



**Teaching Guide**

Identifying Data					2018/19
<b>Subject (*)</b>	Acquisition techniques of electrical measurements	<b>Code</b>	770G02030		
<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	Third	Optional	6	
<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 carácter fundamentally technological. 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. 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.				

**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.
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		
That the student know and comprise the principles of operation of the devices of measure of the electrical magnitudes. Know and it comprise the distinct systems of measure, the forms of connection, direct and indirect of the device of measure and schematise them. It know to design and calculate the installations for the acquisition of electrical measures. It know the rule, legislation and reglamentación with regard to the electrical measure and his installations. It know the technical solutions of the market in the field of the electrical measure.	A4	B1 B4 B5	C3
That the student apply in the practice the forms of connection of the teams of measure, know seleccionar the method and the system of measure more adapted according to the magnitude to measure and the available teams. That it know to realise the setting of the devices of measure and components for his verification and contrastación. It interpret the technical information of the device for the process of measure, was in Spanish or English, as well as of other sources of information in this regard.	A4	B1 B4 B5	

**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.)	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 B4 B5	3	22	25
Guest lecture / keynote speech	A4 B1 B5 C3	21	31	52
Problem solving	A4 B1 B4 B5 C3	21	31	52
Laboratory practice	A4 B1 B4 B5 C3	9	9	18
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 character práctico, 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 ejercicios and problems.
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.
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.
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>Problem solving Laboratory practice Objective test Guest lecture / keynote speech</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
Problem solving	A4 B1 B4 B5 C3	<p>It will have encuesta the assistance to classes of problems, where will go providing and resolving exercises that apply and reinforce the theoretical knowledges. In case that they assign works by groups, will have encuesta the delivery and the exhibition of the same in the class. Of said work will evaluate the structure, documentary quality, originality and presentation on a total of ten points.</p> <p>30% of this activity delivers in 20% for the proofs written of this activity that delivers by the same between them and has a previous character to the final evaluation and the assistance has to be upper to 80% and in the case to have realised exhibition of works of group 20% will deliver by the same between assistance and work. 10% remaining of this activity gives it the regular assistance.</p>	30
Laboratory practice	A4 B1 B4 B5 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 practices. It will deliver an individual final memory or in group, if they establish groups, of the practices realised, that will evaluate in base to the quality, active participation, originality, results and structure on a total of ten points. Being necessary to reach the 5 on 10 to approve the practices.</p> <p>30% of total weight of this section in the asignatura has a compulsory and previous character to the final evaluation.</p>	20



Objective test	A4 B1 B4 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. Each very justified problem in which it arrive to the correct result will mark a point.</p> <p>It is forced for that that do not reach the 5 of the sum of the notes of the parts of problems and of practices.</p> <p>The time of the examination will be of 2h, only expandable for the student that has adapted to the diversity that it considers additional time established by the ADI service of the UDC.</p> <p>The punctuation obtained on ten will contribute to the final qualification in 50%, as long as they surpass the three points on ten in it.</p> <p>In case of not to surpass in the proof the three points, the final qualification will be "Suspense" with the punctuation reached in this proof, independently of the reached in the evaluation of the other proofs.</p> <p>In case 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>	50
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**Assessment comments**

Without practices approved can not approve the asignatura. The final qualification will give with two decimals and will be: If in the objective proof three or more points on 10, as long as they are approved the practices: points of the proofs written of problems until the maximum of a 2 (if assistance to solution of upper problems to 80%; 1 checkpoint to problems (if there is allocation of works the point delivers by the same between assistance and problems) punctuation of the objective proof on 10\*0,5 (if more than three points on 10 in the objective proof) punctuation of the practices of laboratory \*0,2 (if the memory of practices surpasses the 5 on 10). To surpass the signatura in the official announcements is necessary to have a final qualification of 5 or upper (maximum 10 points). If in the objective proof less than three points: Punctuation of the objective proof (independently of the punctuation of the other proofs. If it does not present to the objective proof or to the practices: "No presented" (independently to having realised the others proofs.

**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>- Grupo de Formación de Empresas Eléctricas (1995). Medidda electricas I, II y III . Madrid: Paraninfo</li> <li>- Pallas Arenuy, R (1989). Transductores y acondicionadores de señal. Barcelona: Marcombo</li> <li>- Bolton, William. (1995). Mediciones y pruebas eléctricas y electrónicas. Barcelona:Marcombo</li> <li>- Ramírez Vázquez, José. (1992). Medidas eléctricas. Barcelona : Ceac</li> <li>- Torrente Artero, Oscar (2009). ARDUINO: CURSO PRACTICO DE FORMACION . RC(RS) libros</li> <li>- Cavia Soto, Mª de los Ángeles (2000). Laboratorio de Medidas Eléctricas . Santander: Universidad de Cantabria. Departamento de Ingeniería Eléctrica</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

(\*)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.