UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2015/16
Subject (*)	Mathematics 2		Code	730G05005
Study programme	Grao en Enxeñaría Naval e Oceánica			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	First	FB	6
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Matemáticas			
Coordinador	Brozos Vázquez, Miguel	E-mail	miguel.brozos.vazquez@udc.es	
Lecturers	Brozos Vázquez, Miguel Suarez Taboada, Maria	E-mail	miguel.brozos.vazquez@udc.es maria.suarez3@udc.es	
Web	campusvirtual.udc.es/moodle			
General description	This course is an introduction to the main concepts of Linear Algebra and Integrals over parths and surfaces. The Linear Algebra part includes the study of Vector Spaces and Linear Maps, including a basic analyisis of diagonalization and Jordan normal form of endomorphisms. The study of Integrals over paths and surfaces requires the introduction and study of the main basic properties of these two concepts finishing with some of the important theorems within this area.			

Study programme competences / results	
Code	Study programme competences / results
A1	Skill for the resolution of the mathematical problems that can be formulated in the engineering. Aptitude for applying the knowledge on: linear algebra; geometry; differential geometry; differential and integral calculation; differential equations and in partial derivatives; numerical methods; algorithmic numerical; statistics and optimization
A5	Have a capacity for the space vision and knowledge of the techniques of graphic representation, so much for traditional methods of metric geometry and descriptive geometry, as through the applications of design assisted by computer
B1	That the students proved to have and to understand knowledge in an area of study what part of the base of the secondary education, and itself tends to find to a level that, although it leans in advanced text books, it includes also some aspects that knowledge implicates proceeding from the vanguard of its field of study
B2	That the students know how to apply its knowledge to its work or vocation in a professional way and possess the competences that tend to prove itself by the elaboration and defense of arguments and the resolution of problems in its area of study
B3	That the students have the ability to bring together and to interpret relevant data (normally in its area of study) to emit judgments that include a reflection on relevant subjects of social, scientific or ethical kind
B4	That the students can transmit information, ideas, problems and solutions to a public as much specialized as not specialized
B5	That the students developed those skills of learning necessary to start subsequent studies with a high degree of autonomy
B6	Be able to carrying out a critical analysis, evaluation and synthesis of new and complex ideas.
C1	Using the basic tools of the technologies of the information and the communications (TIC) necessary for the exercise of its profession and for the learning throughout its life.
C2	Coming across for the exercise of a, cultivated open citizenship, awkward, democratic and supportive criticism, capable of analyzing the reality, diagnosing problems, formulating and implanting solutions based on the knowledge and orientated to the common good.
C4	Recognizing critically the knowledge, the technology and the available information to solve the problems that they must face.
C5	Assuming the importance of the learning as professional and as citizen throughout the life.
C6	Recognizing the importance that has the research, the innovation and the technological development in the socioeconomic and cultural advance of the society.

Learning outcomes	
Learning outcomes	Study programme competences / results

To familiarize ourselves with mathematical lenguage, in particular with the algebraic one.	A1 A5	B2 B3 B5 B6	C4
To understand the main ideas in posing mathematical problems, making use of algebraic tools.	A1	B1 B2 B3 B4 B5 B6	C2 C4
To be able to use the bibliographical references and other computer tools, such as mathematical software, to find out the appropriate information to solve a given problem.	A1	B2 B3 B4	C1
To know the main characteristics of a space endowed with an algebraic structure, mainly the vector space structure.	A1	B2 B3	C4 C5
To understand the equivalence between the matrix concept and the linear map concept, knowing the consequences of this relationship.	A1	B2	C4 C5
To know and understand the concepts of paths and surfaces in Euclidean space. To understand the geometrical and physical meaning of derivatives and integrals applied to these mathematical objects.	A1 A5	B2 B6	C4 C5 C6

Contents	
Topic	**Sub-topic**
Vector spaces	Euclidean spaces R^2 and R^3. Operations: sum, product by real numbers. Vector subspaces. Direct sum. Linear combination, span. Linear independence. System of generators. Basis and dimension. Theorem of the basis. Coordinates, change of coordinates. Applications to systems of linear equations.
Linear maps	Correspondences. Maps. Linear maps. Properties of linear maps. Matrix associated to a linear map. Applications to systems of linear equations.
Diagonalization of endomorphisms	Invariant subspaces. Eigenvalues and eigenvectors. Diagonalizable endomorphisms.
Integrals over paths	Paths in R^2 and R^3. Parametrizations. Path integrals of scalar functions. Line integrals of vector fields. Gradient vector fields. Green's Theorem.

