



**Teaching Guide**

Identifying Data					2023/24
<b>Subject (*)</b>	Electricity Measures and Rates	<b>Code</b>	770G02135		
<b>Study programme</b>	Grao en Enxeñaría Eléctrica				
Descriptors					
<b>Cycle</b>	<b>Period</b>	<b>Year</b>	<b>Type</b>	<b>Credits</b>	
Graduate	2nd four-month period	Fourth	Optional	4.5	
<b>Language</b>	Spanish				
<b>Teaching method</b>	Face-to-face				
<b>Prerequisites</b>					
<b>Department</b>	Enxeñaría Industrial				
<b>Coordinador</b>	Castilla Pascual, Consuelo de los L.	<b>E-mail</b>	consuelo.castilla.pascual@udc.es		
<b>Lecturers</b>	Castilla Pascual, Consuelo de los L.	<b>E-mail</b>	consuelo.castilla.pascual@udc.es		
<b>Web</b>	http://moodle.udc.es				
<b>General description</b>	It treats of an asignatura that has a fundamentally technological character. His main aim is to provide to the student the scientific and technical base that allow him know and understand the nature of the problems related with the measures of the distinct electrical magnitudes and the tarificación of the consumptions measured in the structure of the electrical market Spanish. It covers the study of the instruments and methods of electrical measure, diagrams of connection and conditions for a safe measure, already was direct or indirect, as well as legislation afectante to installations of measure.				

**Study programme competences / results**

Code	Study programme competences / results
A4	Capacidade de xestión da información, manexo e aplicación das especificacións técnicas e da lexislación necesarias no exercicio da profesión.
B1	Capacidade de resolver problemas con iniciativa, toma de decisións, creatividade e razoamento crítico.
B4	Capacidade de traballar e aprender de forma autónoma e con iniciativa.
B5	Capacidade para empregar as técnicas, habilidades e ferramentas da enxeñaría necesarias para a práctica desta.
B9	CB2 - Que los estudiantes sepan aplicar sus conocimientos a su trabajo o vocación de una forma profesional y posean las competencias que suelen demostrarse por medio de la elaboración y defensa de argumentos y la resolución de problemas dentro de su área de estudio.
C3	Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.

**Learning outcomes**

Learning outcomes	Study programme competences / results		
Design, calculate the installations for the acquisition of electrical measures Knows the different systems of measure. It knows the principles of rule, reglamentación and legislation of the installations of measure.	A4	B1 B4 B5 B9	C3
Know the technical solutions that offers the market in the field of the measure. It is able to interpret the technical information and other sources of information, in Spanish and English.	A4	B1 B4 B5 B9	C3
Know the distinct modalities of electrical prices (free market, market regulated and bono social) and his structure.	A4	B1 B5 B9	C3



Know the structure and operation of the electrical market Spanish, as well as the agents of the system and his functions.	A4	B1 B4 B5 B9	C3
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Contents	
Topic	Sub-topic
Principles of operation of the devices of measure. (Contents: direct Measures of: Intensity, tension. Diagrams and practical of connection of devices of electrical measure).	Técnicas de medida. Aparatos analógicos.  Errores de medición. Contrastación y calibración.  Características funcionales y distintivas de los aparatos digitales.  El osciloscopio analógico-digital.
Electrical measures. (Contents: direct Measures of Intensity, tension, resistance, frequency, power, energy, factor of pot., isolation, quality of wave, etc. indirect Measures: Transductores of measure and trafos of measure. Diagrams and practical of connection of devices of electrical measure. Electrical market Spanish. Electrical prices.)	Measure of power, factor of power and frequency.  Turnover and counters of energy.  Registradores Of measure and DAQ's (introduction to the use of Arduino)

