Teaching Guide				
Identifying Data				2023/24
Subject (*)	Efficiency of Electric Systems		Code	730547012d
Study programme	Máster Universitario en Eficiencia Enerxética e Sustentabilidade (a distancia)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	3
Language	SpanishGalician			
Teaching method	Non-attendance			
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	moodle.udc.es			
General description	To achieve that the electrical installations and the receptors that constitute them, work of a correct way and that work of an efficient way from an electrical point of view, have to firstly identify and afterwards quantify of a correct way the ineficiencias that can find us presents in any electrical system, such as the desfases between the tension and the current, the fault of symmetry and the fault of linealidad in his circuits, once established these ineficiencias, showed the devices that allow us correct them, so that it attain an improvement in the efficiency of the installation or circuit.			

Study programme competences / results	
Code	Study programme competences / results
A1	CE1 - Apply methodologies and regulations for efficient energy management
B1	CB6 - Possess and understand knowledge that provides a foundation or opportunity to be original in the development and/or application of ideas, often in a research context
B6	CG1 - Search and select alternatives considering the best possible solutions
B7	CG2 - Develop analysis and synthesis skills; encourage critical discussion, defending arguments, and drawing conclusions
B11	CG6 - Acquire new knowledge and skills related to the professional field of the master's degree
B15	CG10 - Know the current legislation and regulations applicable to the renewable energy and energy efficiency sector
C3	CT3 - Use the basic tools of information and communication technologies (ICT) necessary for the exercise of their profession and for learning throughout their lives

Learning outcomes			
Learning outcomes	Study programme competences / results		
The student will identify the various phenomena (reactive, imbalances and harmonics) that can be found in an electrical system or installation, which reduce its efficiency, will know how to quantify their importance and proceed to propose the best solution for them, so that the system is as efficient as possible from the electrical point of view, in accordance with current standards and regulations.	AC1	BC1 BC6 BC7 BC11 BC15	CC3

Contents	
Topic	Sub-topic
Introduction to the ineficiencias in the electrical systems.	Introduction. The Unified Theory of Electrical Power.
Compensation of the reactive power.	Introduction. Characterisation and measure of the reactive energy. Devices of compensation of the cos fi.

Balanced three- and four-wire electrical systems.	Introducción. Theorem of Stokvis-Fortescue. Characterization and measurement of power imbalances Equivalent circuits of receptors and installations. Elimination of imbalances. Filters of sequence.
Non linear loads.	Introduction. Origin of non-sinusoidal periodic waves. Factors periodic signals. Limits of harmonics. Distortion power.
Correction disturbances.	Introduction. UNE-EN-61642. Filters of harmonic. Filters of Rejection. Filters of Absorption.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Workshop	A1 B11	0	10	10
Supervised projects	A1 B1 B6 C3	0	50	50
Objective test	B6 B7 B15	0	12	12
Personalized attention		3	0	3
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Workshop	The student will be provided with the necessary teaching material to be able to develop the contents of the subject.
Supervised projects	Methodology designed to promote students' autonomous learning, under the tutelage of the teacher and in varied settings (academic and professional). It refers primarily to learning "how to do things." It constitutes an option based on the assumption by students of responsibility for their own learning. This teaching system is based on two basic elements: the independent learning of the students and the monitoring of that learning by the teacher-tutor.
Objective test	Evaluation test where the student must demonstrate their level of learning in an objective manner.

Personalized attention	
Methodologies	Description
Objective test Supervised projects	They realise in the corresponding tutorías, where to initiative of the student resolve , or clear the possible doubts.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Objective test	B6 B7 B15	The proof can alternate ask type problem or theoretical questions, and represents 50% of the final note of the matter.	50
Supervised projects	A1 B1 B6 C3	Will be able to realise to varied cape works tutelados along the course, being his compulsory delivery and that treated on problems or practical suppositions related with the matter. The works tutelados, are 50% of the final note of the matter, that will be added to the note obtained in the objective proof, whenever this was described with at least 3.0 points on 10.0 points.	50

Assessment comments
All activities that contribute to the student's final grade will be qualified out of 10.0 points.Second opportunity: the evaluation on this occasion will be the same as the first opportunity, keeping the weights of the activities.Advanced call: in this call or 100% of the qualification will correspond to obtained in the Objective Test.The students with recognition of part-time dedication and academic exemption from assistance must carry out all the mandatory activities at any two schedules established in advance.A fraudulent performance of the tests or evaluation activities, once verified, will imply that the student will be qualified with "fail" (numerical grade 0) in the corresponding call of the academic year, both if the commission of the fault occurs at the first opportunity like a second For this, proceed to modify your qualification in the first opportunity certificate, if necessary

Sources of information	
Basic	- Bacells, Josep y otros (2011). Eficiencia en el uso de la Energía Eléctrica. Marcambo - León Martínez, Vicente; Montañana Romeu, Joaquín (2001). Ineficiencias de los Sistemas Eléctricos. Universidad Politécnica de Valencia - León Martínez, Vicente; Montañana Romeu, Joaquín (2017). Circuitos Conductivos Lineales. Universidad Politécnica de Valencia
Complementary	- Sastry Vadam, R; Sarma, Mulukutla (2009). Power Quality. VAR Compensation in Power Systems. CRC Press - Hofman, Wolfgang; Schlabbach, J. (2012). Reactive Power Compensation. Wiley&Sons - Singh, Bhim; Chandra Ambrish (2015). Power Quality. Problems and Mitigation Techniques. Wiley&Sons - Graña López, Manuel Ángel, León Martínez, Vicente y Montañana Romeu, Joaquín. (2012). Fenómenos de desfase en sistemas trifásicos desequilibrados lineales.. Editorial Académica Española

Recommendations
Subjects that it is recommended to have taken before
Quality of the Electric Service/730547013d
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments
Previous knowledge of analysis of direct current, alternating current 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 objective of action number 5: "Healthy and sustainable environmental and social teaching and research" of the "Green Campus Ferrol Action Plan":   The delivery of documentary work carried out in this matter: ? They 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 do them on paper: - No plastics will be used   - Double-sided prints will be made.   - Recycled paper will be used.   - The printing of drafts will be avoided.? A sustainable use of resources and the prevention of negative impacts on the natural environment must be made.A gender perspective is incorporated into the teaching of this subject (non-sexist language will be used, bibliography of authors of both sexes will be used, intervention in class by male and female students will be encouraged...)