

SUBJECT TEACHING GUIDE

G273 - Algebra and Geometry

First Degree in Industrial Electronic Engineering and Automatic Control Systems

Academic year 2025-2026

1. IDENTIFYING DATA					
Degree	First Degree in Industrial Electronic Engineering and Automatic Control Systems			Type and Year	Core. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Mathematics Basic Training Module				
Course unit title and code	G273 - Algebra and Geometry				
Number of ECTS credits allocated	6	Term	Semester based (2)		
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. MATEMATICA APLICADA Y CIENCIAS DE LA COMPUTACION				
Name of lecturer	MARCO BRAVIN				
E-mail	marco.bravin@unican.es				
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 5. DESPACHO (S5019)				
Other lecturers	ANGEL BARON CALDERA				

4. OBJECTIVES
Efficiently solve systems of linear equations.
Handle the concepts of vectors, bases, subspaces. Know and understand the proofs of linear algebra and geometry
Handle with ease the elementary techniques of linear algebra and geometry.
Solve and program linear algebra and geometry problems using mathematical software, such as Sage.
Handle the theory of endomorphism and some of its applications.
Handle the basic concepts of Euclidean and related geometry.

6. SUBJECT PROGRAM	
CONTENTS	
1	SYSTEMS OF LINEAR EQUATIONS and MATRICES: Systems of linear equations and examples in engineering. Homogeneous systems and vector spaces. Gaussian elimination and elementary matrix operations. Equivalent matrices and Rouché-Frobenius theorem. LU factorization. Determinants. Sage scientific software.
2	VECTOR SPACES: Linear dependence and independence. Bases and dimension. Subspaces.
3	LINEAR APPLICATIONS: Core and image. Dimensions formula. Base changes.
4	THEORY OF ENDOMORPHISM: Invariant subspaces. Eigenvalues and eigenvectors. Diagonalizable matrices. Cayley-Hamilton theorem.
5	EUCLIDEAN GEOMETRY: Scalar product. Norm. Orthonormal bases and orthogonal matrices. Orthogonal projection. QR factorization. Applications: least squares adjustment and oversized systems.
6	AFFINED SPACE: reference systems and related varieties. Related applications and isometries. Direct kinematics of a robot.

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Description Test 1. Continuous evaluation	Written exam	No	Yes	20,00
Description Test 2. Continuous evaluation	Laboratory evaluation	No	No	10,00
Description Test 3. Continuous evaluation	Others	No	No	10,00
Final exam	Written exam	Yes	Yes	60,00
TOTAL				100,00
Observations				
The continuous evaluation grade is the weighted average of the three tests. The grade for the subject is obtained from the weighted average of the continuous evaluation grade and that of the final exam. The continuous evaluation grade is maintained for the extraordinary exam.				
Observations for part-time students				
Students enrolled part-time may choose to follow the evaluation method or to take only the final exam.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
Apuntes y material proporcionado por los profesores.