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Objective test	A4 B1 B5	2	1	3
Problem solving	A4 B1 B4 B5 B9 C3	7.5	21	28.5
Guest lecture / keynote speech	A4 B1 B4 B5	12	19	31
Laboratory practice	A4 B1 B4 B5 B9 C3	12	35	47
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 of practical character, written and final on all the contents of the matter. It will consist in the solution of ten questions, being able to be all, or some, type test or exercises and problems.
Problem solving	Seminars in groups of intermediate size allocated to resolve exercises and problems on the theoretical contents of the matter. During the session will resolve the doubts or difficulties that arise, also will expose the works derived of the session magistral.
Guest lecture / keynote speech	Theoretical oral exhibition-practical of the chapters of the program to transmit knowledges, being able to be complemented with the use of multimedia audiovisual/means. It will offer an overview and structured of the subjects, standing out the important appearances. The professor will be able to request works in group that expand or redunden in practical theoretical/appearances, for his back exhibition in the classes of solution of problems.
Laboratory practice	Realisation of diverse practical experiences of laboratory of the developed in the contents of the matter, that serve to reinforce and contrast the theoretical knowledges purchased.

Personalized attention	
Methodologies	Description



<p>Laboratory practice Problem solving</p>	<p>During the session magistral will attend the doubts in the transcurso of the class or if it was necessary emplazará to the student to tutorías. The doubts that arise in the works proposed will be able to resolve in the tutorías.</p> <p>During the objective proof, the professor will attend to the student that call it in the place of examination of the student.</p> <p>In the practices, the personalised attention will realise in the transcurso of the sessions, well to initiative of the student to clear and answer his doubts, or to initiative of the professor with the end to improve the interest and attitude of the student.</p> <p>They will attend the doubts in the transcurso of the class in average group for the solución of problems, if it was necessary emplazará to the student to tutorías.</p> <p>In the schedule established by the professors for the tutorías, the student that attend to individual title will be able to pose the doubts that arise him in the study of the matter, or in develop him of the solution of an exercise or work on a subject. The student that attend to the tutoría, will have to present the text consulted object of doubt or the development realised in the research of the solution of the exercise that does not go out. Tambien The professors will be able to summon personally to the student if like this they estimated it.</p>
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Assessment			
Methodologies	Competencies / Results	Description	Qualification
Objective test	A4 B1 B5	<p>The examination written final (already was in the ordinary announcement of June or the extraordinary announcement of Julio, to announcement of Xunio that will be able to be advanced to finals of May by unanimous agreement of the enrolled) will be of 10 problems and/or test. In the problems, the very justified in which it arrive to the correct result will mark the point.</p> <p>The length of the examination will be of 2h, expandable for the student that have adaptation to the diversity that estimate additional time established by the service ADI of the UDC.</p> <p>The punctuation obtained on ten will contribute to the final qualification in 40%, to have reached the 5 in the remaining methodologies will serve to go up note.</p> <p>Of it did not reach the 5 in the remaining proofs will serve to attain the approved, but of not to present to this objective proof the final qualification will be of "No presented", with independence of the punctuation reached in the rest of the proofs of the others methodologies.</p>	40



Laboratory practice	A4 B1 B4 B5 B9 C3	<p>The sessions practise of laboratory are of forced assistance, indispensable to be able to approve the asignatura. It will take note of the assistance. It will value the understanding of the matter and the active participation by means of questions to the student in the transcurso of the practical sessions. It will deliver an individual final memory or in group, in which they will relate the practical sessions and his measures as well as the one of the practical exercises that assign referents to the same. The memory of the practices and practical exercises will evaluate in base to the quality, structure, originality, results and documentary quality of his images, on a total of ten points. Being necessary to reach the 5 on 10 to approve the practices, that is to say, 50% of his weight of 20%.</p> <p>20% of total weight of this section in the asignatura has a compulsory and previous character to the final evaluation.</p>	20
Problem solving	A4 B1 B4 B5 B9 C3	<p>Will take into account the assistance to classes of problems, where will go providing and resolving exercises that apply and reinforce the theoretical knowledges. For the practical exercises that assign, being able to be by groups, will take into account the good to proceed in the settings for the obtaining of the measures, the respect to the maximum of the security and order during the development.</p> <p>30% of this activity delivers by the same in the distinct the proofs written of the problems of this activity and the distinct practical exercises of measures. It has a previous character to the final evaluation and the assistance has to be upper to 80%.</p>	30
Guest lecture / keynote speech	A4 B1 B4 B5	<p>Theoretical oral exhibition-practical of the chapters of the program to transmit knowledges, being able to be complemented with the use of multimedia audiovisual/means. It will offer an overview and structured of the subjects, standing out the important appearances. It will value the active regular assistance, whenever it was minimum of 80% will have a weight of 10%.</p>	10