Integrals over surfaces	Parametrized surfaces. Surface integrals. Rotational and divergence. Stokes's Theorem. Divergence Theorem.
Appendix: the free software program MAXIMA	Practical sessions with the free software program MAXIMA

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A1 A5 B3 B4 B5 B6 C2 C4 C5 C6	30	45	75
Workshop	A1 A5 B2 B3 B4 B5 B6 C1 C2 C4 C5	10	10	20
Objective test	A1 A5 B1 B2 B3 B4 B5 B6 C1 C2 C4 C5 C6	5	0	5
Collaborative learning	A1 B3 B4 B5 B6 C2 C4 C5	4	12	16
Problem solving	A1 A5 B1 B2 B3 B4 B5 B6 C2 C4 C5 C6	16	16	32
Personalized attention		2	0	2
(*)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	Oral exhibition complemented with the use of audiovisual means and some questions headed to the students, with the purpose to transmit knowledges and facilitate the learning
Workshop	Formative modality oriented to the application of learnings in which one can combine different methodologies (exhibitions, simulations, debates, problems solving, practical guided, etc) through which the students manage tasks essentially practical on a specific subject, with support and guide of the lecturer.
Objective test	Written exam used for the evaluation of the learning, whose distinctive stroke is the possibility to determine if the answers given are or no correct. It constitutes an instrument of measure, elaborated rigorously, that allows to evaluate knowledges, capacities, skills, performance, aptitudes, attitudes, etc
Collaborative learning	Modalidade didáctica que fomenta a aprendizaxe centrada no alumno baseando o traballo en pequenos grupos, onde os estudantes desenvolven actividades para mellorar a comprensión dunha materia ou dun tema específico da mesma. Cada membro do grupo é responsable da súa aprendizaxe pero tamén de axudar aos seus compañeiros a aprender xa que o éxito na actividade dependerá de todos os membros do grupo. Os elementos esenciais desta técnica son responsabilidade individual, interdependencia positiva, interacción cara a cara, traballo en equipo e proceso de grupo.
Problem solving	Technic by means of which one has to solve a specific problematic situation related to the contents of the subject.

Personalized attention	
Methodologies	Description
Problem solving Workshop	The contents of the subject as well as the homework require that students work by themselves. This will generate some questions that they can ask during the classes or during the office hours.

Assessment

Methodologies	Competencies / Results	Description	Qualification
Objective test	A1 A5 B1 B2 B3 B4 B5 B6 C1 C2 C4 C5 C6	Written exam to assess the knowledge of the subject by the students. Three exams will be performed, the first one in the reserved period for the partial exams, and will involve all the issues studied until the celebration of the exam. The second (and final) exam will be carried out in the period of final exams. The weight of both exams will be the 75% of the final qualification. The third exam will consist of a computer exam with the program MAXIMA, where the students must show their capacity for solving problems using the MAXIMA software. The weight of this third part will be the 10% of the final qualification.	85
Collaborative learning	A1 B3 B4 B5 B6 C2 C4 C5	This is an activity that is based on active learning in groups. This will be graded up to a 15% of the final grade. Those studendts that obtain a minimum of half of the maximum grade are (optionally) excluded to be evaluated of this part in the final exam. The grade will be valid for the two oportunities.	15

Assessment comments

Sources of information	
Basic	- Villa Cuenca, A. (1994). Problemas de Álgebra. CLAGSA - Grossman, S. I. (1995). Álgebra Lineal con Aplicaciones. Mcgraw-Hill - Granero Rodríguez, F. (1991). Álgebra y Geometría Analítica. Mcgraw-Hill - Ladra, M., Suárez, V., Torres, A. (2003). Preguntas test de Álgebra Lineal y Cálculo Vectorial. E. U. Politéctica - Marsden, J., Tromba, A. (2004). Cálculo Vectorial. Addison-Wesley - Burgos, J. (1993). Álgebra lineal. McGrawHill - Larson, R., Edwards, B.H., Calvo, D. C. (2004). Álgebra lineal. Pirámide Ediciones - Lay, D. C. (2007). Álgebra lineal y sus aplicaciones. Addison-Wesley - Hwei P. Hsu (1987). Análisis Vectorial. Addison-Wesley - Larson, R., Hostetler, R., Edwards, B. (1999). Cálculo y Geometría Analítica, Vol. 2. McGraw-Hill
Complementary	As seguintes páxinas web posúen material que pode resultar de interese:http://www.cds.caltech.edu/~marsden/books/Vector_Calculus.htmlNesta páxina web, ademais de incluirse diversos complementos á referencia Marsden-Tromba da bibliografía, pódense descargar como transparencias as distintas leccións do libro.http://demonstrations.wolfram.com/index.htmlEsta páxina web de Wolfram Research posúe numerosos programas elaborados en Mathematica, que poden resultar útiles á hora de visualizar moitos dos contidos da materia. Se ben o programa non é libre, a páxina permite descargar un visor gratuito co que executar as aplicacións.http://193.144.60.200/elearning/Esta páxina contén diversos applets creados co programa Geogebra (software libre), que poden resultar de utilidade para visualizar algúns dos contidos da materia.

Recommendations
Subjects that it is recommended to have taken before
Mathematics 1/730G05001 Physics 1/730G05002
Subjects that are recommended to be taken simultaneously
Physics 2/730G05006
Subjects that continue the syllabus

Ecuacións diferenciais/730G05011 Estatística/730G05012
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.