UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2023/24
Subject (*)	Mathematics for Architecture 1		Code	630G02004
Study programme	Grao en Estudos de Arquitectura			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	First	Basic training	6
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Matemáticas			
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Lecturers	Arós Rodríguez, Angel Daniel Cuellar Cerrillo, Nuria Otero Piñeiro, Maria Victoria Rodriguez Seijo, Jose Manuel	E-mail	angel.aros@udc.es nuria.cuellar@udc.es victoria.otero@udc.es jose.rodriguez.seijo@udc.es	
Web	campusvirtual.udc.gal			
General description	The objective of this subject is to offer the basic knowledge of Mathematics required in a first year of the Degree in Architecture Studies, covering a whole range of geometric, algebraic and analytical concepts, which are considered essential for all students with a view to solving problems of later courses, mathematical or not, as well as presenting methods that solve scientific and technical problems of architectural work and whose knowledge will facilitate the future architect the dialogue with other specialists, who can collaborate with him in carrying out a complex project.			

Study programme competences	
Code	Study programme competences
A5	"Knowledge of the metric and projective geometry adapted and applied to architecture and urbanism "
A11	Applied knowledge of numerical calculus, analytic and differential geometry and algebraic methods
A63	Development, presentation and public review before a university jury of an original academic work individually elaborated and linked to any of the subjects previously studied
B1	Students have demonstrated knowledge and understanding in a field of study that is based on the general secondary education, and is usually at a level which, although it is supported by advanced textbooks, includes some aspects that imply knowledge of the forefront of their field of study
B2	Students can apply their knowledge to their work or vocation in a professional way and have competences that can be displayed by means of elaborating and sustaining arguments and solving problems in their field of study
B3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgements that include reflection on relevant social, scientific or ethical issues
B4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist public
B5	Students have developed those learning skills necessary to undertake further studies with a high level of autonomy
B6	Knowing the history and theories of architecture and the arts, technologies and human sciences related to architecture
B9	Understanding the problems of the structural design, construction and engineering associated with building design and technical solutions
C1	Adequate oral and written expression in the official languages.
C3	Using ICT in working contexts and lifelong learning.
C6	Critically evaluate the knowledge, technology and information available to solve the problems they must face
C7	Assuming as professionals and citizens the importance of learning throughout life
C8	Valuing the importance of research, innovation and technological development for the socioeconomic and cultural progress of society.

Learning outcomes	
Learning outcomes	Study programme competences

Know and apply algebraic methods and analytical geometry: Know the basic concepts of matrix and vector algebra. Know how to calculate eigenvalues and eigenvectors of a matrix, and know the diagonalization process of a matrix.	A11 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C6 C7 C8
Know and apply metric and analytical geometry: Know isometries in the plane and in space.	A5 A11 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C6 C7 C8
Know and apply numerical calculus and differential and integral calculus: Know the simplest numerical methods for solving linear systems. Know and manage the differential calculus of one and several variables. Know and properly apply the integration methods of functions of one variable. Establish the basic concepts of numerical integration. Understand the fundamental concepts related to differential equations. Recognize and integrate equations of first order and higher order. Know how to apply the integration methods of linear differential equations. Know the initial value problem for first order ordinary differential equations. Know and know how to apply approximate methods for solving first-order differential equations. Know the initial value problem for systems of first-order ordinary differential equations. Know and be able to apply approximate methods for solving systems of first-order differential equations.	A11 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C6 C7 C8

