Course file

Study cycle	BACHELOR IN CIVIL ENGINEERING		
Course	Linear Algebra and Analytic Geometry	Mandatory	☒
		Optional	☐
Course scientific area	CIVIL ENGINEERING	Category	B

Course category: B - Basic; C - Core Engineering; E - Specialization; P - Complementary.

Year: 1st	Semester: 1st		ECTS: 5,5		Total: 148
Contact time	T:	TP: 67,5	PL:	S:	OT:

T - Lectures; TP - Theory and practice; PL - Lab Work; S - Seminar; OT - Tutorial Guidance.

Course Director	**Title**	**Position**
Lucía Fernández Suárez	Doutor	Professor Coordenador

Learning objectives (knowledge, skills and competences to be developed by students)

(max. 1000 characters)

In this course, students learn the fundamentals of Linear Algebra and Analytical Geometry. A student who obtains a passing grade should be able to:

1. Perform calculations with matrices and determinants.

2. Analyse and solve systems of linear equations.

3. Understand the concepts of vector space and linear transformation and be able to apply them to solve problems.

4. Compute eigenvalues and eigenvectors and diagonalize matrices.

5. Compute inner, cross and scalar triple products, and understand their geometric interpretation.

6. Apply the concepts learned to the solution of problems in coordinate geometry.

7. Apply the knowledge learned in the course to the solution of problems in engineering.

Syllabus

(max. 1000 characters)

Matrices. Definition and notation. Matrix operations. Echelon form and rank of a matrix. Systems of linear

equation. Inverse of a matrix.

Determinants: definition and examples. Properties. Methods of evaluating determinants.

Vector spaces. Subspaces. Generating sets. Linear dependence. Basis and dimension. Change of basis.

Linear transformations. Definition and examples. Matrix representation of a linear transformation.

Kernel and image of a linear transformation. Operations with linear transformations.

Eigenvalues and eigenvectors. Definition and examples. Eigenspaces. Algebraic and geometric multiplicity of an eigenvalue. Diagonalization.

Euclidean spaces. Inner product. Norm, distance,angle. Cross product. Analytical Geometry.

Analytical representation of straight lines and planes. Conics and quadrics.

Demonstration of the consistency between the syllabus and the course objectives

(max. 1000 characters)

The syllabus contains the usual tools required to solve linear problems (matrices, determinants and eigenvalue theory) and the basic examples where these tools are applied (solution of linear systems, linear maps and analytical geometry problems).

Teaching methodology (evaluation included)

(max. 1000 characters)

Lectures where the material in the syllabus is explained, illustrative examples are presented and a portion of the time is devoted to problem solving.

Continuous assessment:

Two written examinations each covering half of the syllabus. In order to pass the student must score at least 8 points (out of 20) in each exam and average at least 10 point. One of the mid-term exams can be repeated on the date of the first final exam.

Final exams:

In order to pass, a student must obtain a grade of at least 10 points (out of 20) in a final exam which can be attempted three times on different dates.

Demonstration of the consistency between teaching methodology and the course learning objectives (max. 3000 characters)
The format of the lectures allows the teacher to explain the theory of linear algebra concisely and simultaneously illustrate how the theory is applied in the solution of typical problems.

Main Bibliography (max. 1000 characters)
1. Anton, Rorres, "Algebra Linear com Aplicacoes", Bookman. 2. David Lay, "Linear Algebra and its Applications", Pearson, Addison Wesley. 3. A. Steinbruch e P. Winterle, "Algebra Linear", McGraw Hill. 4. G. Strang, "Linear Algebra and its Applications", HBJ Publishers. 5. S. Blyth e E. F. Robertson, "Basic Linear Algebra". Springer.