



**Teaching Guide**

| Identifying Data    |   |        |                                  |         | 2019/20 |
|---------------------|---|--------|----------------------------------|---------|---------|
| Subject (*)         | Fundamentos de Electricidade  | Code   | 770G02013                        |         |         |
| Study programme     | Grao en Enxeñaría Eléctrica   |        |                                  |         |         |
| Descriptors         |   |        |                                  |         |         |
| Cycle               | Period  | Year   | Type                             | Credits |         |
| Graduate            | 1st four-month period   | Second | Obligatory                       | 6       |         |
| Language            | Spanish   |        |                                  |         |         |
| Teaching method     | Face-to-face  |        |                                  |         |         |
| Prerequisites       |   |        |                                  |         |         |
| Department          | Enxeñaría Industrial  |        |                                  |         |         |
| Coordinador         | Castilla Pascual, Consuelo de los L.  | E-mail | consuelo.castilla.pascual@udc.es |         |         |
| Lecturers           | Castilla Pascual, Consuelo de los L.  | E-mail | consuelo.castilla.pascual@udc.es |         |         |
| Web                 | http://moodle.udc.es  |        |                                  |         |         |
| General description | <p>The fundamental aim of this asignatura is the training of the student so that it purchase the knowledge and can use the principles of the theory of circuits and the conocimiento of basic concepts of the machines electricas. By his compulsory character, this matter is fundamental in the training of the Engineer. It is related with all those of the Degree Electrical Engineering that work with electrical and electronic circuits, in particular with the asignatura Foundations of Electronics that gives in the following cuatrimestre and giving continuity for Circuits electricos of power, Electrical Installations, electrical Machines I and II of the third course, the optativa Technical of Acquisition of Electrical Measures and the ones of fourth course: Installations of Renewable Energies, Accionamiento of Electrical Machines and Transport of Electrical Energy. In the Degree of Industrial Electronic Engineering and automatic relates with the matter Foundations of Electronics of the following cuatrimestre, giving also continuity to electrical Systems of third course.</p> |        |                                  |         |         |

**Study programme competences / results**

| Code | Study programme competences / results   |
|------|---|
| A15  | Coñecer e utilizar os principios da teoría de circuitos e máquinas eléctricas.  |
| 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.                    |
| C5   | Entender a importancia da cultura emprendedora e coñecer os medios ao alcance das persoas emprendedoras.                          |
| C6   | Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse. |
| C7   | Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.  |

**Learning outcomes**

| Learning outcomes  | Study programme competences / results |
|--|---------------------------------------|
| <p>Results of learning Typology To A B C</p> <p>Reinforce, simulate and validate the theoretical knowledges in the practical applications of blackboard and of laboratory. Handle properly devices of measure, realise settings of circuits and measurements. Document each practice with: diagrams, characteristics of elements and teams of measure, conditions of essay, ranks and tables of measures. Boost the work in group.</p> <p>That is to say, the result of learning: &amp;quot;it Knows and it comprises the foundations of the theory of circuits and of the electrical machines and has skill to apply them to the analysis of simple problems.&amp;quot;;, indicated in the memory of verification are contemplated in this section.</p> |                                       |



|  |     |                |                |
|--|-----|----------------|----------------|
| <p>It know to select the most suitable method that modelice mathematically the linear circuit, in front of the distinct types of excitation, for the calculation of tensions and currents. It realise the energetic balance in the circuit, calculate consumptions and determine performances. It analyse the results and obtain conclusions.</p> <p>It know to indicate electrical magnitudes, elements and teams of measure in the diagram of the circuit. In the case to work in alternating, accompany the solution with diagrams fasoriales. Employ the suitable nomenclature in the circuit.</p> <p>Know and it analyse the principle of operation of the machines electricas, know the diagrams that represent them in the circuit, calculate tensions, currents, consumptions and determine performances.</p> <p>That is to say, the result of learning: "it Knows and it comprises the foundations of the theory of circuits and of the electrical machines and has skill to apply them to the analysis of simple problems.", indicated in the memory of verification are contemplated in this section.</p> |     |                |                |
| <p>NOTE: Really they are not competitions, but knowledges and skills.</p> <p>That the student know and comprise: the real behaviour and ideal of the elements, of the electrical machines and teams of basic measure of the circuit in front of diverse types of excitations, as well as the methods of analysis, methods of calculation employed in the analysis of circuits and diets of operation.</p> <p>That is to say, the result of learning: "it Knows and it uses the principles of the theory of circuits and of the electrical machines.", indicated in the memory of verification are contemplated in this section.</p>  |     |                |                |
| It knows the foundations of the theory of circuits and of the electrical machines  | A15 | B1<br>B4<br>B5 | C5<br>C6<br>C7 |
| It comprises the principles of the theory of circuits and of the electrical machines and has skill to apply them to the analysis of simple problems of electrical circuits and of electrical machines.   | A15 | B1<br>B4<br>B5 | C5<br>C6<br>C7 |

