

		Teaching	Guide		
Identifying Data				2015/16	
Subject (*)	Mathematics 2		Code	730G05005	
Study programme	Grao en Enxeñaría Naval e Oce	ánica			
		Descrip	otors		
Cycle	Period	Yea	ear Type		Credits
Graduate	2nd four-month period	Firs	it	FB	6
Language	SpanishGalicianEnglish				
Teaching method	Face-to-face				
Prerequisites					
Department	nt Matemáticas				
Coordinador	Brozos Vázquez, Miguel E-mail miguel.brozos.vazquez@udc.es				
Lecturers	Brozos Vázquez, Miguel		E-mail	miguel.brozos.vazquez@udc.es	
	Suarez Taboada, Maria			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 S	Skill for the resolution of the mathematical problems that can be formulated in the engineering. Aptitude for applying the knowledge on:
li	inear algebra; geometry; differential geometry; differential and integral calculation; differential equations and in partial derivatives;
n	numerical methods; algorithmic numerical; statistics and optimization
A5 H	Have a capacity for the space vision and knowledge of the techniques of graphic representation, so much for traditional methods of metric
g	geometry and descriptive geometry, as through the applications of design assisted by computer
B1 T	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
it	tself tends to find to a level that, although it leans in advanced text books, it includes also some aspects that knowledge implicates
p	proceeding from the vanguard of its field of study
B2 T	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
p	prove itself by the elaboration and defense of arguments and the resolution of problems in its area of study
B3 T	That the students have the ability to bring together and to interpret relevant data (normally in its area of study) to emit judgments that
ir	nclude a reflection on relevant subjects of social, scientific or ethical kind
B4 T	That the students can transmit information, ideas, problems and solutions to a public as much specialized as not specialized
B5 T	That the students developed those skills of learning necessary to start subsequent studies with a high degree of autonomy
B6 E	Be able to carrying out a critical analysis, evaluation and synthesis of new and complex ideas.
C1 L	Using the basic tools of the technologies of the information and the communications (TIC) necessary for the exercise of its profession and
fo	for the learning throughout its life.
C2 C	Coming across for the exercise of a, cultivated open citizenship, awkward, democratic and supportive criticism, capable of analyzing the
r	reality, diagnosing problems, formulating and implanting solutions based on the knowledge and orientated to the common good.
C4 F	Recognizing critically the knowledge, the technology and the available information to solve the problems that they must face.
C5 A	Assuming the importance of the learning as professional and as citizen throughout the life.
C6 F	Recognizing the importance that has the research, the innovation and the technological development in the socioeconomic and cultural
а	advance of the society.

 Learning outcomes
 Study programme

 Learning outcomes
 competences /

 results
 results



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



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

	Plannin	g		
Methodologies / tests	Competencies /	Teaching hours	Student?s personal	Total hours
	Results	(in-person & virtual)	work hours	
Guest lecture / keynote speech	A1 A5 B3 B4 B5 B6	30	45	75
	C2 C4 C5 C6			
Workshop	A1 A5 B2 B3 B4 B5	10	10	20
	B6 C1 C2 C4 C5			
Objective test	A1 A5 B1 B2 B3 B4	5	0	5
	B5 B6 C1 C2 C4 C5			
	C6			
Collaborative learning	A1 B3 B4 B5 B6 C2	4	12	16
	C4 C5			
Problem solving	A1 A5 B1 B2 B3 B4	16	16	32
	B5 B6 C2 C4 C5 C6			
Personalized attention		2	0	2
(*)The information in the planning table is for guida	nce only and does not	take into account the	heterogeneity of the stu	udents.

	Methodologies		
Methodologies	Description		
Guest lecture /	Oral exhibition complemented with the use of audiovisual means and some questions headed to the students, with the		
keynote speech	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	The contents of the subject as well as the homework require that students work by themselves. This will generate some		
Workshop	questions that they can ask during the classes or during the office hours.		

Assessment



Methodologies	Competencies /	Description	Qualification
	Results		
Objective test	A1 A5 B1 B2 B3 B4	Written exam to assess the knowledge of the subject by the students.	85
	B5 B6 C1 C2 C4 C5		
	C6	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.	
		The factor of the description of the second s	45
Collaborative learning	A1 B3 B4 B5 B6 C2	I his is an activity that is based on active learning in groups. This will be graded up to	15
	C4 C5	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.	

Assessment comments

Basic - Villa Cuenca, A. (1994). Problemas de Álgebra. CLAGSA - Grossman, S. I. (1995). Álgebra Lineal con Aplicaciones. Mcgraw-Hill - Grapero Rodríguez, E. (1991). Álgebra y Geometría Apalítica. Mcgraw-Hill				
- Grossman, S. I. (1995). Álgebra Lineal con Aplicaciones. Mcgraw-Hill				
- Granero Rodríguez, F. (1991) Álgebra y Geometría Apolítica, Mograw-Hill				
- Granero Rounguez, r. (1991). Algebra y Geometria Analitica. Mograw-rim	- Granero Rodríguez, F. (1991). Álgebra y Geometría Analítica. Mcgraw-Hill			
- Ladra, M., Suárez, V., Torres, A. (2003). Preguntas test de Álgebra Lineal y Cálculo Vector	- 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	- 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. McGra	aw-Hill			
Complementary The following webpages may be of interest for				
students:http://www.cds.caltech.edu/~marsden/books/Vector_Calculus.htmlThis webpage co	ontains complement			
material to the reference Marsden-Tromba from the bibliography, one can download as slide	es different parts of the			
book. http://demonstrations.wolfram.com/index.htmlThis webpage from Wolfram Research h	nas computer programs			
developed in Mathematica. They can be useful for visualization of concepts and techniques	explained during the			
course. http://193.144.60.200/elearning/This webpage contains several applets created with	Geogebra (free software),			
that the student can find useful to visualize contents of the course. The following webpages r	may be of interest for			
students:http://www.cds.caltech.edu/~marsden/books/Vector_Calculus.htmlThis webpage co	ontains complement			
material to the reference Marsden-Tromba from the bibliography, one can download as slide	es different parts of the			
book. http://demonstrations.wolfram.com/index.htmlThis webpage from Wolfram Research h	nas computer programs			
developed in Mathematica. They can be useful for visualization of concepts and techniques	explained during the			
course. http://193.144.60.200/elearning/This webpage contains several applets created with	Geogebra (free software),			
that the student can find useful to visualize contents of the course.				

Recommendations

Subjects that it is recommended to have taken before



(*)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.