Teaching Guide				
Identifying Data				2020/21
Subject (*)	Quality of the Electric Service		Code	770523014
Study programme	Mestrado Universitario en Eficiencia e Aproveitamento Enerxético			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	3
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Industrial			
Coordinador	Graña Lopez, Manuel angel	E-mail	manuel.grana@udc.es	
Lecturers	Graña Lopez, Manuel angel	E-mail	manuel.grana@udc.es	
Web	https://moodle.udc.es/			
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.			
Contingency plan	1. Changes in content The contents are not modified. 2. Methodologies All teaching methodologies are maintained, modifying only their face-to-face character. 3. Mechanisms for personalized attention to students Tools: Moodle, Teams, email. With the tutoring schedule published. 4. Modifications in the evaluation The evaluation methodologies and their weighting are maintained, except for their face-to-face character. 5. Modifications of the bibliography or webgraphy. There are no modifications.			

Study programme competences / results	
Code	Study programme competences / results
A1	Análise e aplicación de metodoloxías e normativa para unha xestión eficiente da enerxía.
B9	Extraer, interpretar y procesar información, procedente de diferentes fuentes, para su empleo en el estudio y análisis.
B13	Aplicar los conocimientos teóricos a la práctica
B15	Conocer la legislación vigente y reglamentación aplicable al sector de las energías renovables y de la eficiencia energética.
C1	Adquirir la terminología y nomenclatura científico-técnica para exponer argumentos y fundamentar conclusiones.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Know the legislation and the at present valid rule on quality of the electrical service.	AJ1	BC9 BC15	

Know the main types of perturbations and events that affect to the quality of the electrical service, as well as his causes, effects and measures of correction.		BC13	CC1
Know the main characteristic of an analyser of power to select the most suitable.		BC9	

Contents	
Topic	**Sub-topic**
Introduction	Presentation of the subject Previous knowledges
Continuity of the supply	Definition Types of interruptions TIEPI NIEPI
Quality of the product	Frequency Overvoltages/Undervoltages Flicker Voltage unbalance Harmonic distortion Interharmonics Noise Interruptions Sags (dips)/Swells Transients
Quality of the attention to the consumer	Definition Indexes of individual quality
ANNEXES	Basic regulations Electromagnetic compatibility. Measurement of the quality of supply. The Spanish electricity market. Contracting of the electricity supply. Measurement and billing of electric power. Claims. Connection systems for the neutral and the earth ground. Electrotechnical regulations. NOTE: The annexes are not subject of examination.

Planning				
Methodologies / tests	**Competencies / Results**	**Teaching hours (in-person & virtual)**	**Student?s personal work hours**	**Total hours**
Introductory activities	A1	1	1	2
Guest lecture / keynote speech	A1 B15 C1	9	9	18
Problem solving	B13	8	8	16
Laboratory practice	B13	3	3	6
Supervised projects	B9 C1	3	15	18
Objective test	A1 B13 B15 C1	2	12	14
Personalized attention		1	0	1
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies

Methodologies	Description
Introductory activities	Presentation of the subject, in big group (GG).
Guest lecture / keynote speech	Oral exhibition complemented with the use of audiovisual means and the introduction of motivating questions headed to the students, with the purpose to transmit knowledges and facilitate the learning. It corresponds to the class of theory, in big group (GG).
Problem solving	Technician by means of which has to resolve a concrete problematic situation, from the knowledges and procedures that have studied and worked. It corresponds to the class of problems, in average group (GM).
Laboratory practice	Methodology that allows that the students apply the knowledges purchased, through the realisation of activities of practical character. It corresponds to the practices of workshop, in small group (GP).
Supervised projects	Methodology designed to promote the autonomous learning of the students, under the tutela of the professor and in a professional stage. It is referred prioritariamente to the learning of the "cómo do the things". It constitutes an option based in the assumption by the students of the responsibility by his own learning. This system of education bases in two basic elements: the independent learning of the students and the follow-up of this learning by the professor. With this methodology pretends that the student can know the characteristics of the analysers of power to be able to select the most adapted of between the commercial offer that offers the market. It is a complementary activity of the practices of workshop, in small group (GP).
Objective test	Proof written used for the evaluation of the learning. With the end to value with greater rigour the achievement of the aims, the proof consists of two parts differentiated: questions of multiple answer (ítems) and resolution of problems. Questions of multiple answer (ítems): it constitutes an instrument of measure, whose distinctive shot is that it allows to describe the answers given like correct or no; in addition to valuing the knowledges purchased. Resolution of problems: part in which it pretends evaluate conceptual contents, procedimentales and actitudinales. It corresponds to the examination of theory and problems.

Personalized attention	
Methodologies	**Description**
Objective test	Tutorials of review of examinations.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Laboratory practice	B13	The qualification will be the sum of the corresponding note to the assistance and evaluation of the practices of workshop, that will value between 0 and 5 points, and the note of a final examination (proof of multiple answer), that will value also between 0 and 5 points.	25

Supervised projects	B9 C1	The qualification will correspond to the evaluation of the extension and quality of the works presented, that will value them between 0 and 10 points.	50
Objective test	A1 B13 B15 C1	This proof consists in the resolution of problems and/or ítems, and will compute between 0 and 10 points.	25

Assessment comments
Rating of subject = [Objective Proof (theory and problems) * 0'25] + [Practices of laboratory * 0'25] + [Mentored work nº 1 * 0'25] + [Mentored work nº 2 * 0'25].In the presentation of the subject (first day of class), additional and voluntary activities can be indicated, whose evaluation will be added to the grade of the subject. In any case, the qualification of the subject can not exceed 10 points.To surpass the matter is necessary to obtain, at least, five points in the note of the matter.

Sources of information	
Basic	- (). . 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. Vídeos descritivos:https://www.youtube.com/watch?v=iPxK9yt1XVYhttps://www.youtube.com/watch?v=CoySYBHXqBkhttps://www.youtube.com/watch?v=WoxlENO-M1Uhttps://www.youtube.com/watch?v=pPMcIZbHCpMhttps://www.youtube.com/watch?v=Pv5ximOmE2o&t=218s
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Efficiency of Electric Systems/770523013
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments
Prior knowledge of circuit analysis in DC, AC and three-phase circuits as well as symmetrical components is required.In another order of things, to help achieve a sustained immediate environment and meet the goal of action number 5: "Healthy and sustainable environmental and social teaching and research" of the "Green Campus Ferrol Action Plan":   The delivery of the documentary works that are made in this matter: ? Will be requested in virtual format and / or computer support   ? It will be done through Moodle, in digital format without the need to print them   ? If it is necessary to make them on paper: - Plastics will not be used   - Double-sided prints will be made.   - Recycled paper will be used.   - Printing of drafts will be avoided.? There must be a sustainable use of resources and the prevention of negative impacts on the natural environment.