



## IDENTIFYING DATA

### Electrical installations, surveying and construction

|                     |   |          |      |            |
|---------------------|---|----------|------|------------|
| Subject             | Electrical installations, surveying and construction  |          |      |            |
| Code                | V12G380V01923   |          |      |            |
| Study programme     | Grado en Ingeniería Mecánica  |          |      |            |
| Descriptors         | ECTS Credits  | Choose   | Year | Quadmester |
|                     | 9   | Optional | 4th  | 1st        |
| Teaching language   | #EnglishFriendly<br>Spanish<br>Galician   |          |      |            |
| Department          |   |          |      |            |
| Coordinator         | Prieto Alonso, Manuel Angel   |          |      |            |
| Lecturers           | Arias Sánchez, Pedro<br>Lorenzo Cimadevila, Henrique<br>Prieto Alonso, Manuel Angel   |          |      |            |
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| Web                 | <a href="http://moovi.uvigo.gal/">http://moovi.uvigo.gal/</a>   |          |      |            |
| General description | Legal attributions of Graduated of the technological fields, are to project and direct works for the execution of industrial installations and works in buildings. Based on this, the Graduated must acquire a general knowledge about materials and constructive systems for industrial systems, as well as the legal rules that can affect to this field of work. |          |      |            |

The main objectives of this subject, highlights:

- Knowledges referred the constitution of the electric system in the his group, and rules, constitutive components and techniques in the electric installations, especially of low tension.
- Know how the raw and prefabricated materials used in the construction, as well as, its application.
- Know how the methodologies and constructive systems existing in the design process of a construction.
- Know how and realice the legal rules and normative of general character that affect to the execution of the works supervised for engineers.
- Know how the environmental impact of the building and the energetic efficiency solutions.

## Skills

|      |  |
|------|--|
| Code |  |
| B1   | CG1 Skills for writing, signing and developing projects in the field of industrial engineering, whose purpose, specializing in Mechanics, construction, alteration, repair, maintenance, demolition, manufacturing, installation, assembly or operation of: structures, mechanical equipments, energy facilities, electrical systems and electronic installations and industrial plants, and manufacturing processes and automation. |
| B5   | CG5 Knowledge to carry out measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and other similar works.   |
| B7   | CG7 Ability to analyze and assess the social and environmental impact of the technical solutions.  |
| C23  | CE23 Knowledge and ability to calculate and design of structures and industrial buildings.   |
| C26  | CE26 Applied knowledge of systems and manufacturing processes, metrology and quality control.  |
| D2   | CT2 Problems resolution.   |
| D7   | CT7 Ability to organize and plan.  |
| D8   | CT8 Decision making.   |
| D9   | CT9 Apply knowledge.   |
| D10  | CT10 Self learning and work.   |
| D12  | CT12 Research skills.  |
| D17  | CT17 Working as a team.  |
| D20  | CT20 Ability to communicate with people not expert in the field.   |

## Learning outcomes

| Expected results from this subject   | Training and Learning Results |            |  |
|--|-------------------------------|------------|--|
| Capacity stop the development and direction of projects within the scope of the industrial engineering, that have by object to building, reform, repair, preservation, *demolición, or *montaxe of structures, energetic and electric installations. | B1<br>B5<br>B7                | C23<br>C26 | D2<br>D7<br>D8<br>D9                             |
| Knowledge applied of systems and processes of *metroloxía and control of the quality.  |                               |            | D10  |
| Purchase knowledges of *topografía and be the one who to apply them the works. Purchase knowledges of the constructive elements.   |                               |            | D12  |
| Knowledge and utilization of the principles of theory of circuits and electric machines.   |                               |            | D17<br>D20                                       |
| New  | B1<br>B5<br>B7                | C23<br>C26 | D2<br>D7<br>D8<br>D9<br>D10<br>D12<br>D17<br>D20 |

