

**1. General information****Course:** CIRCUIT THEORY**Type:** CORE COURSE**Degree:** 354 - UNDERGRADUATE DEGREE PROGRAMME IN ELECTRICAL ENGINEERING (ALM)**Center:** 106 - SCHOOL OF MINING AND INDUSTRIAL ENGINEERING**Year:** 2**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 56405**ECTS credits:** 6**Academic year:** 2023-24**Group(s):** 55**Duration:** C2**Second language:****English Friendly:** Y**Bilingual:** N**Lecturer:** RAQUEL JURADO MERCHANT - Group(s): 55

Building/Office	Department	Phone number	Email	Office hours
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**2. Pre-Requisites**

Students must have the ability to solve mathematical problems that may arise in engineering and the aptitude to apply knowledge of linear algebra, differential geometry, differential and integral calculus and differential equations. They must also understand the basic concepts of the general laws of mechanics, thermodynamics, fields and waves and electromagnetism, and their application to the resolution of engineering problems. It is also advisable to have previously taken the subject of Electrical Technology.

**3. Justification in the curriculum, relation to other subjects and to the profession**

The subject Circuit Theory is a natural continuation of the subject Electrical Technology and its related competence in the principles of circuit theory and electrical machines. It serves as a basis for other subjects in which a knowledge of dynamic circuit analysis is necessary and introduces the principles of electrical machines.

The mathematical tools studied in this subject, although specialised in the study of circuits, are of general application in the analysis of dynamic systems of any kind and, therefore, this subject is of great interest and usefulness for the future graduate.

**4. Degree competences achieved in this course****Course competences**

Code	Description
A04	To be able to transmit information, ideas, problems and solutions to both a specialist and non-specialist audience.
A05	To have developed the learning skills necessary to undertake subsequent studies with a greater degree of autonomy.
C04	Knowledge and use of the principles of the theory of circuits and electrical machinery.
CG03	Knowledge of basic materials and technologies that assist the learning of new methods and theories and enable versatility to adapt to new situations.
CG04	Ability to take the initiative to solve problems, take decisions, creativity, critical reasoning and ability to communicate and transmit knowledge, skills and abilities in Electrical Engineering.

**5. Objectives or Learning Outcomes****Course learning outcomes****Description**

Know how to determine the temporal response of circuits  
Knowledge of the fundamentals of the Theory of Symmetrical Components  
Know how to analyze circuits in the presence of periodic signals  
Know how to analyze the frequency response of circuits  
Know how to use computational tools in the analysis of circuits  
Know how to apply the Laplace Transform in the analysis of circuits

**6. Units / Contents**

**Unit 1: TIME-DOMAIN CIRCUIT ANALYSIS**  
**Unit 2: APPLICATIONS OF THE LAPLACE TRANSFORM TO SOLVING CIRCUITS**  
**Unit 3: APPLICATIONS OF FOURIER ANALYSIS TO CIRCUIT RESOLUTION**  
**Unit 4: FREQUENCY RESPONSE ANALYSIS. FILTERS**  
**Unit 5: SYMMETRIC COMPONENT THEORY**

**ADDITIONAL COMMENTS, REMARKS**

Laboratory practicals:

Practical 1: Computational tools for circuit analysis.

Practical 2: Study of the time response in first order circuits.

Practical 3: Study of the time response in circuits with successive switching.

Practice 4: Study of the time response in second order circuits.

Practice 5: Applications of Fourier analysis.

Practice 6: Study of frequency response.

Practice 7: Fundamentals of symmetrical components.

7. Activities, Units/Modules and Methodology							
Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Combination of methods	C04 CG03	1.2	30	N	-	Presentation and development of fundamental theoretical concepts.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	A04 A05 C04 CG03 CG04	0.4	10	N	-	Resolution of exercises by the teacher that illustrate the theoretical contents discussed above.
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	A04 A05 C04 CG03 CG04	0.6	15	N	-	They will consist of small groups of practical exercises that will help to resolve any doubts that may have arisen both in the theoretical concepts and in the resolution of problems. To support the resolution process, it will be complemented with the use of specific software that will allow both the simulation of the proposed circuits and the use of mathematical tools that will speed up the resolution of the practical cases. Attendance at these group tutorial sessions will be compulsory, and students will be required to submit a report of the activities carried out during these sessions.
Formative Assessment [ON-SITE]	Assessment tests	A04 A05 C04 CG03 CG04	0.2	5	Y	Y	Written tests to evaluate the theoretical and practical contents developed in the course.
Study and Exam Preparation [OFF-SITE]	Self-study	A04 A05 C04 CG03 CG04	3.6	90	N	-	
<b>Total:</b>			<b>6</b>	<b>150</b>			
<b>Total credits of in-class work: 2.4</b>				<b>Total class time hours: 60</b>			
<b>Total credits of out of class work: 3.6</b>				<b>Total hours of out of class work: 90</b>			