| Contents   |  |
|--|--|
| Topic  | Sub-topic  |
| Circuits, laws and elements.<br>(Contents: Analysis of circuits. Elements of circuits. Laws of Kirchhoff). | Theory of circuits. Introduction.<br>Elements of circuits.<br>Introduction to the topological analysis.  |
| Analysis of circuits. Examples in DC.  | Generalisation of the association of passive elements.<br>Methods of analysis.<br>Fundamental theorems.  |
| Analysis of circuits in AC.<br>(Contents: Analysis of Circuits).   | Simple circuit in sinusoidal permanent diet.<br>Validity of the methods of analysis and of the fundamental theorems. Examples.<br>Power and energy in AC |
| Systems trifásicos.  | Analysis of the circuit trifásico.<br>Power in the systems trifásicos.   |
| Introduction to the electrical machines.   | Máquinas estáticas y rotativas.  |

| Planning              |                        |                                      |                               |             |
|-----------------------|------------------------|--------------------------------------|-------------------------------|-------------|
| Methodologies / tests | Competencies / Results | Teaching hours (in-person & virtual) | Student?s personal work hours | Total hours |
|                       |                        |                                      |                               |             |



|                                |                          |    |    |    |
|--------------------------------|--------------------------|----|----|----|
| Guest lecture / keynote speech | A15 B4 C5 C7             | 21 | 31 | 52 |
| Workbook                       | A15 B1 B4 B5 C5 C6<br>C7 | 0  | 3  | 3  |
| Objective test                 | A15 B1 B4 B5 C5          | 2  | 13 | 15 |
| Laboratory practice            | A15 B1 B5 C5 C6          | 9  | 6  | 15 |
| Student portfolio              | A15 B1 B4 B5 C5 C6<br>C7 | 0  | 10 | 10 |
| Problem solving                | A15 B1 B4 B5 C5          | 21 | 31 | 52 |
| 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   |
| Guest lecture / keynote speech | Theoretical oral exhibition-practises of the chapters of the program that realises to transmit knowledges, complemented with the use of multimedia audiovisual/means. In the case of subjects compendio of theoretical definitions requested the reading like personal work of the student and will give a day and time to resolve the doubts. To end to facilitate the learning will pose questions and recommended readings of which will deduce the answers so that they appear in the student portafolio.   |
| Workbook                       | Personal work of the student on distinct contents of the signatura. During the course requested the reading of subjects compendio of theoretical definitions and formulated questions recommending readings to find his answer.   |
| Objective test                 | The proof of final evaluation written of practical character, on the contents of the matter. It will consist in the solution of ten exercises.  |
| Laboratory practice            | Realisation of diverse settings of electrical circuits in softwares of simulation that illustrate the results obtained in the theoretical classes and of problems. The student will have in the platform Moodle of the leaves of takings of data yes like videos complement to the practices. The student will realise the understanding reading of the practice, took data and will resolve the calculations associated and the questions that pose , in some cases will check the resolution of the circuit by means of the use of simulation tool Orcad Pspice Lite. In the final memory the student will value the result obtained. |
| Student portfolio              | It consists in a notebook of the work of character fundamentally practical, that collect so much the exercises realised in class like the personal work realised by the student in the exercises that poses the professor so that they are in the portafolio. The justification of the solution of an exercise will accompany with theoretical annotations that the professor resalte in the class. Also they will include the theoretical questions that indicate , with the answers that the student deduce of the readings recommended by the professor to such effect.  |
| Problem solving                | Seminars in groups of intermediate size allocated to resolve exercises and problems. Posed with antelación or in the same day. It will deliver with antelación the billed of problems that have to form part of the notebook of work whose solution correspond to develop by part of the student. During the session will resolve the doubts or difficulties that have arisen.  |

| Personalized attention |             |
|------------------------|-------------|
| Methodologies          | Description |
|                        |             |



|  |   |
|--|---|
| Objective test<br>Problem solving<br>Workbook<br>Student portfolio<br>Laboratory practice<br>Guest lecture /<br>keynote speech | <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 tutorial.</p> <p>The doubts that arise in the readings recommended will be able to resolve in the tutorial.</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>The notebook, portafolios of the student, will ask it the professor during the classes, to go seeing the advance in the same and will indicate to the student the sections that has to improve to guide it and encourage it. In each delivery will have to be like minimum the exercises of the previous day. At least they will do two deliveries. The student will be able to consult in tutorías the doubts that pose him in front of the indications of the professor.</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 tutorial.</p> <p>In the schedule established by the professor 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 the development of the solution of an exercise. 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 goes out. Also the professor will be able to summon personally to the alumnado if like this it estimated it.</p> |
|--|---|

