UNIVERSIDADE DA CORUÑA

Teaching Guide		
Identifying Data		**2017/18**
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

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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 solve problems that may appear in an engineering context.	A1	B1 B2 B3 B5	C5 C6
To think in a logic, critic and creative way.		B2 B3 B5 B6	C2 C5 C6
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
Objective test	A1 A5 B1 B2 B3 B4 B5 B6 C1 C2 C4 C5 C6	5	0	5
ICT practicals	A1 A5 B2 B3 B4 B5 B6 C1 C2 C4 C5	10	10	20
Problem solving	A1 A5 B1 B2 B3 B4 B5 B6 C2 C4 C5 C6	20	28	48
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
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
ICT practicals	This methodology allows students to learn effectively, through practical activities (demonstrations, simulations, etc.) the theory of a specific field through the use of information and communication technology. This type of training is geared towards the implementation of learning in which you can combine various methodologies / tests by using electronic tools such as a calculator, computer, etc. The students developed practical oriented tasks on a specific topic, with the support and supervision of the professors. These practices can be done individually or in groups.
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 ICT practicals	The contents of the subject as well as the different methodologies developed require that students work by themselves. This will generate some questions that they can ask during the classes or during the office hours. Also, the ICT practicals will be guided by the professors in charge.

Assessment

Methodologies	Competencies / Results	Description	Qualification
Objective test	A1 A5 B1 B2 B3 B4 B5 B6 C1 C2 C4 C5 C6	Written exam will be used to assess learning of the contents of the subject. The exam consists of four parts, the first one will be performed in the planned period for partial exams and will include lessons 1 and 2. This part will be eliminatory and retrievable and will be weighted as 40% of the final grade. The second part will be developed throughout the course by making working groups, students being graded by a test assessing gained competences. This part will be weighted as 15% of the final grade. The third part will be performed during the usual period of final exams and will assess the first, second and third parts. Its total weight is 90%. The fourth part will consist of a test related to the software MAXIMA, where the student will show his/her capability in solving problems about the contents of the subject aided by the computer. This test is not retrievable: mark will be saved until the second opportunity. Its weight is 10% of the final grade..	100

Assessment comments

Comments about the assessment:

First part: it will be graded at a maximum of 4 points. If at least 2 points are reached in this part, students may choose not to do the corresponding part in the final exams (first or second opportunity). Second part: it will be graded at a maximum of 1,5 points. If at least 0.75 points are reached in this part, students may choose not

to do the corresponding part in the final exams (first or second

opportunity).

Third part:

   - If a minimum of 50% in the first part (issues 1 and 2) or in the second part (issue 3), students may choose not to do the corresponding part in the final exams (first or second opportunity).

      - Students will be necessarily assessed of lessons 4 and 5 of the final exam. Furthermore, a minimum of the 40% of the grade is required to pass the subject.

Remark: grades obtained in the first and the second part will be saved until the second opportunity if half of the grade is got. This is independently applied to each part involved in the assessment.

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 lección 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
Differential equations/730G05011
Statistics/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.