



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 Spanish Galician			
Department				
Coordinator	Arias Sánchez, Pedro Prieto Alonso, Manuel Angel			
Lecturers	Arias Sánchez, Pedro Lorenzo Cimadevila, Henrique Prieto Alonso, Manuel Angel Soilán Rodríguez, Mario			
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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 realize 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.

Training and Learning Results

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.

Expected results from this subject

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	C23	D2
	B5	C26	D7
	B7		D8
			D9
			D10
Knowledge applied of systems and processes of *metroloxía and control of the quality.			D12
			D17
Purchase knowledges of *topografía and be the one who to apply them the works. Purchase knowledges of the constructive elements.			D20
Knowledge and utilization of the principles of theory of circuits and electric machines.			D17
			D20
New	B1	C23	D2
	B5	C26	D7
	B7		D8
			D9
			D10
			D12
			D17
			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. 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, BEDIU), 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. Linear surveying, general considerations. Linear profiles, methods. Trasversal profiles and transversal sections. Slides. Volumetric measurements. Earth-moving. 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, BEDIU). 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. The administrative structure by means of Geographical Information Systems. 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. Prefabricated materials. Auxiliary structures. 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. The building and safe energy, constructive solutions.

Electrical power system	The national electrical power system Components of an electrical power system Operation of the power system. Electricity market
Components of electrical installations	Electrical conductors and cables Switching, control and protection devices Transformers Motors Lighting equipment Energy meters. Power factor correction
Electrical installation design methodology	Installed power loads Máximum power demand 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 Power drawings One-line electrical diagrams Control drawings
Lighting	Fundamentals of lighting Photometric magnitudes 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
				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, **Geoprocessing 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