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 2023-2024

1. IDENTIFYING DATA					
Degree	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)	
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
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Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 2. DESPACHO PROFESOR (S2026)
Other lecturers	GERARDO DIEZ CAGIGAL

3.1 LEARNING OUTCOMES
- Know and apply universal equations of the theory of electrical circuits and the equations that govern the behavior of linear circuit elements.
- Understand, implement and evaluate the problems associated with sinusoidal steady state and frequency response.
- Understand, implement and evaluate general methods of analysis in steady state circuits.
- Understand, implement and evaluate the theorems of circuits.

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. COURSE ORGANIZATION	
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 the U.D. 1 and 2. The structure may contain: a) an objective test (test) consisting of the resolution of items, with six options and / or b) one or two development problems and / or c) delivery of weekly practices.	Written exam	No	Yes	50,00
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	50,00
TOTAL				100,00

Observations

Continuous assessment:
If the partial test has been passed (grade greater than or equal to 4 out of 10), only the second part not evaluated (U.D. 3 and 4) may be taken in the final exam, and a grade higher than 5 points out of 10 must be obtained with it, to pass the course. Additionally, in the second part, a grade greater than or equal to 4 points out of 10 must be obtained to pass the course.
If the partial test was not passed (less than 4 points out of 10), the final evaluation will be carried out in its entirety and must be obtained to pass the subject: a) in both parts (U.D. 1-2 and U.D. 3-4) a grade higher than 4 out of 10 and b) a joint grade equal to or greater than 5. Correction criteria and qualification of the tests: Objective test: it takes into account: right items, errors, blank answers and
approaches. The valuation is carried out according to corrected hits (Ac), being, Ac = A - E / 5 (A = nº of right items, E = nº of errors (being able to obtain a negative note). Penalties: Concept errors, lead to the null score of the item. The formulations must be formulated using the standard symbology of the quantities, and the numerical solutions must bear the standard symbol of the unit of measurement. Each error or fault represents a reduction of 0.2 points.
Only for duly justified causes (eg health restrictions) and whenever the academic authorities indicate so, the evaluation tests may be organized remotely. In this case, the teachers of the subject would evaluate the thematic blocks using various tools such as, email, videoconference software, Moodle, etc.
The remote evaluation of the works, practical laboratory exercises and written tests is foreseen, in the case of a new health alert by COVID-19 making it impossible to carry out the evaluation in person.

Observations for part-time students

The evaluation will be conducted with the same criteria as full-time students.

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.