

## SUBJECT TEACHING GUIDE

G377 - Linear Algebra And Geometry

Degree in Energy Resources Engineering

First Degree in Energy Resources Engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Energy Resources Engineering First Degree in Energy Resources Engineering			Type and Year	Core. Year 1 Core. Year 1
Faculty	School of Mines and Energy Engineering				
Discipline	Subject Area: Mathematics Basic Training Module				
Course unit title and code	G377 - Linear Algebra And Geometry				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Knowledge Field					
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICA APLICADA Y CIENCIAS DE LA COMPUTACION
Name of lecturer	PAULA CAMUS BRAÑA
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Other lecturers	ENRIQUE RODRIGUEZ FERNANDEZ

#### 4. OBJECTIVES

- To develop logical mathematical reasoning and the ability to relate practical problems to the solution of systems of linear equations, the calculation of eigenvalues and vectors and the notions of matrices, vector spaces and linear transformations, as well as problems of Euclidean Geometry.
- To understand and have good command of the basic concepts related to linear algebra , in particular, the notions of matrices, determinants, vector spaces, vector subspaces, linear independence, bases and dimension, dot product, least squares, linear transformations, kernel and image, eigenvalues and eigenvectors, characteristic polynomial.
- To apply the acquired knowledge to real situations and problems , linked to their professional career and other related fields.
- To acquire skills in the use of mathematical software as an aid in the resolution of problems .
- To get used to consulting bibliographical references to obtain information .

#### 6. SUBJECT PROGRAM

CONTENTS	
1	<p>BLOCK I: MATRICES. DETERMINANTS. LINEAR EQUATIONS SYSTEMS</p> <p>Matrix Algebra. Elemental matrices. Matrices factorization: LU and Cholesky. Linear equation systems. Gaussian elimination.</p>
2	<p>BLOCK II: VECTOR SPACES</p> <p>Vector space. Base. Vector subspace. Euclidean space. Approximation of a continuous function in an interval. Least squares approximation.</p>
3	<p>BLOCK III. LINEAR APPLICATIONS AND DIAGONALIZATION OF ENDOMORPHISMS</p> <p>Linear applications. Kernel and image- Invariant subspaces. Diagonalization of matrices by similarity.</p>
4	<p>BLOCK IV. GEOMETRY. APPLICATIONS</p> <p>Definitions and examples. Isometries in <math>R^2</math> and <math>R^3</math>.</p>

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Practical evaluation: Follow-up tests	Laboratory evaluation	No	No	5,00
Practical evaluation: Practical exam	Laboratory evaluation	No	Yes	10,00
Practical evaluation: Follow-up test	Written exam	No	Yes	15,00
Written evaluation: Theoretical and practical exam	Written exam	Yes	Yes	60,00
Reports evaluation: Coursework and reports	Others	No	No	10,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
<p>The global score will be the lowest value between 4.9 and the weighted average of all evaluation activities for those students who got less than the minimum score in any of the evaluated activities.</p> <p>In the activities with a specific format (template for practical reports, programming templates, reserved space in written exams), the lack of adaptation to the format will be punished. Likewise, unjustified answers, inaccurate use of mathematical terminology and concepts and the lack of basic mathematical competences will be penalized.</p> <p>A student can go to the extraordinary examination only to those recoverable parts that he /she failed (score of less than 5 out of 10 points).</p> <p>The final score in the extraordinary call, for the students who take any exam, will be the weighted average of all described evaluation activities carried out along the semester.</p>				
<b>Observations for part-time students</b>				
<p>The subject can be entirely followed through the Moodle website. Those students enrolled part-time, who request it at the beginning of the term, may have a single evaluation, which means having all the theoretical and practical exams of all the subject blocks and the practical exam in the ordinary examination. It is mandatory to attend all in-person evaluation activities (tests and computer practices), to ensure the evaluation of the same concepts and competences as their classmates.</p>				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
<b>BASIC</b>
Apuntes de la asignatura en el Open Course Ware de la Universidad de Cantabria . 2010. <a href="https://ocw.unican.es/course/view.php?id=282">https://ocw.unican.es/course/view.php?id=282</a>
Larson R., Edwards B.H., Falvo D.C. 2004. Álgebra Lineal Pirámide. ISBN: 84-368-1878-4. <a href="http://catalogo.unican.es.unican.idm.oclc.org/cgi-bin/abnetopac/?TITN=226698">http://catalogo.unican.es.unican.idm.oclc.org/cgi-bin/abnetopac/?TITN=226698</a>
Kolman B., Hill D.R. 2006. Álgebra Lineal, 8ªEdición. Pearson. ISBN: 970-26-0696-9. <a href="http://catalogo.unican.es.unican.idm.oclc.org/cgi-bin/abnetopac/?TITN=239995">http://catalogo.unican.es.unican.idm.oclc.org/cgi-bin/abnetopac/?TITN=239995</a>