



## Teaching Guide

Identifying Data					2014/15
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				
Prerequisites					
Department	Matemáticas				
Coordinador	Brozos Vázquez, Miguel	E-mail	miguel.brozos.vazquez@udc.es		
Lecturers	Brozos Vázquez, Miguel Torres Miño, Araceli	E-mail	miguel.brozos.vazquez@udc.es araceli.torres@udc.es		
Web	campusvirtual.udc.es/moodle				
General description	Nesta asignatura farase unha introducción á álgebra linear, traballando conceptos como o de espacio vectorial e aplicación linear e introducíndose nas súas propiedades. Posteriormente introduciranse os conceptos de curvas e superficies no espacio tridimensional, estudiándoas en base ós coñecementos de álgebra linear e cálculo diferencial e integral adquiridos previamente nesta asignatura e na de Matemáticas 1.				

## Study programme competences

Code	Study programme competences
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
A2	Understanding and domination of the basic concepts on the general laws of the, thermodynamics, mechanics, fields and waves and electromagnetism and its application for the resolution of problems characteristic of the engineering
A3	Basic knowledge on the use and programming of the computers, operating systems, databases and computer programs with application in engineering
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
A7	Knowledge of the basic concepts of the mechanism of fluids and of its application to the careens of ships and artifacts, and to the machines, equipment and naval systems.
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
B6	Be able to conceiving, designing or putting in practice and adopting a substantial process of research with scientific rigor to solve any formulated problem, as well as that public specialized and not specialized in a clear way and without ambiguities communicates its conclusions -and the knowledge and last reasons that it sustain-
B7	Be able to carrying out a critical analysis, evaluation and synthesis of new and complex ideas.
B8	Designing and to carry out research in new or little known areas, with application of research techniques (so much with quantitative methodologies as qualitative) in different contexts (area public or deprived, with homogeneous or multidisciplinary equipment, etc.) to identify problems and needs.
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.
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			
Subject competencies (Learning outcomes)	Study programme competences		
To familiarize ourselves with mathematical language, in particular with the algebraic one.	A1 A2 A3 A5 A7	B2 B3 B6 B7 B8	C4
To understand the main ideas in posing mathematical problems, making use of algebraic tools.	A1 A2 A3	B2 B3 B6 B7 B8	C4 C5 C6
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 A3	B2 B3 B4	C1
To know the main characteristics of a space endowed with an algebraic structure, mainly the vector space structure.	A1 A2 A7	B2 B3 B6	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 A2 A5	B2 B6 B7	C4 C5 C6

Contents	
Topic	Sub-topic
Vector spaces	Euclidean spaces $\mathbb{R}^2$ and $\mathbb{R}^3$ . 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	<p>Paths in <math>\mathbb{R}^2</math> and <math>\mathbb{R}^3</math>.</p> <p>Parametrizations.</p> <p>Path integrals of scalar functions.</p> <p>Line integrals of vector fields.</p> <p>Gradient vector fields.</p> <p>Green's Theorem.</p>
Integrals over surfaces	<p>Parametrized surfaces.</p> <p>Surface integrals.</p> <p>Rotational and divergence.</p> <p>Stokes's Theorem.</p> <p>Divergence Theorem.</p>
Appendix: the free software program MAXIMA	Practical sessions with the free software program MAXIMA

### Planning

Methodologies / tests	Ordinary class hours	Student's personal work hours	Total hours
Guest lecture / keynote speech	30	45	75
Workshop	10	10	20
Objective test	6	0	6
Problem solving	20	25	45
Personalized attention	4	0	4

(\*)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
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 questions that they can ask during the classes or during the office hours.

### Assessment

Methodologies	Description	Qualification
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Objective test	<p>Written exam to assess the knowledge of the subject by the students.</p> <p>Three exams will be performed, the first one in the reserved period for the partial exams, and will involve all the chapters studied until the celebration of the exam.</p> <p>The second (and final) exam will be carried out in the period of final exams. The weight of both exams will be the 90% of the final qualification.</p> <p>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.</p>	100
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### Assessment comments

### Sources of information

<b>Basic</b>	<ul style="list-style-type: none"> <li>- Larson, R., Edwards, B.H., Calvo, D. C. (2004). Álgebra lineal. Pirámide Ediciones</li> <li>- Burgos, J. (1993). Álgebra lineal. McGrawHill</li> <li>- Grossman, S. I. (1995). Álgebra Lineal con Aplicaciones. Mcgraw-Hill</li> <li>- Lay, D. C. (2007). Álgebra lineal y sus aplicaciones. Addison-Wesley</li> <li>- Granero Rodríguez, F. (1991). Álgebra y Geometría Analítica. Mcgraw-Hill</li> <li>- Hwei P. Hsu (1987). Análisis Vectorial. Addison-Wesley</li> <li>- Marsden, J., Tromba, A. (2004). Cálculo Vectorial. Addison-Wesley</li> <li>- Larson, R., Hostetler, R., Edwards, B. (1999). Cálculo y Geometría Analítica, Vol. 2. McGraw-Hill</li> <li>- Ladra, M., Suárez, V., Torres, A. (2003). Preguntas test de Álgebra Lineal y Cálculo Vectorial. E. U. Politécnica</li> <li>- Villa Cuenca, A. (1994). Problemas de Álgebra. CLAGSA</li> </ul>
<b>Complementary</b>	

### Recommendations

#### Subjects that it is recommended to have taken before

#### Subjects that are recommended to be taken simultaneously

Physics 2/730G05006

#### Subjects that continue the syllabus

Mathematics 1/730G05001

Physics 1/730G05002

#### 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.