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System			
Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Laboratory sessions	30.00%	30.00%	<p>Students must solve the proposed exercises analytically and/or by means of simulation and hand in the resolution in due time and form.</p> <p>As this is a compulsory activity, students must achieve a minimum of 40% of their grade in order to pass the course.</p> <p>This activity can only be recovered when, for duly justified reasons, the teacher deems it necessary to extend the deadline or to take a practice exam. These recoveries will only be allowed if the student has achieved the minimum grade required in the rest of the evaluable activities (partial tests or final exam).</p> <p>The grade will not be retained for subsequent academic years.</p>
Mid-term tests	70.00%	0.00%	<p>They will consist of two tests related to both theoretical aspects and practical application.</p> <p>Passing them will require at least 40% of the maximum mark in each of the mid-term exams.</p> <p>They will be of an eliminatory nature.</p>

			If the average mark between the mid-term exams passed is equal to or higher than 4 points out of 10, the practical grade will be taken into account and the course will be passed if the mark obtained is higher than 5 points.
Final test	0.00%	70.00%	It will consist of a test related to both theoretical aspects and practical application, which will be structured as two partial tests. Passing the test will require achieving at least 40% of the maximum mark in each of the parts into which it is divided.  If the average mark between the parts passed is equal to or higher than 4 points out of 10, the practical grade will be taken into account and the subject will be passed if the mark obtained is higher than 5 points.
<b>Total:</b>		<b>100.00%</b>	<b>100.00%</b>

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

#### Evaluation criteria for the final exam:

##### Continuous assessment:

Students will have two mid-term exams which will be eliminatory, i.e. if they pass a mid-term they will not have to sit the final exam.

In order to pass the course in the ordinary exams, a minimum of 40% of the maximum grade must be obtained in each of the mid-term exams and in the practicals, all of which are compulsory activities.

If this requirement is not met, even if the overall grade of the subject after the weighted average of all the evaluable parts is higher than 5 out of 10, the grade in the minutes will be Fail (4). In the event that the weighted average does not reach 4, the grade will be that obtained from the weighted average of all the activities.

The recovery of the partial tests will be possible in the final exam, while the recovery of the practicals will be possible as detailed in the previous description. During the partial or final exams it is strictly forbidden to use any kind of electronic device (mobile phones, tablets, smartwatches, etc.), even if they are switched off.

In case of non-compliance with this rule, the grade will be Fail (0), even if the terminal is switched off. This rule is applicable to all exam sessions.

##### Non-continuous evaluation:

For students who do not take part in non-continuous assessment, the criteria will be the same as for continuous assessment, except that the part of the assessment corresponding to the partial tests will be examined in a single final exam which will be structured as two partial tests and which will be subject to the same criteria as those established for the partial tests of continuous assessment.

Passing the practicals is also compulsory and is subject to the same criteria as for the continuous assessment.

#### Specifications for the resit/retake exam:

In the extraordinary exam session, the same criteria will be followed as in the ordinary exam session.

#### Specifications for the second resit / retake exam:

In the special final exam session, the same criteria will be followed as in the ordinary exam session.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	30
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	10
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Formative Assessment [PRESENCIAL][Assessment tests]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Global activity	
Activities	hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	30
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	10
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Formative Assessment [PRESENCIAL][Assessment tests]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
<b>Total horas: 150</b>	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
CONEJO A.J., CLAMAGIRAND A., POLO J.L., ALGUACIL N.	Circuitos Eléctricos para la Ingeniería	Mc. Graw Hill Interamericana	Madrid		2004	
CARLSON, A.B	Teoría de Circuitos.	Thomson.			2004	
EDMINISTER, J.A	Circuitos Eléctricos.	Mc Graw Hill			1997	
FRAILE MORA, JESÚS.	Electromagnetismo y Circuitos Eléctricos. (4ª Ed.).	Mc Graw Hill			2005	
GARCÍA BREIJÓ, E y 2 más.	PSPICE.	Paraninfo.			1995	
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MARTÍNEZ MARTÍNEZ, JUAN ANTONIO	Teoría de Circuitos II (Apuntes)				2000	
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PASTOR, A., y otros	Circuitos Eléctricos (Vol. 1).	UNED	2003
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ROEPER.	Corrientes de Cortocircuito en Redes Trifásicas.	Marcombo.	
ROSSA, T.	Circuitos y Señales.	Reverté.	1991
ALEXANDER C.K., SADIKU M.N.O.	Fundamentos de Circuitos Eléctricos	Mc. Graw Hill Madrid	2022