Centre	**University College of Engineering of Vitoria-Gasteiz**
Name of subject	**25972 - Algebra**
Qualification	**Degree in Industrial Electronical and Automation Engineering**
Brief description of the subject content	**Linear algebra and geometry**
Type	**Compulsory**
Credits	**6 ECTS**
Year	**1**
Term(s)	**1st**
Department	**Applied Mathematics**
Language	**Spanish and Basque**

Outcomes / Objectives

Read and interpret mathematical texts related to Linear Algebra, accurately and rigorously express in writing their logical-deductive reasoning and be able to convey it to others.

Use matrices, determinants and techniques for solving systems of linear equations in the different areas of Linear Algebra of application in Engineering.

Accurately use mathematical elements related to vector spaces and Euclidean vector spaces, understanding them as an abstraction of the properties of free vectors in a plane and space. Construct the most suitable basis that simplifies the solution of a problem, develop the best approximation of a vector in a subspace and apply it to the approximate solution of incompatible systems.

Handle the fundamental concepts of linear applications, appreciating their importance in different areas of Linear Algebra in the field of Engineering.

Diagonalise a real matrix and orthogonally diagonalise a real symmetric matrix, understanding their meaning as the simplification of a transformation and apply it to the calculation of the inverse, matrix power, evaluation of a polynomial function in a square matrix, and the classification of quadrics.

Identify and use quadratic forms as basic forms for the geometric study of conics and quadrics in an affine space.

Syllabus

Unit 1.- Vector spaces: Definition. Subspaces. Linear dependence/independence. Bases.

Unit 2.- Matrix calculus and systems of linear equations: Matrices. Determinants. Systems of linear equations.

Unit 3.- Linear applications: Definition. Classification. Associated matrix.

Unit 4.- Euclidean vector space: Scalar product. Orthogonality. Gram-Schmidt method. Orthogonal projection. Best approximation.

Unit 5.- Diagonalisation: Eigenvalues and eigenvectors. Diagonalisation. Orthogonal diagonalisation

Unit 6.- Affine geometry, conics and quadrics: Affine space. Quadratic forms. Conics. Quadrics

Unit 7. Content extension.

Methodology

Teaching Method

Face-to-Face Teaching Hours								
Lectures	Seminars	Classroom practice	Lab. practice	Computer sessions	Clinical practice	Workshops	Industrial workshops	Field practice
48.0	0.0	12.0						

Student Hours of Non Face-To-Face Activities								
Lectures	Seminars	Classroom practice	Lab. practice	Computer sessions	Clinical practice	Workshops	Industrial workshops	Field practice
72.0	0.0	18.0						

Assessment System

General criteria

1. Written essay exam
2. Practical activities (exercises, cases or problems)

Clarification regarding assessment

In the normal exam session.

- The written exam accounts for 80% of final grade.
- Practical activities account for 20% of final grade.

In the re-sit exam session.

- The written exam accounts for 100% of final grade.

Bibliography

Basic Bibliography

- Beitia, M.B.; Besga, M. C.; Cabezas, J. M. y Pastor, E. Fundamentos Matemáticos de la Ingeniería II: Álgebra Lineal. Resumen teórico y problemas. Servicio editorial de la U.P.V. / E.H.U.
- J.L. Malaina et al. Lecciones Básicas de Álgebra Lineal. Servicio editorial de la U.P.V. / E.H.U.

In-depth Bibliography

- Blanco M. F. y Reyes M. E. Problemas de Álgebra Lineal y Geometría. Ed. Universidad de Valladolid
- De Burgos, J. Álgebra Lineal.Ed. Mc. Graw-Hill
- Iglesias Martín, M.A. Trigonometría Esférica. Teoría y problemas resueltos.Ed. UPV/ EHU
- Rojo, J. y Martín, I. Ejercicios y problemas de Álgebra Lineal.Ed. Mc. Graw-Hill
- Strang, G. Álgebra Lineal y sus aplicaciones.Ed. Addison-Wesley
- De la Villa, A. Problemas de Álgebra.Ed. CLAGSA

Websites

- http://www.vc.ehu.es/matematicaaplicada/
- http://thales.cica.es/rd/Recursos/rd99/ed99-0289-02/ed99-0289-02.html
- http://www.matematicastyt.cl/Algebra_Lineal/Inicio.htm
- http://www.walter-fendt.de/m14s/index.html