| Assessment    |                        |             |               |
|---------------|------------------------|-------------|---------------|
| Methodologies | Competencies / Results | Description | Qualification |



|                   |                       |   |    |
|-------------------|-----------------------|---|----|
| Objective test    | A15 B1 B4 B5 C5       | <p>70% delivers in:</p> <p>10% that corresponds to an objective proof of three items to realise in class of length 30 minutes, after the first delivery of the protafolios.</p> <p>The remaining 60% corresponds:</p> <p>Aal final examination (already was the one of the ordinary announcement in January or the extraordinary announcement of Julio) will be of ten Items: questions in shape of short problems of several concepts. For each Item will propose several answers, where only one is possible. The student will have to justify the answer chosen and because descarta the remaining. A item only can cost a point or zero. The item very justified explains a point. The evil justified or without justifying do not explain.</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 will contribute to the final qualification in 60%, as long as they surpass the three points on 10 in her.</p> <p>In case of not surpassing in the final examination the three points on ten, the final qualification will be Suspense with the punctuation reached in this proof independently of the reached in the others two methodologies.</p> <p>In case of not to present to this objective proof the final qualification will be of No presented.</p> <p>The punctuation obtained will contribute to the final qualification in 70%, as long as they surpass the three points about 10 in it.</p> <p>In case of not surpassing in the proof the three points on ten, the final qualification will be "Suspenso" with the punctuation reached in this proof independently of the reached in the others two proofs.</p> <p>In case of not to present to this objective proof the final qualification will be of "No presented"</p> | 70 |
| Student portfolio | A15 B1 B4 B5 C5 C6 C7 | <p>Each exercise will have to be clearly separated of the following, have his billed with his data, diagrams and questions. In the development of the solution, the magnitudes employed, have to indicate of clear form in the electrical circuit and will take into account all the theoretical annotations of interest that the student collect of the indicated in class. It will value the reading by means of the answers to the theoretical questions. The fault of some exercise, his development or the no delivery will do that the notebook do not mark in the final delivery. The professor anytime will be able to ask the delivery of the notebook. The punctuation will be of Bad (M) or No realised (NR) (0 points on 10), Regulate (R) (3,33 points) or Well (B)(6,66) or Very Very (MB) (10 points) and will contribute to the qualification in 15%.</p> <p>In case of not to present to this objective proof the final qualification will be of No presented.</p>   | 15 |



|                     |                 |  |    |
|---------------------|-----------------|--|----|
| Laboratory practice | A15 B1 B5 C5 C6 | <p>The practical sessions in laboratory are of forced assistance, indispensable to be able to approve the asignatura. It took note of the assistance. The teaching of laboratory is a complement to the theoretical classes, in them will propose exercises of application of the theory. It will value the understanding of the work of laboratory and the active participation by means of questions to the student in the transcurso of the practices. It will deliver a final memory of the practices realised.</p> <p>The punctuation will be of Bad (M) or No realised (NR) (assigning 0 points on 10), Regulate (R) (3,33 points) or Well (B) (6,66) or (MB) (10 points). Punctuation only applicable in the academic course in that they realise said practical (ordinary announcements-January and extraordinary-Julio).</p> <p>The practices surpassed (punctuation of R, B or MB) in alone previous courses are valid &amp;quot;Cconvalidables&amp;quot; (CV during the four following years to his realisation), but only will cost 3,33 points (R).</p> | 15 |
|---------------------|-----------------|--|----|

### Assessment comments

The final qualification will give with two decimals and will be:

· If in the objective proof final three or more points, as long as they are surpassed the practices:

Punctuation of the portafolio  $*0,15 +$  punctuation of the practices surpassed (R, B or MB) $*0,15 +$  punctuation tests objective $*0,60$ (if more than three points)+ punctuation of the objective proof in class $*0,10$  if the assistance was to regulate (upper to 80%) along the course.

To surpass the asignatura in the official announcements is necessary to have a final qualification of 5 on ten or upper.

· If in the objective proof less than three points:

Punctuation of the objective proof.

· If it does not present to the objective proof:

No presented

· If they do not surpass the practices:

Punctuation in the practices.

