Teaching Guide					
Identifying Data					2023/24
Subject (*)	Mathematics I			Code	631G01101
Study programme	Grao en Náutica e Transporte Marítimo				
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				
Coordinador	Cao Rial, María Teresa		E-mail	teresa.cao@udc.es	
Lecturers	Calvo Garrido, María Del Carmen Cao Rial, María Teresa		E-mail	carmen.calvo.garrido@udc.es teresa.cao@udc.es	
Web	www.nauticaymaquinas.es/				
General description	This course is devoted to the study of the basic results and applications of classical subjects in mathematics: Linear Algebra, Euclidean Geometry, Functional Analysis and Complex Variable. The studenst will learn to use these specific mathematical tools, but also they will improve their skills in developing new methods and adquiring new technlolgies, to consult bibliographic references and online resources, to elaborate a memory in a rigourous and sistematic manner, to give lectures to others and collaborate with other colleagues, etc. In general they will develop a sense of scientific and rational thinking, capable to adapt to unexpected situations which may arise in their future practice as an engineer.				

Study programme competences / results	
Code	Study programme competences / results
A54	RA1C-Write, explain and transmit the theoretical knowledge acquired both orally and in writing using scientific-technical language.
A55	RA2C-Identify and relate acquired knowledge to other disciplines
A57	RA4C-Collecting and interpreting relevant data
B30	RA7H-Applying critical, logical and creative thinking
B31	RA9H-Effectively solve practical problems associated with the subject by applying the knowledge acquired.
B32	RA10H-Know, analyse, synthesise and apply the contents, fundamental concepts and applications of the subject.
B33	RA11H-Develop both individual and group work
B34	RA12H-Handle bibliographic material and computer resources.
B35	RA13H-Handle with ease the tools, techniques, equipment and/or material/instrumental of each subject.
B36	RA14H-Use information and communication technology (ICT) tools necessary for the exercise of their profession and for lifelong learning.
C14	RA16X-Produce a report in a rigorous and systematic way.

Learning outcomes			
Learning outcomes	Study programme competences / results		
RA1C-Write, explain and transmit the theoretical knowledge acquired both orally and in writing using scientific-technical language.	A54		
RA2C-Identify and relate acquired knowledge to other disciplines	A55		
RA4C-Collecting and interpreting relevant data	A57		
RA7H-Applying critical, logical and creative thinking		B30	
RA9H-Effectively solve practical problems associated with the subject by applying the knowledge acquired.		B31	
RA10H-Know, analyse, synthesise and apply the contents, fundamental concepts and applications of the subject.		B32	
RA11H-Develop both individual and group work		B33	
RA12H-Handle bibliographic material and computer resources.		B34	

RA13H-Handle with ease the tools, techniques, equipment and/or material/instrumental of each subject.		B35	
RA14H-Use information and communication technology (ICT) tools necessary for the exercise of their profession and for lifelong learning.		B36	
RA16X-Produce a report in a rigorous and systematic way.			C14

Contents	
Topic	**Sub-topic**
Lesson 1.- Matrices and Determinants.	1.1.- Matrices. Operations with matrices. 1.2.- Determinants.
Lesson 2.- Vector spaces.	2.1.- Introduction. 2.2.- Definition, examples and properties. 2.3.- Linear subspace. 2.4.- Linear dependence and linear independence. 2.5.- Generator systems. 2.6.- Bases. Dimension. 2.7.- Equations of a linear subspace. 2.8.- Range of a system of vectors.
Lesson 3.- Linear Mappings	3.1.- Introduction. 3.2.- Linear mappings. 3.3.- Matrix associated to a linear mapping. 3.4.- Change of basis matrix.
Lesson 4.- Systems of Linear Equations.	4.1.- Introduction. 4.2.- Definition, examples. 4.3.- Existence and uniqueness of solution. Rouche-Frobenius theorem. 4.4.- Cramer's rule. 4.5.- Gauss and Gauss-Jordan method.
Lesson 5.- Matrix Diagonalization.	5.1.- Eigenvectors and Eigenvalues. Properties. 5.2.- Characteristic polynomial. Properties. 5.3.- Diagonalizable Matrices. Diagonalization. 5.4.- Diagonalization Of Symmetric Matrices.
Lesson 6.- Affine Space E3. Problems of Incidence and Parallelism.	6.1.- Affine Space Associated to a Vector Space. System of Reference. Coordinates. 6.2.- Equations of Straight Lines. 6.3.- Relative positions of Straight Lines. 6.4.- Equations of a Plane. 6.5.- Relative positions of Planes. Bundles of Planes. 6.6.- Relative positions of Straight Lines and Planes.
Lesson 7.- Euclidean Vector Spaces. Scalar product, Vector product. Mixed Product.	7.1.- Scalar product 7.2.- Determination of a Scalar Product. Gram Matrix. 7.3.- Euclidean Vector Space. Definition. 7.4.- Norm of a Vector. Relevant Equalities and Inequalities. 7.5.- Angle of two Vectors. Orthogonality. 7.6.- Orthonormal Basis. Expression of the Scalar Product in an Orthonormal Basis. 7.7.- Euclidean Space E3. 7.8.- Orientation in E3. 7.9.- Vector product in R3 . Properties. Analytical expression. 7.10.- Mixed product. Analytical expression. Geometrical interpretation.