Contents	
Topic	**Sub-topic**
Vector spaces. Linear applications.	Vectorial space. Subspaces. Bases. Dimension. Basis change. Orthogonality. Orthonormal bases. Linear application. Associated matrix.
Diagonalization of matrices.	Eigenvalues and eigenvectors of a square matrix. Characteristic polynomial. Diagonalizable matrices. Orthogonal diagonalization.
Geometric transformations.	Orthogonal transformations. Classification in R2 and R3. Isometries.
Numerical methods for solving systems of linear equations.	Direct methods for solving linear systems: LU factorization, Cholesky factorization. Iterative methods for solving linear systems: Gauss-Seidel.
Real functions and vector functions.	Real valued functions. Vector functions. Limit and continuity. Derivation: Partial derivatives. Total derivative. Successive derivatives. Derivation of composite functions. Derivation of implicit functions. Derivation of vector functions.
Integration. Numerical integration.	Continuation of integration methods. Numerical integration.
Introduction to ordinary differential equations.	Introduction to differential equations. First order ordinary differential equation. Higher order ordinary differential equation. Systems of ordinary differential equations. Differential equation in partial derivatives.
Methods for solving ordinary differential equations (I).	Analytical methods for solving first-order ordinary differential equations. Analytical methods for solving higher order ordinary differential equations.
Methods for solving ordinary differential equations (II).	Linear differential equations of order n. Analytical methods for solving linear differential equations.
Numerical methods for solving ordinary differential equations.	Need for numerical methods. Numerical methods for solving first order ordinary differential equations. Numerical methods for solving systems of first order ordinary differential equations.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Introductory activities	A63 B1 B2 B3 B4 B5 B6 B9 C1 C3 C6 C7 C8	1	0	1
Guest lecture / keynote speech	A5 A11 A63 B1 B2 B3 B4 B5 B6 B9 C1 C3 C6 C7 C8	25	30	55
Objective test	A5 A11 A63 B1 B2 B3 B4 B5 B6 B9 C1 C3 C6 C7 C8	4	0	4
Workshop	A5 A11 A63 B1 B2 B3 B4 B5 B6 B9 C1 C3 C6 C7 C8	29	60	89
Personalized attention		1	0	1
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Introductory activities	In the first class of the course there will be a presentation of the contents, skills and objectives to be achieved with this subject.
Guest lecture / keynote speech	Oral presentation complemented by the use of audiovisual media, in which the teacher will present the different topics of the subject as well as the problems that the student must learn to solve. Throughout it, the student may intervene by asking questions that facilitate his/her instruction and the teacher will ask questions addressed to the students in order to transmit knowledge and facilitate learning.
Objective test	Theoretical-practical exam of the subject.
Workshop	As the subject develops, the teacher will hand out problem sets that the students will have to solve and/or will propose assignments. The problem sets are not exams and it is recommended that each student discuss difficult problems with other students, after having tried to solve them and discover where their difficulty lies, although each one must develop their own solutions.

Personalized attention	
Methodologies	Description
Guest lecture / keynote speech Workshop	Throughout the course, each student should carry out at least two sessions of 30 minutes each with the teacher. In them the teacher will solve the doubts that the student presents.

Assessment			
Methodologies	Competencies	Description	Qualification
Objective test	A5 A11 A63 B1 B2 B3 B4 B5 B6 B9 C1 C3 C6 C7 C8	The evaluation of the student will be carried out as explained in the observations.	100

Assessment comments

First opportunity (January): The subject matter is divided into two blocks. At the end of each block, there will be a partial liberatory exam of the corresponding subject. Those students who have attended at least 70% of the classes may take the partial exams. Those students with recognition of part-time dedication and academic exemption from attendance (which must be communicated to the subject teacher), may take these partial exams without having to achieve the minimum attendance requirement.
Those students who obtain an average grade between the two partials, greater than or equal to 5, will have passed the subject, and will not have to take the final exam.
The final exam will consist of two tests corresponding to the subject of each block. Those students who have not passed the subject through the partial exams will be examined in the block, or blocks, that they have not passed (*). The presentation to the exam of a block already approved previously, supposes the express resignation to the previous qualification. To pass the subject it will be necessary to obtain an average grade, between the two blocks, greater than or equal to 5.
(*) Those students who, having to examine the two blocks, only examine one of them, will be graded as failed on the first opportunity and will obtain the smallest value between 4.5 and the resulting average between the highest recent qualification obtained in each of the blocks.
Second opportunity (July): The students who have not passed the subject in the first opportunity have a second opportunity to pass it. The evaluation of the student in this second opportunity will be carried out by means of a global exam of the entire subject, whose qualification will provide the final mark.
Both opportunities: The fraudulent performance of the tests or evaluation activities, once verified, will directly imply the qualification of suspense in the call in which it is committed: the student will be graded with fail (numerical grade 0) in the call of the academic year, whether the commission of the fault occurs on the first opportunity or on the second. To do this, the qualification of the first opportunity will be modified, if necessary.

