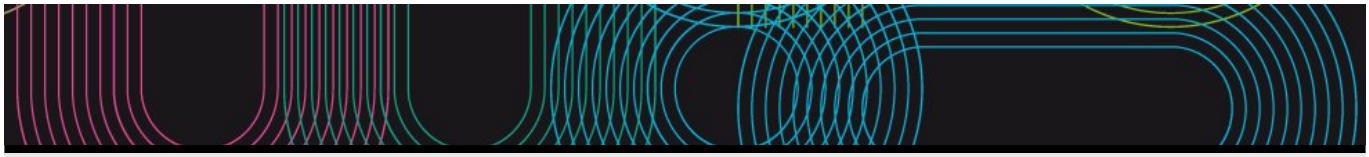
Universidade Vigo

Subject Guide 2022 / 2023



IDENTIFYING DATA				
Electrical systems				
Subject	Electrical systems			
Code	V12G360V01705			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language				
Department				
Coordinator	Villanueva Torres, Daniel			
Lecturers	Parajo Calvo, Bernardo José Villanueva Torres, Daniel			
E-mail	dvillanueva@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	(*)Analizar, deseñar e simula-lo funcionamento dos siistemas eléctricos. Coñecer e interpreta la normativa utilizada pra calcular instalaciones eléctricas industriaes.			

Skills	
Code	
B3	CG3 Knowledge in basic and technological subjects that will enable them to learn new methods and theories, and equip them with versatility to adapt to new situations.
C21	CE21 Knowledge of electric systems of power and their applications
D2	CT2 Problems resolution.
D6	CT6 Application of computer science in the field of study.
D10	CT10 Self learning and work.
D14	CT14 Creativity.
D16	CT16 Critical thinking.
D17	CT17 Working as a team.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
New	B3	C21	D2 D6 D10 D14 D16 D17
(*)Documentación, elaboración, presentación y defensa del proyecto de una instalación		C21	D2 D6 D10 D17

Contents
Topic

Systems of Electrical Energy	Introduction to the systems of electrical energy. The electrical sector Spanish. Operation of the electrical system Spanish: balance between production and consumption. Centres of Control of Electrical Network of Spain. Maps of network. Zones of distribution in Spain and small distributors. Quality of the Electrical Service. Indexes of quality of the Service.
Networks of Distribution in Low Tension	Elements of the aerial networks of *BT. Execution of the networks on façade and on supports. Subterranean networks of *BT. Put to earth and continuity of the neutral. Criteria of dimensioning of the wires of *BT. Tackled: general box of protection and line *repartidora. Forecast of loads and factors of simultaneity.
Elements of the Systems of Electrical Energy.	Introduction to the general description of the systems. *Aparamenta Electrical. Parameters of the electrical lines: resistance, inductance and *capacitancia. Model of the electrical line. Model of transformer of power. Model of the alternator. Preparation of the model of an electrical system in values by unit.
Centres of Transformation for Distribution	Diagrams and constitution of Centres of transformation. Systems of protection. Put to earth of the Centres. Switches, *seccionadores and fusible. *Pararrayos. Interconnection *pararrayos-*trafo. Picture of *BT: interconnections *trafo-picture of *BT. Protection against the environmental aggression.
Study of the Operation of the System: Flow of Loads	Introduction. Radial networks and *malladas. Solution to the flow of loads: method of Gauss-*Seidel. Control and operation of the system: structure, controls of frequency and of tension, tertiary control.
Protection of the Systems of Power.	Characteristics of the currents of *cortocircuito: method of calculation. (JOIN-IN 60909). Analysis of the *cortocircuitos *trifásicos balanced and unbalanced (JOIN-IN-21239). Criteria of protection of the electrical system Spanish. Elements of protection against overload and *cortocircuitos: automatic and fusible switches. *Sobretensiones: Origin and mechanism of propagation. Coordination of the isolation: protection against the *sobretensiones (JOIN-IN 60071-1-2).
Industrial installations in Drop and Half tension.	Elements of the installations: symbology, electrical diagrams, electrical wires, devices of control and protection, electrical pictures, fusible, *contactores and relays. Compensation of the reactive energy: harmonic and filters
Luminothcnics And Installations of Illumination.	Foundations of luminothecnics. Elements of the installations of lighted up. Efficiency of the luminous sources. Harmonic and lighted up

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	30	38	68
Problem solving	4	12	16
Laboratory practical	4	12	16
Mentored work	4	30	34
Objective questions exam	2	2	4
Essay questions exam	2	2	4
Laboratory practice	2	2	4
Essay	2	2	4

*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 of the cores of the subjects, followed of the convenient explanation to favour his understanding. Motivation of the interest by the knowledge of the matter.

Problem solving	Understanding of the models applied to justify the behaviour of the elements of the Electrical System. Application of the suitable procedures to evaluate his performance.
Laboratory practical	Practical application of the concepts learnt in theory. Know the elements and the procedures that employ in real electrical installations.
Mentored work	Deepening of the knowledge of the legal rule that affects to the design of the technical application. Documentation of solution adopted and justification of his opportunity for the security of the Surroundings: environment, users and installations.