Lesson 8.- Metric Problems in Euclidean Spaces.	8.1.- Normal equation of a Plane. 8.2.- Angles between Linear Manifolds in R3: Angle of Two Planes, Angle of Two Straight Lines, Angle of Straight Line and Plane. 8.3.- Distance between Linear Manifolds in R3: Distance of a Point to a Plane, Distance of a Point to a Straight Line. Distance between two Planes, Distance between Straight Line and Plane. Distance between two Straight Lines. Common Perpendicular to two Straight Lines. 8.4.- Cylindrical coordinates and Spherical coordinates in R3.
Lesson 9.-Real valued functions of a Real Variable. Continuity.	9.1.- Basic definitions. 9.2.- Functional limits. 9.3.- Continuity. Types of Discontinuity. 9.4.- Properties and Theorems on Continuous Functions.
Lesson 10.- Differentiability and Applications of the Derivatives.	10.1.- Derivative and Differential of a Function in a Point. Geometrical meaning. 10.2.- Properties and Calculation of Derivatives. 10.3.- Derivative function. Successive derivatives. 10.4.- Applications of the Derivatives to the Local Study of a Function: Growth and Decreasing. Maxima and Minima. Concavity and Convexity. Inflection points. 10.5.- Theorems of Rolle and Mean Value Theorem. 10.6.- Rules of L´Hôpital
Lesson 11.- Theorem of Taylor and Applications. Plot of a real function.	11.1.- Expression of a Polynomial by means of his Derivatives in a Point. 11.2.- Polynomial and Theorem of Taylor. Formulae of Taylor and Mac Laurin. 11.3.- Expression of Lagrange for the Residual. Bounds for the residual. 11.4.- Applications to the Local Study of a Function: Monotonicity. Extremal values. Concavity and Convexity. Inflection points. Plot of a real function.
Lesson 12.- Indefinite integration of Functions of a Real Variable	12.1.- General definitions. Table of Primitives. 12.2.- Immediate integration 12.3.- Integration by Parts 12.4.- Integration of Rational Functions 12.5.- Integration by Replacement or Change of Variable
Lesson 13.- Definite Integration. Applications.	13.1.- General definitions 13.2.- Properties 13.3.- Mean Value Theorem. Barrow's Rule. 13.4.- Evaluation of Definite Integrals. 13.5.- Improper Integral. 13.6.- Applications of the Definite Integral
Lesson 14.- Complex Numbers	14.1.- General definitions 14.2.- Fundamental operations 14.3.- Powers and Roots 14.4.- Exponential form of a Complex 14.5.- Logarithms And Complex Powers.