## Contents

| Topic                                |   |
|--------------------------------------|---|
| Bases of the Geotechnologies         | Sources for Cartographic data. Web resources. Geomatic methodologies how raw data: Surveying, Photogrametry, LiDAR, GNSS. Instrumentation. Generation of Point Clouds. Surfaces and level curves. Industrial surveying, accuracy. Reverse engineering.<br>The explanation and development of this topic presents a high technological component: a high and up-to-date level of equipment is available. Likewise, software is generally used for free access, or alternatively with free licenses for students. AVAILABLE MEDIA: Total robotic station, GNSS systems (GPS, GLONASS, GALILEO, BEDIOU), LiDAR sensor, unmanned aerial vehicles (UAVs) with RGB, Thermal and Multispectral sensors. Softwares: QGIS, CloudCompare, Revit, CYPE. BIM, GRASS, SAGA, Metashape. |
| Applications of Surveying            | Activities related with the execution of a work. Survey stakeout. Definition and procedure. Instrumentation. Survey stakeout of points and alignments. Planimetric & altimetric methods for survey stakeout.<br>Linear surveying, general considerations. Linear profiles, methods. Trasversal profiles and transversal sections. Slides. Volumetric measurements. Earth-moving.<br>The explanation and development of this topic presents a high technological component: a high and up-to-date level of equipment is available. Likewise, the software is generally used for free access, or alternatively with free licenses for students. AVAILABLE MEANS: Total robotic station, GNSS systems (GPS, GLONASS, GALILEO, BEDIOU). Software: QGIS, AutoCAD, Topocal.     |
| Urbanism and land planning           | The project. The process of bidding. The construction companies. Planning and management of a work. Execution and control of Works, agents. Activities related with the execution of a work.<br>The administrative structure by means of Geographical Information Systems.<br>To make queries in various sources of geospatial information (IDEE, IGN, EIEL, etc.) and geographic information servers. Access to the regulations of urban planning and territorial planning (SIOTUGA, Catastro, Laws of the Land, etc.).  |
| Construcción materials and machinery | Introduction of building materials. Materials: Stone, Ceramic, Binder, Organic, Metallic. Mortar & concrete.<br>Prefabricated materials. Auxiliary structures.<br>Access and know the regulations of PG3 works and construction-building regulations CTE.   |
| Systems and Constructive Processes   | Environmental management. Retain walls. Earth-moving. Drainages and foundations. Beams and pillars. Closings. Installations.<br>The building and safe energy, constructive solutions.   |
| Electrical power system              | The national electrical power system<br>Components of an electrical power system<br>Operation of the power system.<br>Electricity market  |

|  |   |
|--|---|
| Components of electrical installations                 | Electrical conductors and cables<br>Switching, control and protection devices<br>Transformers<br>Motors<br>Lighting equipment<br>Energy meters. Power factor correction |
| Electrical installation design methodology             | Installed power loads<br>Máximum power demand<br>Cable selection based on ampacity, on voltage drop and short circuit temperature rise                                  |
| Regulations and standards for electrical installations | National standards for electrical installations: REBT, MIE-RAT, LAT, CTE  |
| Electrical drawings                                    | Electrical symbols<br>Power drawings<br>One-line electrical diagrams<br>Control drawings  |
| Lighting   | Fundamentals of lighting<br>Photometric magnitudes<br>Lighting calculations methods   |

### Planning

|   | Class hours | Hours outside the classroom | Total hours |
|---|-------------|-----------------------------|-------------|
| Lecturing   | 44          | 78                          | 122         |
| Problem solving   | 4           | 8                           | 12          |
| Laboratory practical                                    | 14          | 20                          | 34          |
| Practices through ICT                                   | 10          | 12                          | 22          |
| Studies excursion                                       | 4           | 2                           | 6           |
| Objective questions exam                                | 1           | 0                           | 1           |
| Problem and/or exercise solving                         | 2           | 0                           | 2           |
| Report of practices, practicum and external practices 2 |             | 24                          | 26          |

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

### Methodologies

|                       | Description  |
|-----------------------|--|
| Lecturing             | Exhibition by part of the professor of the contents on the matter object of study, theoretical bases and/or guidelines of a work, exercise or project to develop by the student.   |
| Problem solving       | Activity in which they formulate problem and/or exercises related with the matter. The student has to develop the ideal or correct solutions by means of the exercise of routines, the application of formulas or algorithms, the application of procedures of transformation of the available information and the interpretation of the results. It is used to employ as I complement of the lesson *magistral. |
| Laboratory practical  | Activities of application of the knowledges to concrete situations and of acquisition of basic skills and of procedure related with the matter object of study. They develop in special spaces with *equipación skilled.   |
| Practices through ICT | Activities of application of the knowledges to concrete situations, and of acquisition of basic skills and of procedure related with the matter object of study. They develop through the TIC in the classrooms of computing.  |
| Studies excursion     | Activities of application of the knowledges to concrete situations and of acquisition of basic skills and of procedure related with the matter object of study. They develop in spaces no external academicians.   |