Personalized assistance

Methodologies	Description
Lecturing	Attention to questions and doubts posed by the student in the development of the classes
Problem solving	Attention to questions and doubts posed by the student in the development of the classes
Mentored work	Attention to questions and doubts posed by the student in the development of the classes
Laboratory practical	Attention to questions and doubts posed by the student in the development of the classes
Tests	**Description**
Objective questions exam	Attention to questions and doubts posed by the student regarding the development of the proof of evaluation
Essay questions exam	Attention to questions and doubts posed by the student regarding the development of the proof of evaluation
Essay	Attention to questions and doubts posed by the student regarding the development of the proof of evaluation
Laboratory practice	Attention to questions and doubts posed by the student regarding the development of the proof of evaluation

Assessment

	Description	Qualification	Training and Learning Results		
Lecturing	Teaching of theoretical contents	0			
Problem solving	Examples and cases type	0			
Laboratory practical	Practical application of theoretical concepts	0			
Mentored work	(*)Exemplos de traballos e/ou proxectos a *reaizar	0			
Objective questions exam	Answer to the questionnaires to evaluate the knowledges of the matter.	20	B3	C21	
Essay questions exam	Justification and documentation of the cases proposed.	40	B3	C21	D2 D10
Laboratory practice	Delivery of memories of practices and/or results of the same	20	B3	C21	D6 D10 D16 D17
Essay	Documentation and justification of the central cores of the project. Preparation of diagrams and figures. Clarity of the editorial of the text. Sources of documentation used.	20	B3	C21	D2 D6 D10 D14 D16 D17

Other comments on the Evaluation

To surpass the subject, it is necessary to obtain a mark upper or the same to 50% and that any of the four parts was evaluated underneath of the 30 % of the maximum mark of each part. In the case that a student do not reach the minumum in any of the parts, his/her final mark would be fail (4.0). The students that renounce to his/her continuous assessment, will have the opportunity to pass the subject in a final exam, with the same parts and with the same weights as for the rest of students. The evaluations of each one of the parts will be kept along the same academic course, but this will not be true for the following ones. Ethics commitment: it is expected that the student has a suitable behaviour. In the case a non-proper behaviour is detected (copy, plagiarism, unauthorised use of electronic devices, and others) it would be considered that the student will not have the necessary requirements to surpass the subject. In this case, the mark in the current course will be a fail (0.0).

Sources of information

Basic Bibliography

Barrero, Fermín, **Sistemas de Energía Eléctrica.**, 2006,
Gómez Expósito y otros, **Análisis y Operación de Sistemas de Energía Eléctrica**, 2002,
D.P. Kothari e I.J. Nagrath,, **Sistemas Eléctricos de Potencia**, 2008,
Stevenson, Willian y Grainger John J,, **Análisis de sistemas eléctricos de potencia**, 2004,

Complementary Bibliography

Cuadernos Técnicos, **Reglamento Electrotécnico para BT**, 2008,
Cuadernos Técnicos, **Aparatos de protección y maniobra. La instalación eléctrica**, 2010,
Manual Ténico 189, **Maniobra y protección de las baterías de condensadores de MT**, 2002,
Unión-Fenosa Distribución, **CENTRO DE TRANSFORMACIÓN INTEMPERIE CTI**, 2010,
UNESA, **METODO DE CALCULO Y PROYECTO DE INSTALACIONES DE PUESTA A TIERRA PARA CENTROS DE TRANSFORMACIÓN CONECTADOS A REDES DE TERCERA CATEGORÍA**, 1989,
COMITE DE DISTRIBUCIÓN, **GUÍA TÉCNICA SOBRE CÁLCULO, DISEÑO MEDIDA DE LAS INSTALACIONES DE PUESTA A TIERRA EN REDES DE DISTRIBUCIÓN**, 1985,
MT 2.33.35, **DISEÑO DE PUESTAS A TIERRA EN APOYOS DE LAAT DE TENSION NOMINAL IGUAL O INFERIOR A 20 kV**, 2010,
IT.0110.ES.RE.PTP, **PROYECTO TIPO LÍNEAS ELÉCTRICAS AÉREAS DE BAJA TENSIÓN**, 2011,
Distribución, **PROYECTO TIPO LÍNEAS ELÉCTRICAS AÉREAS HASTA 20kV**, 2010,
MT 2.41.22, **RED AEREA TRENZADA DE BAJA TENSION**, 2009,
MT 2.21.60, **LÍNEA AÉREA DE MEDIA TENSIÓN Simple circuito con conductor de aluminio acero**, 2010,

Recommendations

Subjects that continue the syllabus

Electrical components in vehicles/V12G360V01902
Final Year Dissertation/V12G360V01991

Subjects that it is recommended to have taken before

Basics of circuit analysis and electrical machines/V12G360V01302
Applied electrotechnics/V12G360V01501
Electrical machines/V12G360V01605