### Assessment comments

Without practices approved can not approve the asignatura. The final qualification will give with a decimal and will be, as long as they are approved the practices: points of the proofs written of problems until the maximum of a 3 (if assistance to solution of upper problems to 80%) 1 active checkpoint to expositivas (if upper assistance to 80%) punctuation of the objective proof on  $10 \cdot 0,4$  punctuation of the practices of laboratory on  $10 \cdot 0,2$  (as long as the memory of practices surpasses the 5 on 10). Of not to surpass the practices, independently of the notes reached in the other methodologies, will be the note reached in the practices on 10 and of not to present to the practices, independently of the notes reached in the other methodologies To surpass the signatura in the official announcements is necessary to have a final qualification of 5 or upper (maximum 10 points).

If he does not appear for the practices, he does not present himself regardless of the score in the other methodologies.

\* Partial enrollment students will be able to agree with the teacher the possibility of doing alternative activities to the face-to-face ones.

\* The criteria for passing the second chance are the same as those for the first chance.

In agreement to the art.11.4.c Of the Regulation Discipline of the Student of the UDC, in case of plagiarism in examination or proof of evaluation the qualification will be of suspense in the announcement in that it commit the fault: the/the student will be qualified with ?suspense? (numerical note 0) in the corresponding announcement of the academic course, so much if the commission of the fault produces at the earliest opportunity as in the second. For this, will proceed to modify his qualification in the record, if it was necessary.

#### Advance of Call

The evaluation criteria for the December advance call will be the same as those used for the second chance call of the previous year.

#### Academic dispensation

The evaluation procedures described are applicable to all students, whether or not they have academic dispensation, only that in case of dispensation and justification of impossible attendance, alternative activities to face-to-face activities may be established



## Sources of information

<b>Basic</b>	<ul style="list-style-type: none"><li>- Chacón de Antonio, Francisco Julián (2000). Medidas eléctricas para Ingenieros. Madrid: Universidad Pontificia Comillas</li><li>- Ramírez Vázquez, José. (1992). Medidas eléctricas. Barcelona : Ceac</li><li>- Grupo de Formación de Empresas Eléctricas (1995). Medidda electricas I, II y III . Madrid: Paraninfo</li><li>- Cavia Soto, M<sup>a</sup> de los Ángeles (2000). Laboratorio de Medidas Eléctricas . Santander: Universidad de Cantabria. Departamento de Ingeniería Eléctrica</li><li>- Bolton, William. (1995). Mediciones y pruebas eléctricas y electrónicas. Barcelona:Marcombo</li><li>- Pallas Arenuy, R (1989). Transductores y acondicionadores de señal. Barcelona: Marcombo</li><li>- Torrente Artero, Oscar (2009). ARDUINO: CURSO PRACTICO DE FORMACION . RC(RS) libros</li><li>- Cornejo, Javier (2014). La nueva facturación de la energía eléctrica . Barcelona:Ediciones Experiencia S.L.</li></ul>
<b>Complementary</b>	

## Recommendations

### Subjects that it is recommended to have taken before

Expresión Gráfica/770G02005  
Estadística/770G02008  
Fundamentos de Electricidade/770G02013

### Subjects that are recommended to be taken simultaneously

Electric Machines I/770G02021  
Electric Installations low voltage/770G02022

### Subjects that continue the syllabus

Electric Machines II/770G02026  
High-voltage electrical installations/770G02027  
Electric Machines and Drives/770G02035

### Other comments

For a sustainable environment and to comply with the objective of action nº 1: the delivery of the documentary works that are carried out in the material:1.1. They will be requested in virtual format and / or computer support.1.2. It will be done through Moodle, in dixital format without the need to print them.1.3. If made on paper:- Plastics will not be used.- Double-sided prints will be made.- Recycled paper will be used.- Printing of drafts will be avoided.

(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.