### Personalized assistance

| Methodologies         | Description                          |
|-----------------------|--------------------------------------|
| Laboratory practical  | Practices of laboratory              |
| Practices through ICT | Practices in classrooms of computing |

### Assessment

|                          | Description   | Qualification | Training and Learning Results |
|--------------------------|---|---------------|-------------------------------|
| Objective questions exam | Global evaluation of the educational process and the acquisition of competitions and knowledges through proofs type test. | 20            | B5 C23 D8<br>C26 D9           |

|   |  |    |                                     |
|---|--|----|-------------------------------------|
| Problem and/or exercise solving                       | Global evaluation of the educational process and the acquisition of competitions and knowledges through proofs of resolution of problems and exercises.  | 40 | B7 C26 D2 D7 D9                     |
| Report of practices, practicum and external practices | Global evaluation of the educational process and the acquisition of competitions and knowledges through memory of works realized in the computer room or field practice, where the student must demonstrate that he sufficiently dominates the softwar used in the different parts of the subject, this software is updated periodically, usually free access, or alternatively with free licenses for students. | 40 | B1 C23 D7 B5 C26 D10 B7 D12 D17 D20 |

### Other comments on the Evaluation

Participation in the theoretical classes will be assessed positively, and attendance in practical classes will be mandatory in the face-to-face scenario, and will be assessed positively in the non-face-to-face scenario. The realization of the practices and delivery of the reports of the same, will be part of the process of continuous evaluation of the student.

The final exam will consist of two sections, one corresponding to the part of Topography and Construction, and the other the contents of Electrical Installations. Both parties will include theoretical questions and application exercises. Each section will be evaluated from 0 to 10 points, obtaining the final rating from the average value. A minimum of 4 points will be required in each of the parts of each section to be able to overcome the subject.

The qualification of the internships will be saved for the calls of that same academic year.

Ethical commitment: The student is expected to present appropriate ethical behavior. In the case of detecting unethical behavior (copying, plagiarism, use of unauthorized electronic devices, and others) it will be considered that the student does not meet the necessary requirements to overcome the subject. In this case, the overall qualification in the current academic year will be suspended (0.0).

### Sources of information

#### Basic Bibliography

Moreno Garzón, Ignacio, **Topografía aplicada a la construcción y replanteo de obras**, Granada : C.O.A.A.T., D.L., 1995

Martínez Fernández, Francisco Manue, **Topografía práctica para la construcción**, Barcelona: Ceac, 2007

Schmitt, Heinrich, **Tratado de construcción**, 8ª ed. amp., 2009

Neila González, F. Javier, **Arquitectura bioclimática y construcción sostenible**, 2009

Crespo Escobar, Santiago, **Materiales de construcción para edificación y obra civil**, Editorial Club Universitario, 2010, 2010

Ministerio de Industria y Energía, RD 842/2002, **Reglamento Electrotécnico para BT, 2002**, 2002

Moreno Alfonso, Narciso; Cano González, Ramón, **Instalaciones eléctricas en baja tensión**, Paraninfo, 2017

García Trasancos, José, **Instalaciones eléctricas en media y baja tensión**, Paraninfo, 2009

#### Complementary Bibliography

Garrard, Chris, **Geoprocening with Python**, Shelter Island, NY: Manning, cop, 2016

Paul Bolstad, **GIS fundamentals : a first text on geographic information systems**, 4ª, White Bear Lake (Minnesota): Eider press, 2012

### Recommendations

#### Subjects that continue the syllabus

Final Year Dissertation/V12G380V01991

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

Graphic expression: Graphic expression/V12G380V01101

Computer science: Computing for engineering/V12G380V01203

Technical Office/V12G380V01701