

## SUBJECT TEACHING GUIDE

### G695 - Fundamentals of Electrotecnics

#### First Degree in Industrial Technologies Engineering

Academic year 2025-2026

1. IDENTIFYING DATA					
Degree	First Degree in Industrial Technologies Engineering			Type and Year	Compulsory. Year 2
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Electromechanics Module: Further Basic Training				
Course unit title and code	G695 - Fundamentals of Electrotecnics				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Knowledge Field	Industrial engineering, mechanical engineering, automation engineering, industrial organization engineering and navigation engineering				
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA ELECTRICA Y ENERGETICA
Name of lecturer	FRANCISCO JAVIER BALBAS GARCIA
E-mail	franciscojavier.balbas@unican.es
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 3. DESPACHO PROFESORES (S3070)
Other lecturers	PABLO BENAVENTE RICO

4. OBJECTIVES
The overall objective is that the student knows analyze electrical circuits, or stationary regime of permanent work.
The specific objectives of the course are: * Knows and applies the universal laws and elements of electrical circuits. * Apply the general methods of analysis and network theorems, steady state and alternating sinusoidal current. * It will analyze circuits in the frequency domain. * It will analyze circuits consisting of quadropole. * Connections and know how to interpret readings as ideal devices: voltmeter, ammeter and watt meter.

6. SUBJECT PROGRAM	
CONTENTS	
1	<p><b>BT1 CIRCUIT ELEMENTS</b></p> <p>Theoretical contents: Introduction. Lumped circuits. Universal laws. Waveforms. Measuring devices. Linear passive two-terminal elements: resistors, capacitors and inductors. Operational immittance. Association of passive elements. Independent sources. Association of independent sources. Differential equation of a network. Dual elements and magnitudes. n-terminal linear elements: coupled inductors, ideal transformer, controlled sources, operational amplifier, ideal gyrator, negative impedance convertors.</p>
2	<p><b>BT2 SINUSOIDAL STEADY-STATE ANALYSIS</b></p> <p>Theoretical contents: Introduction. Single-phase generator. Analysis undetermined coefficients of the linear differential equation, Transform phasor and complex immittance. Complex analysis. Powers. Methods of measurement of powers. Single-phase systems: Boucherot's theorem, Concept of power factor, Power factor compensation. Real sources: features, power, performance, maximum power transfer. Resonance and frequency response.</p>
3	<p><b>BT3 METHODS OF ANALYSIS AND NETWORK THEOREMS</b></p> <p>Theoretical contents: Introduction. Network topology elements. Analysis using Kirchhoff's laws. Maxwell analysis methods: mesh and node. Analysis with dependent sources and other special cases. Input and transfer immittance. Network theorems: reciprocity, superposition, substitution, Thévenin and Norton, Frank and Tellegen.</p>
4	<p><b>BT4 TWO-PORTS</b></p> <p>Theoretical contents: Introduction. Concept multipole. Basic parameters and equations quadropole passive: relation between parameters. Equivalent and symmetries in quadripoles passive. Associations cuadripolos: Brune test. Passive quadropole inserted into the network. Image or characteristic parameters. Quadripoles in sinusoidal regime: power transmission, adaptation. Quadripole actives.</p>

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Contents of the B.T. 1 and 2: a) test with six options (4 points) and / or, b) problems (5 points) and / or, c) weekly practices (1 point).	Written exam	No	Yes	45,00
Contents of the B.T. 3 and 4: a) test with six options (4 points) and / or, b) problems (5 points) and / or c) weekly practices (1 point). Contents of the B.T. 1 and 2: a) test with six options (4 points) and / or, b) problems (6 points).	Written exam	Yes	Yes	45,00
Recoverable in Regular Examination Session	Work	No	Yes	5,00
Recoverable in Extraordinary Examination Session	Work	No	Yes	5,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
<p>Continuous assessment is performing three written tests throughout the semester. Each test covers all content posted until four days before the holding of the corresponding test. The maximum score for each test is 10 points, distributed according to the following: Theory, 3.5 points; Objective test, 2.5 points; Problem, 2.5 points; Lab 1.5 points. The final mark for Continuous Assessment (CFEC), results from the weighted average <math>CFEC = (C1 + 2C2 + 3C3) / 6</math> of the marks obtained in the three tests (C1, C2, C3), provided that the minimum score of the third test is, <math>C3 &gt; = 4.5</math> points.</p> <p>The retest those students whose final grade must be performed by continuous assessment has not reached 5 points; also, those other students who, having passed the continuous assessment, wish to improve their final grade. The test consists of carrying out a written test, of identical structure to the continuous assessment tests, covering all course contents. Students are presented to improve final grade will be assigned to that obtained in the examination, anyone who has been his rating on continuous except evaluation if your score is less than 5 points, to be awarded the value of 5, approved.</p>				
<b>Observations for part-time students</b>				
The assessment of part-time students will be the same as for other students.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
<b>BASIC</b>
<ul style="list-style-type: none"> <li>• Material teórico-práctico suministrado por el profesor en la plataforma Moodle de la UC y en el Servicio de Reprografía del Centro.</li> <li>• Eguíluz, L.I. 1 986. "Pruebas Objetivas de Ingeniería Eléctrica". Madrid. Ed. Alhambra. ISBN: 84-205-1257-5.</li> <li>• Eguíluz, L.I. et al. 2 001. "Pruebas Objetivas de Circuitos Eléctricos". Pamplona. EUNSA. ISBN: 84-313-1888-0.</li> <li>• Nilsson, J.W. et al. 2 001. "Circuitos Eléctricos". México. Pearson Educación. ISBN: 970-17-0406-1.</li> <li>• Pastor, A. et al. 2 005 "Circuitos Eléctricos: Volumen I y II". Madrid. UNED. ISBN: 84-362-4957-7.</li> <li>• Sánchez, P. et al. 2 007. "Teoría de Circuitos: Problemas y Pruebas Objetivas orientadas al aprendizaje". Madrid. Pearson Educación. ISBN: 978-84-8322-387-1.</li> </ul>