and description of an electric power system<br>b) Models of the fundamental elements of an electric power system<br>- Electric lines, transformers, generators, motor and generic loads           |
| 2. Analysis of faults in electric systems     | a) Balanced faults<br>b) Unbalanced faults<br>- symmetrical Components<br>- sequence networks  |
| 3. High Voltage electric lines                | a) Electrical models of lines<br>- Parameters<br>- Equivalent Circuits<br>- Steady-state<br>- Transient state<br><br>b) Mechanical calculation of overhead lines<br>- Conductors<br>- Supports<br>- Insulators |
| 4. Overvoltages and insulation coordination   | a) Types of overvoltages<br>b) Insulations coordination<br>c) Overvoltage protection devices   |
| 5. Substations                                | a) Configuration types<br>b) Substation components<br>c) Grounding systems in high voltage installations   |

**Planning**

|                       | Class hours | Hours outside the classroom | Total hours |
|-----------------------|-------------|-----------------------------|-------------|
| Lecturing             | 18          | 36                          | 54          |
| Problem solving       | 12.5        | 25                          | 37.5        |
| Practices through ICT | 18          | 36                          | 54          |
| Essay questions exam  | 4.5         | 0                           | 4.5         |

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

**Methodologies**

|                       | Description  |
|-----------------------|--|
| Lecturing             | (*)Exposición por parte do profesor dos conceptos teóricos de cada tema a todo o grupo no horario de aula establecida polo centro. Fomentarase a participación activa dos alumnos en forma de preguntas e respostas en ambos os sentidos.  |
| Problem solving       | (*)Formulación e resolución por parte do profesor de exercicios tipo básicos de aplicación práctica dos contidos teóricos previamente desenvolvidos.   |
| Practices through ICT | (*)Proporanse casos prácticos de maior dimensión e complexidade como aplicación dos contidos da materia e que deben ser resoltos polos alumnos na aula informática coa utilización de ferramentas de software comercial e/ou de desenvolvemento propio. Este tipo de exercicios normalmente son expostos e iniciados na aula informática e finalizados polo alumno de forma autónoma. Serán entregados antes da seguinte práctica. |

**Personalized assistance**

| Methodologies         | Description |
|-----------------------|-------------|
| Problem solving       |             |
| Practices through ICT |             |

**Assessment**

| Description | Qualification | Training and Learning Results |
|-------------|---------------|-------------------------------|
|             |               |                               |

|                      |  |    |    |     |                                     |
|----------------------|--|----|----|-----|-------------------------------------|
| Problem solving      | It Will evaluate the correct resolution and delivery in time and form of diverse exercises of practical type proposed in the kinds of problems and in the practices of laboratory.   | 40 | B3 | C23 | D1<br>D2<br>D6<br>D10<br>D16<br>D17 |
| Essay questions exam | Examination of theoretical type-@práctico with resolution of exercises of application of the concepts of the subject.<br>Minimum note of 4 on 10 in this part to approve the subject.<br><br>In this *examen, any part of the subject will be able to be freed stop the student in function of the evaluation obtained in the "Resolution of problems" | 60 | B3 | C23 | D1<br>D2<br>D6<br>D10<br>D16<br>D17 |

### Other comments on the Evaluation

In the announcement of July the \*examen of developmental questions \*contará a 100%.

Commitment \*Español\* that the present student a behaviour \*Español\* suitable. In the case to detect a behaviour no \*Español\* (copy, \*plaxio, \*utilización of devices \*electrónicos unlicensed, and others) will consider that the student no \*reñe the necessary requirements to surpass the subject. In this case to \*calificación global in the present course \*académica \*será of \*suspense (0.0).

No \*permitirá to \*utilización of \*ningún device \*electrónico during them test of \*evaluación except \*autorización expresses. The fact to enter a device \*electrónico unlicensed in the classroom of examination \*será considered reason of no \*superación of the subject in the present course \*académica and the \*calificación global \*será of \*suspense (0.0)

### Sources of information

#### Basic Bibliography

Pascual Simón Comín y otros, **Cálculo y Diseño de Líneas Eléctricas de Alta Tensión**, Garceta,

A. G. Exposito, **Análisis y Operación de Sistemas de Energía Eléctrica**, McGraw Hill,

J. Moreno Mohino y otros, **Reglamento de Líneas de Alta Tensión y sus fundamentos**, Paraninfo,

J. A. Martínez Velasco, **Coordinación de aislamiento en redes eléctricas de alta tensión**, McGraw Hill,

#### Complementary Bibliography

### Recommendations

#### Subjects that continue the syllabus

Electric power systems/V12G320V01802

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

Electrical engineering/V12G320V01401

Basics of circuit analysis and electrical machines/V12G320V01304

Electrical machines/V12G320V01504

### Contingency plan

#### Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of the uncertain and unpredictable evolution of the sanitary alert caused by the \*COVID-19, the University of Vigo establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or partially face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a more agile and effective way when being known in advance (or with a wide \*antelación) by the students and the \*profesorado through the tool normalised and institutionalised of the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===

"The contents and the evaluation does not modify , only will adapt the educational methodologies and the proofs to the telematic means facilitated by the University, in case to be necessary"