Teaching Guide				
Identifying Data				2022/23
Subject (*)	Efficiency of Electric Systems		Code	730547012
Study programme	Máster Universitario en Eficiencia Enerxética e Sustentabilidade			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	3
Language	SpanishGalician			
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 Méndez Sanmartín, Cristian	E-mail	manuel.grana@udc.es cristian.mendez@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
Objective test	B1 B6 B7	3	12	15
Laboratory practice	B6 B11	12	6	18
Supervised projects	B15 C3	0	12	12
Guest lecture / keynote speech	A1 B11 B15	9	18	27
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
Objective test	Proof of evaluation where the student will have to show his degree of learning of an objective way.
Laboratory practice	You practise them of laboratory are a fundamental activity for the learning of this matter. They consist in practical suppositions where the student will have to show the theoretical knowledges purchased
Supervised projects	They develop tasks, that allow to settle the theoretical and practical knowledges, that can go from formulating problems and brief works the simple until others with some complexity.
Guest lecture / keynote speech	Face-to-face activity in the classroom, where will establish the fundamental concepts of the matter. It will realise by means of an oral exhibition, complemented with audiovisual and multimedia means, is whose end transmit the knowledges and facilitate the learning.

Personalized attention	
Methodologies	Description
Supervised projects Guest lecture / keynote speech Laboratory practice	They realise in the corresponding tutorías, where to initiative of the student resolve , or clear the possible doubts.

Assessment			
Methodologies	Competencies / Results	Description	**Qualification**

Supervised projects	B15 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
Objective test	B1 B6 B7	In the dates fixed officially by the centre, realised this final proof. The proof can alternate ask type problem or theoretical questions, and represents 40% of the final note of the matter.	40
Laboratory practice	B6 B11	The practical are compulsory, and is necessary to have them realised to be able to surpass the asignatura. The practices represent 10% of the final note of the matter, and added to the note obtained in the theoretical proof whenever this was upper to 3.0 points on 10.0 points.	10

Assessment comments
All the activities that contribute to the final note of the student, will be qualified on 10.0 points.

Sources of information	
Basic	- Bacells, Josep y otros (2011). Eficiencia en el uso de la Energía Eléctrica. Marcombo - León Martínez, Vicente; Montañana Romeu, Joaquín (2001). Ineficiencias de los Sistemas Eléctricos. Universidad Politécnica de Valencia - León Martínez, V; Montañana Romeu, J. (2017). Circuitos Conductivos Lineales. Universidad Politénica 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 - Félice, E. (2001). Perturbaciones Armónicas. Paraninfo Thomson - 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
Subjects that are recommended to be taken simultaneously
Quality of the Electric Service/770523014
Subjects that continue the syllabus
Other comments

<p>Requírense coñecementos previos de análise de circuítos en corrente
contínua, alterna e trifásica, así como de compoñentes simétricas.</p><p>Noutro
orden de cousas, para axudar a acadar un ambiente inmediato sostido e
cumprir o obxectivo da acción número 5: "Ensino e investigación
ambiental e social sa e sostible" do "Plan de Acción do Campus Verde de
Ferrol":</p><p>   A entrega dos traballos
documentais feitos neste asunto:</p><p>
 ? Pedirase en formato virtual e / ou soporte informático</p><p>
     ? Realizarase a través de Moodle, en formato dixital sen necesidade de imprimir</p><p>
             ? Se é necesario facelos en
papel:</p><p>
 - Os plásticos non serán utilizados</p><p>
       - As impresións realizaranxe a dobre cara.</p><p>
             - Usarase o papel reciclado.</p><p>
                 - Evitarase a impresión de
borradores.</p><p>? Debe haber un uso sostible dos recursos ea prevención de impactos negativos sobre o medio natural.</p>