UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2015/16
Subject (*)	Álxebra lineal I		Code	632G02007
Study programme	Grao en Tecnoloxía da Enxeñaría Civil			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	First	FB	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Métodos Matemáticos e de Representación			
Coordinador	Fuentes Garcia, Luis	E-mail	luis.fuentes@udc.es	
Lecturers	Fuentes Garcia, Luis Taboada Vazquez, Raquel Villar Ferrer, Juan	E-mail	luis.fuentes@udc.es raquel.taboada@udc.es j.villar@udc.es	
Web	caminos.udc.es/info/asignaturas/grado_tecic/101/AL1/index.html			
General description	The aim of the course is to provide a solid background in linear algebra and mathematical foundation engineering. This first part of the course focuses on studying finite dimensional vector spaces.			

Study programme competences	
Code	Study programme competences
A1	Capacidad para plantear y resolver los problemas matemáticos que puedan plantearse en el ejercicio de la profesión. En particular, conocer, entender y utilizar la notación matemática, así como los conceptos y técnicas del álgebra y del cálculo infinitesimal, los métodos analíticos que permiten la resolución de ecuaciones diferenciales ordinarias y en derivadas parciales, la geometría diferencial clásica y la teoría de campos, para su aplicación en la resolución de problemas de Ingeniería Civil.
B2	Resolver problemas de forma efectiva.
B3	Aplicar un pensamiento crítico, lógico y creativo.
C1	Reciclaje continúo de conocimientos en el ámbito global de actuación de la Ingeniería Civil.
C4	Entender y aplicar el marco legal de la disciplina.
C6	Compresión de la necesidad de analizar la historia para entender el Presente.
C8	Facilidad para la integración en equipos multidisciplinares.

Learning outcomes			
Learning outcomes	Study programme competences		
To know and to understand the basic theory of linear algebra required in civil engineering , especially the study of vector spaces.	A1		
Know, understand and manage elementary mathematical notation.	A1	B3	
Learn to express with precision and rigor.	A1		C1
Learn to use the basic techniques of mathematical reasoning.	A1	B2 B3	
Understanding the importance of justifying the thesis and results in science .	A1	B3	C4 C6
Develop critical thinking and analytical skills .	A1	B2 B3	C4 C8
Learn to pose and solve mathematical problems of Linear Algebra,	A1	B2 B3	

Contents	
Topic	Sub-topic

I. Preliminars.	1. Correspondences and maps. 1.1 Sets Definiction and notation. Operations with sets. 1.2 Correspondences. Maps. Definition, properties and classification. 2. Combinatorics. 2.1. Product rule. 2.2. Variations. 2.3. Permutations. 2.4. Combinations.
II. Matrices and determinants.	1. Matrices. 1.1 Basic definitions. 1.2 Operations with matrices. 1.3 Special matrices. 2. Determinants. 2.1 Preliminars on permutacions. 2.2 Determinant of a square matrix: definition and properties. 2.3. Development of a determinant by adjoints. 2.4. Rank of a matrix. 2.5. Inverse of a matrix. 3. Equivalence and congruence of matrices. 3.1 Elementary transformations. 3.2 Row equivalence of matrices. 3.3 Column equivalence of matrices. 3.4 Matrix equivalence. 3.5 Matrix congruence. 4. Systems of linear equations. 4.1 Cramer's rule. 4.2 Rouche-Frobenius' Theorem. 4.3 Gaussian elimination.

III. Vectorial spaces.	1. Vectorial spaces and subspaces. 1.1 Definition and properties. 1.2 Vectorial subspaces. 2. Spanning systems. Free linear systems. Basis. 2.1 Linear combinations of vectors. 2.2 Linear dependence and indepdence of vectors. 2.3 Basis, dimension and coordinates. 2.4 Rank of a vector set. 2.5 Change of basis. 2.6 Equations of a subspace. 2.7 Dimension formula. 3. Linear maps. 3.1 Definitions and properties. 3.2 Matrix form of a linear map. 3.3 Change of basis. 3.4 Kernel and image of a linear. 3.5 Composition fo homomorphisms. 4. Endomorphisms. 4.1 Introduction. 4.2 Eigen values and eigen vectors. 4.3 Diagonalization by similarity. 4.4 Triangularization by similarity. Jordan form

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A1 B2 B3	27	32	59
Seminar	A1 B2 B3	27	33	60
Mixed objective/subjective test	A1 B2 B3	3	3	6
Problem solving	A1 B2 B3	0	10	10
Workbook	A1 B2 B3	0	10	10
Personalized attention		5	0	5
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	New mathematic concepts will be developed from examples familiar for the students, or explaining the questions are wished to be solved with them; from this their common caracthers will be abstracted causing its more accuracy deffinition. The theory which allows to solve the questions described at the beginning will be developed after. Students participation is desirable, sharing their doubts or comments as the class progresses.
Seminar	Simultaneously to the theoretical development of the matter collections of exercics are given. The goal is allowing students to practise the knowledge adquierd at theorical classes. At seminars the most important problems will be discussed.

Mixed objective/subjective test	Exam where concepts are methods of the subjets are evaluated.
Problem solving	Each student must solve individually some of the proposed problems.
Workbook	Before the beginning of each item, some notes about the contents are avaiable for the students. The notes are intended as a complement of teacher's explanations. A previous reading of students familiarize them with an outline of what they will study.

Personalized attention	
Methodologies	**Description**
Problem solving Seminar Guest lecture / keynote speech	

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Problem solving	A1 B2 B3	Each student must solve individually some of the proposed problems.	10
Mixed objective/subjective test	A1 B2 B3	Exam where concepts are methods of the subjets are evaluated.	90
Others			

Assessment comments

Sources of information	
Basic	- Juan de Burgos (2000). Álgebra Lineal. McGraw-Hill - Fuentes, Salete y Cruces (1980). Álgebra vectorial y Tensorial. ETSICCP Madrid - F. Granero (1992). Álgebra y Geometría Analítica. McGraw-Hill - Anzola, Caruncho y Pérez-Canales (1981). Problemas de Álgebra (Tomos 1,3). Madrid - S. Lipschutz, M.L. Lipson (2000). Teoría y problemas de probabilidad. McGraw-Hill - Luis Fuentes García (2005-). Apuntes y ejemplos (http://caminos.udc.es/info/asignaturas/grado_tecic/101/AL1/index.html). A Coruña Â
Complementary	- J. Rojo (2001). Álgebra lineal. McGraw-Hill - F. Ayres Jr. (1991). Teoría y problemas de matrices. McGraw-Hill - J. Rojo e I. Martín (1994). Ejercicios y problemas de álgebra. McGraw-Hill - S.I. Grossman (1995). Álgebra lineal. McGraw-Hill - J. Flaquer y otros (1996). Curso de álgebra lineal. Ediciones Universidad de Navarra - P. Sanz y otros (1998). Problemas de álgebra lineal. Prentice Hall - M. Castellet e I. Llerena (1991). Álgebra lineal y geometría. Reverté - J. Arvesú y otros (1999). Álgebra lineal y aplicaciones. Síntesis - J. Pérez Vilaplana (1991). Problemas de cálculo de probabilidades. Paraninfo

Recommendations
Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously
Cálculo infinitesimal I/632G02001
Subjects that continue the syllabus
Álxebra lineal II/632G02008 Cálculo de probabilidades e estatística/632G02013 Fundamentos de mecánica computacional/632G02015 Ecuacións diferenciais/632G02017
Other comments

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.