SUBJECT TEACHING GUIDE

G280 - Fundamentals of Electrical Engineering

Degree in Industrial Electronic Engineering and Automatic Control Systems

First Degree in Industrial Electronic Engineering and Automatic Control Systems

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Industrial Electronic Engineering and Automatic Control Systems First Degree in Industrial Electronic Engineering and Automatic Control Systems			Type and Year	Compulsory. Year 1 Compulsory. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Fundamentals of Electrical Engineering Module: Further Basic Training				
Course unit title and code	G280 - Fundamentals of Electrical Engineering				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Knowledge Field					
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA ELECTRICA Y ENERGETICA
Name of lecturer	ALBERTO ARROYO GUTIERREZ
E-mail	alberto.arroyo@unican.es
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 2. DESPACHO PROFESOR (S2026)
Other lecturers	CARMELA ORIA ALONSO EUGENIO SAINZ ORTIZ

4. OBJECTIVES

The overall aim is that the student knows to analyze electrical circuits in any work system.

Specifically, in this subject:
* Know and apply the main equations of the circuit elements.
* Use methods of analysis in direct and altern current.
* Analyze circuits in the frequency domain.
* Be able to understand the connections and the use of the measurement equipments.

6. SUBJECT PROGRAM	
CONTENTS	
1	BT 1: ELEMENTS OF LINEAR CIRCUITS 1.1 Theoretical contents: Introduction. General circuits. Excitation waveforms / answers. Measuring devices. Two terminal passive elements. Association of passive elements. Independent active elements. Association of active elements. Generalized Ohm law. Dual elements and magnitudes. 1.2 Problems of classroom: Approach and resolution strategies and implementation problems items. 1.3 Activities of tutorial: Proposed items and problems / Clarification and resolution of doubts. 1.4 Group work: Resolution, in groups of 2/3 students, and some of the items proposed problems.
2	BT 2: CIRCUITS IN SINUSOIDAL STEADY STATE 2.1 Theoretical contents: Introduction. Analysis by undetermined coefficients of the D.E of the network. Phasor transform. Phasor or complex analysis. Power in sinusoidal state. Power measurement. Boucherot theorem: installations, the power factor. Real sources: features, power and efficiency, maximum power transfer. 2.2 Problems of classroom: Approach and resolution strategies and implementation problems items. 2.3 Activities of tutorial: Proposed items and problems of application / Clarification and resolution of doubts. 2.4 Group work: Resolution, in groups of 2/3 students, and some of the items proposed problems.
3	BT 3: ANALYSIS OF THE FREQUENCY RESPONSE 3.1 Theoretical contents: Introduction. Quality of coils and capacitors. Study of dipole RLC series: variation of impedance and current with frequency, bandwidth and quality factor, definition and properties of resonance. Study of GCL dipole by duality. Studyof resonance in series and shunt impedances. 3.2 Problems of classroom: Approach and resolution strategies and implementation problems items. 3.3 Activities of tutorial: Proposed items and problems of application / Clarification and resolution of doubts. 3.4 Group work: Resolution, in groups of 2/3 students, and some of the items proposed problems.
4	BT 4: METHODS OF CIRCUIT ANALYSIS 4.1 Theoretical contents: Introduction. Elements of network topology. Analysis using Kirchhoff's laws. Mesh analysis: general and particular cases. Knots analysis: general and particular cases. Analysis with controlled sources. Reciprocity theorem. Linearity and superposition theorems. Thevenin and Norton theorems. Substitution rule. Frank theorem and its dual. Tellegen's theorem. 4.2 Problems of classroom: Approach and resolution strategies and implementation problems items. 4.3 Activities of tutorial: Proposed items and problems of application / Clarification and resolution of doubts. 4.4 Group work: Resolution, in groups of 2/3 students, and some of the items proposed problems.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Contents of Units 1 and 2. The structure may include: 1) Objective test with closed options and/or open exercises. Evaluation: 4 points and 2) One or two development problems. Evaluation: 6 points.	Written exam	No	Yes	45,00
Contents of the U.D. 3 and 4. a) an objective test (test) consisting of the resolution of items, with six options and / or b) problems and / or c) delivery of weekly practices. Contents of the U.D. 1 and 2. a) test (test) and / or b) problems.	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
TOTAL				100,00

Observations

For the purposes of continuous assessment, if the Partial Exam has been passed (score equal to or greater than 3 points out of 10), only the second part not evaluated in the Partial Exam will be taken in the Final Exam. A minimum average score of 5 points out of 10, combining this part and the two follow-up tests, is required to pass the course. Additionally, a minimum of 3 points out of 10 is necessary in the Final Exam.

If the Partial Exam was not passed (less than 3 points out of 10), the entire Final Exam must be taken. This exam will consist of two parts, with a minimum of 3 points out of 10 required in each part to pass the course, and an overall average of 5 points out of 10.

Correction and grading criteria for the tests:
Objective Test: Considerations include: correct answers, mistakes, blank responses, and approaches. Evaluation is based on corrected answers (Ac), where Ac = A – E/5 (A = number of correct answers, E = number of mistakes), and a negative score is possible. Penalties: Conceptual errors result in zero points for the item. Formulations must use standardized symbols for quantities, and numerical solutions must include the standardized unit symbols. Each error or omission results in a 0.2 point deduction.

Observations for part-time students

Part-time students must attend the assessment in the Final Exam or the Recovery Exam unless otherwise agreed with the professor.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Material teórico-práctico suministrado por el profesor.

Eguíluz, L.I. et al. "PRUEBAS OBJETIVAS DE CIRCUITOS ELÉCTRICOS". EUNSA. Pamplona, 2001.

Sánchez, P. et al. “TEORÍA DE CIRCUITOS: PROBLEMAS Y PRUEBAS OBJETIVAS ORIENTADAS AL APRENDIZAJE”. Pearson Educación. Madrid, 2007.

Pastor, A. et al. "CIRCUITOS ELÉCTRICOS". Volumen I. UNED. Madrid, 2004.

Pastor, A. et al. "CIRCUITOS ELÉCTRICOS". Volumen II. UNED. Madrid, 2005.

Nilsson, J.W. et al. “CIRCUITOS ELÉCTRICOS”. Prentice Hall. México, 2001.