The development and overcoming of these contents, together with those corresponding to other subjects that include the acquisition of specific competencies of the degree, guarantees the knowledge, comprehension and sufficiency of the competencies contained in Table AII / 2, of the STCW Convention, related to the level of management of chief mates of the Merchant Navy, on ships without gross tonnage limitation and Master up to a maximum of 500 GT.	Table A-II / 2 of the STCW Convention. Mandatory minimum requirements for certification of masters and chief mates on chief on ships of 500 gross tonnage or more.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A55 A57 B30 B32	28	28	56
Problem solving	A54 B30 B31 B32 B33 B35 B36	24	36	60
Supervised projects	A54 A57 B30 B31 B32 B34 B35 B36 C14	0	10	10
Seminar	A55 A54 B30 B31 B32 B33 B34 B35	0	10	10
Document analysis	A55 A57 B34 B35 B36	0	3	3
Introductory activities	B1 B3 B4 B7 B12 B14 B15 B22	2	2	4
Objective test	A54 B30 B31 B32	2	0	2
Personalized attention		5	0	5
(*)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	Exposition in the classroom of the fundamental concepts.
Problem solving	In each topic, exercises will be proposed to solve.
Supervised projects	Proposed individual and group projects.
Seminar	Individual and / or very small group tutorships.
Document analysis	Select books and web pages to use
Introductory activities	Introdución á materia
Objective test	Knowledge assessment.

Personalized attention	
Methodologies	Description
Problem solving Supervised projects	The students are encouraged to attend in small groups or individually to the professors' office, or by TEAMS, to solve questions that may arise, thus obtaining a more specific guidance, acoording to their specific difficulties. Due to the health situation caused by COVID-19, meetings with students will preferably be held online (MS Teams).

Assessment

Methodologies	Competencies / Results	Description	Qualification
Problem solving	A54 B30 B31 B32 B33 B35 B36	Resolver problemas.	15
Guest lecture / keynote speech	A55 A57 B30 B32	Resolución de cuestións teóricas ou prácticas breves relacionadas cos contidos da sesión maxistral	10
Objective test	A54 B30 B31 B32	Proba para amosar os coñecementos teóricos e prácticos adquiridos.	60
Supervised projects	A54 A57 B30 B31 B32 B34 B35 B36 C14	Traballos propostos.	15

Assessment comments
The students participating in the EHEA should take a minimum of 75% of the continuous assessment (c.a.) tests done in the classroom. These c.a. test might be posed either on keynote lectures or problem solving sessions, and they represent the 40% of the final score. The other 60% of the score will be obtained from the partial tests that will take place throughout the term. The students who have followed the continuous assessment but have not reached the 50% of the score through the partial tests will have a chance to reach it through a final test. This final test will include all topics of the term (the partial tests do not exclude topics) The students who decide to not take part in the EHEA will be evaluated with an objective test that includes an individual test of assimilation of practical-theoretical knowledge and problem solving. Those students with recognition of part-time dedication and academic exemption of attendance, as established by the norm that regulates the regime of dedication to the study of undergraduate students in the UDC (Arts 2.3, 3.b, 4.3 e 7.5) (04/05/2017), and want to stay on the path of the EHEA and benefit from continuous assessment, must INDICATE SUCH CONDITION AT THE BEGINNING OF THE COURSE and attend at least 50% of the interactive lectures. In case of not being able to attend the sessions where c.a. tests where taken, they should attend tutorials at the proffesor office or by TEAMS, where they will perform equivalent tests. Both opportunities: Fraud in tests or evaluation activities, once verified, will directly imply failing the subject in which it has been committed: the student will be receive a final mark equal to 0, whether the commission of the fraud happens 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	- D.G. Zill, W.S. Wright, J. Ibarra (). Matemáticas 1. Cálculo Diferencial. McGraw Hill - D.G. Zill, W.S. Wright, J. Ibarra (). Matemáticas 2. Cálculo Integral. McGraw Hill - S. Grossman, J. Ibarra (). Matemáticas 4. Álgebra Lineal. McGraw Hill - Á.M. Ramos del Olmo, J.M. Rey Cabezas (2017). Matemáticas básicas para el acceso a la universidad. Pirámide - R.E. Larson, R.P. Hostetler, B.H. Edwards (1999). Cálculo. McGraw Hill
Complementary	- García , A.y otros. (). CÁLCULO I (Teoría y Problemas). Librería I.C.A.I - Villa, A. de la (). PROBLEMAS DE ALGEBRA LINEAL. GLAGSA - Granero, F (). CÁLCULO. Mac Graw-Hill - Granero, F (). EJERCICIOS Y PROBLEMAS DE CÁLCULO (I y II). Tébar Flores

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Phisics/631G01103 Physics I/631G02153
Subjects that continue the syllabus
Mathematics II/631G01106
Other comments
Attend the optional introductory course which is given the first week.

(*)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.