Teaching Guide				
Identifying Data				2024/25
Subject (*)	Mathematics for Architecture 2		Code	630G02009
Study programme	Grao en Estudos de Arquitectura			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	First	Basic training	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Matemáticas			
Coordinador	Otero Piñeiro, Maria Victoria	E-mail	victoria.otero@udc.es	
Lecturers	Cuellar Cerrillo, Nuria González Pérez, Patricia Otero Piñeiro, Maria Victoria Rodriguez Seijo, Jose Manuel	E-mail	nuria.cuellar@udc.es patricia.gonzalez.perez victoria.otero@udc.es jose.rodriguez.seijo@udc.es	
Web	campusvirtual.udc.gal/			
General description	This course is part of the basic subjects taught in the first year of the curriculum leading to the degree of graduate in Architecture. It is a continuation of Mathematics 1, and it extends the study of integral calculus and introduces the student to the study of differential geometry of curves and surfaces.			

Study programme competences / results	
Code	Study programme competences / results
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 / results

To know the different ways of expressing plane curves and twisted curves. To know how to recognize the equations of some curves. To know the concept of surface and its forms of expression. To know how to calculate the tangent plane and the normal line to a surface at a point. To know how to recognize and handle quadrics. To know some types of surfaces: of revolution, translation and ruled. To know how to find their equations. Know the key concepts of differential geometry of curves. Know how to find the elements of Frenet's Trihedron, as well as how to calculate bending and torsional curvatures. To know Frenet's formulas. To acquire the elementary concepts of differential geometry of surfaces. To know how to calculate the unit normal vector to a surface at a point. To know how to find the equations of asymptotic lines and lines of principal curvature. To know how to classify the points of a surface. To know some technical applications.	A11 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C6 C7 C8
To understand the concept and properties of the multiple integral. To know how to calculate double and triple integrals. To know how to use double and triple integrals in applications. To acquire the fundamental concepts of vector analysis. To know the concept of integral of a scalar field and of a vector field along a curve. To know and know how to apply Green's theorem. To know the concepts of surface integral of a scalar field and of a vector field. To know and know how to apply Gauss's theorem and Stokes' theorem.	A11 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C6 C7 C8

Contents	
Topic	**Sub-topic**
TOPIC 1. Curves and surfaces.	1.1 Plane curves: Definitions. Ways of expressing a plane curve. Some important plane curves. Conics. 1.2 Twisted curves: Definitions. Ways of expressing a twisted curve. Differentiable curve. Tangent vector. 1.3 Surfaces: Definitions. Ways of expressing a surface. Coordinate curves. Tangent plane and normal line. 1.4 Quadrics. 1.5 Surfaces of revolution and translation. 1.6 Ruled surfaces. Types of ruled surfaces. Developable ruled surfaces. Non-developable ruled surfaces.
TOPIC 2.- Differential geometry of curves.	2..1 Twisted curve arc. Definitions. Curvilinear abscissa. Differential element of arc. 2.2 Intrinsic or Frenet's trihedron. Elements of Frenet's trihedron. Equations. 2.3 Curvature and torsion of a twisted curve. Calculation of curvature and torsion. 2.4 Frenet's formulas.
TOPIC 3.- Differential geometry of surfaces.	3.1 First Fundamental Form. 3.2 Angle of two curves on a surface. 3.3 Normal curvature and Second Fundamental Form. 3.4 Directions and asymptotic lines. 3.5 Principal curvature directions and lines of curvature. 3.6 Remarkable curvatures: principal curvatures, mean curvature and Gaussian curvature. 3.7 Classification of points on a surface by Gaussian curvature. Applications.
TOPIC 4. Multiple integration.	4.1 Concept of multiple integral. Properties. 4.2 Calculation of double integrals. 4.3 Change of variable in double integrals. 4.4 Calculation of triple integrals. 4.5 Change of variable in triple integrals. 4.6 Applications of multiple integrals.

TOPIC 5. Curvilinear and surface integration.	5.1 Fundamental concepts of vectorial analysis. 5.2 Line integrals. Green's theorem. 5.3 Surface integrals. 5.4 Gauss-Ostrogradski's theorem. Stokes' theorem.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Introductory activities	A63 B1 B2 B3 B4	1	0	1
Guest lecture / keynote speech	A11 B6 B9 C1 C3 C6 C7 C8	25	30	55
Workshop	A11 A63 B1 B2 B3 B4 B5 C1 C3 C6	29	60	89
Objective test	A11 B1 B2 B4 B9 C1 C6	4	0	4
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.
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.
Objective test	Theoretical-practical exam of the subject.

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 / Results	Description	**Qualification**
Objective test	A11 B1 B2 B4 B9 C1 C6	The evaluation of the student will be carried out as explained in the observations.	100
Others			

Assessment comments

First opportunity (June): 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/or 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 exams 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 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: Fraud in tests or evaluation activities, once verified, will directly imply failing the subject in which it has been committed, according to current UDC regulations.

Sources of information	
Basic	- Larson, R. E.; Hostetler, R. P.; Edwards, B. H. (2003). Cálculo II. Ed. Pirámide, Madrid - Marsden, J.; Tromba, A (2004). Cálculo Vectorial. Pearson Educación, S.A. Madrid - López de la Rica, A (1997). Geometría Diferencial. Glagsa, Madrid - Lipschutz, Martin M. (1971). Teoría y problemas de geometría. McGraw-Hill, México - Struik, Dirk J. (1970). Geometría diferencial clásica. Aguilar S.A. Ediciones. Madrid
Complementary	- Demidovich (1998). 5000 problemas de Análisis Matemático. Ed. Paraninfo - García López y otros (1996). Cálculo II. Teoría y problemas de funciones de varias variables. Ed. GLAGSA - Bolgov, Demidovich y otros (1983). Problemas de las Matemáticas Superiores. Ed. Mir, Moscú - Martínez Sagarzazu, E. (1996). Ecuaciones Diferenciales y Cálculo Integral. Ser. Ed. de la Univ. del País Vasco - Stoker, J.J. (1989). Differential Geometry. New York, Wiley Classics Edition - Manfredo P. do Carmo (1995). Geometría diferencial de curvas y superficies. Alianza Editorial S.A. Madrid.

Recommendations
Subjects that it is recommended to have taken before
Mathematics for Architecture 1/630G02004
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
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.