### Sources of information



|                             |   |
|-----------------------------|---|
| <p><b>Basic</b></p>         | <p>- 7. Queijo García, Gumersindo (2018). Fundamentos de Tecnología Eléctrica. Madrid: UNED</p> <p>- 6. Ras i Oliva, Enric. (1987). Teoría de circuitos fundamentos. Barcelona [etc.] : Marcombo, D.L.</p> <p>- 2. Eguiluz Moran, Luis I. (1997). Pruebas objetivas de ingeniería eléctrica.. Santander, T.G.D.S.L.</p> <p>- 1. Boylestad, R. L. ( 2009). Electrónica: teoría de circuitos y dispositivos electrónicos . Naucalpán de Juárez : Prentice Hall</p> <p>- 3. Eguiluz Morán, Luis I.. (2001). Pruebas objetivas de circuitos eléctricos. Madrid: EUNSA</p> <p>- 5. Fraile Mora, L.I. (2004). Electromagnetismo y circuitos eléctricos.. Madrid: MacGraw-Hill</p> <p>- 4. Fraile Ardanuy, J. (2004). Problemas resueltos de electromagnetismo y circuitos eléctricos.. Madrid : Colegio de Ingenieros de Caminos, Canales y Puertos, Servicio de Publicaciones</p> <p>- 8. Gerrero Fernandez, Alberto (1995). Electrotecnia. Madrid: MacGraw-Hill</p> <p>- 7. Usaola García, J. (2002). Circuitos eléctricos: problemas y ejercicios resueltos.. Madrid: Prentice Hall</p> <p>BÁSICA: 1. Boylestad, R. L.Electónica: teoría de circuitos y dispositivos electrónicos / Robert L. Boylestad, Louis Nashelsky. 10ª ed. Naucalpán de Juárez : Prentice Hall, 2009.SIGNATURA: BR ET 30 2. Eguiluz Moran, Luis I. Pruebas objetivas de ingeniería eléctrica. [Santander] : T.G.D.S.L., [1997] SIGNATURA: BR EL 34 3. Eguiluz Morán, Luis I.. Pruebas objetivas de circuitos eléctricos. Madrid: EUNSA, 2001SIGNATURA: BR EL 14 4. Fraile Ardanuy, J.Problemas resueltos de electromagnetismo y circuitos eléctricos.Madrid : Colegio de Ingenieros de Caminos, Canales y Puertos, Servicio de Publicaciones, 2004SIGNATURA: BR EL 46 5. Fraile Mora, L.I.Electromagnetismo y circuitos eléctricos.4ª ed. Madrid: MacGraw-Hill, 2005SIGNATURA: BR EL 15 6. Ras i Oliva, Enric. Teoría de circuitos fundamentos. 4ª ed. renovada. Barcelona [etc.] : Marcombo, D.L. 1987SIGNATURA: BR EL 47 6. Usaola García, J.Circuitos eléctricos: problemas y ejercicios resueltos.Madrid: Prentice Hall, 2002SIGNATURA: BR EL 41 Otros libros de interés: * Hayt, Kemmerly, Dubrin (2002). Análisis de Circuitos en Ingeniería. Madrid. McGraw-Hill * W. Nilson, Ana Riedel (2001). Circuitos Eléctricos. Prentice Hall * Bruce Carlson (2002). Teoría de Circuitos. Madrid. Thomson * Parra V., Ortega J., Pastor A., Pérez A. (1992). Teoría de Circuitos.Tomos I y II. Madrid. U.N.E.D * Boix, Oriol(2009). Tecnología Eléctrica. Cano Pina S.L. Ediciones Ceysa</p> |
| <p><b>Complementary</b></p> | <p>Otros libros de interés: * Hayt, Kemmerly, Dubrin (2002). Análisis de Circuitos en Ingeniería. Madrid. McGraw-Hill * W. Nilson, Ana Riedel (2001). Circuitos Eléctricos. Prentice Hall * Bruce Carlson (2002). Teoría de Circuitos. Madrid. Thomson * Parra V., Ortega J., Pastor A., Pérez A. (1992). Teoría de Circuitos.Tomos I y II. Madrid. U.N.E.D * Boix, Oriol(2009). Tecnología Eléctrica. Cano Pina S.L. Ediciones Ceysa</p>   |

## Recommendations

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

Calculus/770G01001  
 Linear Algebra/770G01006  
 Physics II/770G01007

### Subjects that are recommended to be taken simultaneously

### Subjects that continue the syllabus

Electric Machines I/770G02021  
 Electric Installations low voltage/770G02022  
 Electrical power circuits/770G02023  
 Power Stations/770G02024  
 Electric Machines II/770G02026  
 High-voltage electrical installations/770G02027  
 Installations of Renewable Energies/770G02033  
 Electric Machines and Drives/770G02035  
 Electric Energy Transport/770G02036  
 Acquisition techniques of electrical measurements/770G02030  
 Electromagnetic Compatibility in industrial installations/770G02039  
 Efficient management of electric power/770G02040



## Other comments

<p> They are necessary previous knowledges of: electromagnetism, linear systems, differential equations, complex calculation and vectorial representation. As it indicated&nbsp; in the general description, the asignatura is related with all those of the Degree Industrial Electrical Engineering and Automatic that work with electrical and electronic circuits, in particular with the asignatura Foundations of Electronics that gives&nbsp; in the following cuatrimestre and giving continuity for Electrical Circuits of Power, Installations, electrical Machines I and II of the third course and other optativas and of fourth course. </p>

**(\*)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.**