Sources of information	
Basic	Lay, D. (2007). Álgebra Lineal y sus aplicaciones. México, Prentice-HallLarson, R.; Hostetler, R. P.; Edwards, B. H. (2006). Cálculo, volúmenes 1 y 2. Madrid, McGraw-HillAyres, F. (1991). Ecuaciones Diferenciales. México, McGraw-HillZill, D. G. (2007). Ecuaciones diferenciales con aplicaciones de modelado. México, Ed. ThomsonFaires, J. D.; Burden, R. (2004). Métodos Numéricos. Madrid, Thomson
Complementary	Alsina, C.; Trillas, E. (1992). Lecciones de Álgebra y Geometría. Editorial Gustavo Gili, S. A.Ayres, F. (1992). Cálculo Diferencial e Integral. Madrid, McGraw-HillBradley, G. L.; Smith, K. J. (1997). Cálculo de una variable, volúmenes 1 y 2. Madrid, Prentice-HallBurgos, J. (1994). Álgebra Lineal. Madrid, McGraw-HillBurgos, J. (1994). Cálculo infinitesimal de una variable. Madrid, McGraw-HillBurgos, J. (1995). Cálculo infinitesimal de varias variables. Madrid, McGraw-HillDemidovich, B. (1998). 5.000 problemas de Análisis Matemático. Madrid, ParaninfoGranero, F. (2001). Cálculo integral y aplicaciones. Madrid, Prentice-HallGranero, F. (1995). Cálculo infinitesimal de una y varias variables. Madrid, McGraw-HillGrossman, S. (1995). Álgebra lineal con aplicaciones. México, McGraw-HillHernández, E. (1998). Álgebra y Geometría. Madrid, Addison-WesleyMarsden, J.; Tromba, A. (2004). Cálculo Vectorial. Madrid, Pearson EducaciónRojo, J.; Martín, I. (2005). Ejercicios y problemas de Álgebra Lineal. Madrid, McGraw-HillSpiegel, M. R. (1991). Cálculo Superior. México, McGraw-HillSpiegel, M. R.; Moyer, R. E. (2007). Álgebra Superior. México, McGraw-HillNagle, R. K.; Saff, E. B. (1992). Fundamentos de Ecuaciones Diferenciales. E. U. A., Addison-Wesley IberoamericanaMartínez Sagarzazu, E. (1996). Ecuaciones diferenciales y cálculo integral. Servicio Editorial Univ. del País VascoBerman, G. N. (1983). Problemas y ejercicios de análisis matemático. Moscú, Ed. MirSimmons, G. F.; Krantz, S. G. (2007). Ecuaciones diferenciales. Teoría, técnica y práctica. México, McGraw-HillDemidovich, B. (1993). Problemas y ejercicios de análisis matemático. Madrid, ParaninfoSimmons, G. F. (2002). Cálculo y Geometría Analítica. Madrid, McGraw-HillGarcía, A. y otros (1998). Cálculo I. Madrid, CLAGSAGarcía, A. y otros (1996). Cálculo II. Madrid, CLAGSARogawski, J. (2012). Cálculo. Varias variables.. Barcelona, Editorial RevertéRogawski, J. (2012). Cálculo. Una variable. Barcelona, Editorial RevertéInformación adicional en: https://campusvirtual.udc.gal/

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus
Mathematics for Architecture 2/630G02009 Mathematical Techniques for Architecture/630G02047
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.