UNIVERSIDADE DA CORUÑA

Teaching Guide					
Identifying Data					2024/25
Subject (*)	Mathematics II			Code	631G01106
Study programme	Grao en Náutica e Transporte Marítimo				
Descriptors					
Cycle	Period	Year		Type	Credits
Graduate	2nd four-month period	First		Basic training	6
Language	SpanishGalician				
Teaching method	Face-to-face				
Prerequisites					
Department	Matemáticas				
Coordinador	Arós Rodríguez, Angel Daniel		E-mail	angel.aros@udc.es	
Lecturers	Arós Rodríguez, Angel Daniel Cao Rial, María Teresa		E-mail	angel.aros@udc.es teresa.cao@udc.es	
Web	www.nauticaymaquinas.es/				
General description	This course is devoted to the study o basic concepts of Planar and Spherical Trigonometry, two-dimensional and three-dimensional loci (in particular conic sections and quatric surfaces), Differential and Integral Calculus in several variables and Statistics. 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.- Circular Functions. Formulas	1.1. Basic definitions and relationships 1.2. Graphical representations 1.3. Usual formulas 1.4. Inverse functions 1.5. Trigonometric equations
Lesson 2.- Planar Trigonometry. Solving Triangles. Applications.	2.1 Definitions 2.2. Laws of sines and cosines. other formulas 2.3. Solving Oblique Triangles 2.4. Complements and applications
Lesson 3.- Spherical triangles. General Properties.	3.1. Dihedral angles. The supplementary rectilinear 3.2. Trihedron. Polar trihedron 3.3. Spherical surface. Definitions 3.4. Spherical Triangle. Associated trihedron 3.5. Polar Spherical triangle. Properties 3.6. Accessories
Lesson 4.-Groups of Bessel?s formulas. Delambre and Neper analogies.	4.1. Bessel?s formulas 4.2. Briggs' formulas 4.3. Delambre-Gauss' analogies 4.4. Neper?s analogies
Tema 5.- Resolución de Triángulos Esféricos Oblicuángulos.	5.1. Análise de Casos 5.2. Complementos
Lesson 6.- Solving Oblique Spherical Triangles.	6.1. Definitions 6.2. General case: navigating a maximum circumference 6.3. Navegating a parallel 6.4. Navegating a plane 6.5. Estima (estimate position)
Lesson 5.- Solving Right-angled Spherical Triangles.	5.1. Definitions 5.2. Particular formulas. Napier?s nifty Rules 5.3. Particular propierties of the right triangles. 5.4. Solving right triangles. 5.5. Decomposition into right triangles. Perpendicular method.
Lesson 7.- Loci in the Plane. Conic sections.	7.1. Locus in the plane 7.2. Conic sections 7.2.1. Circle 7.2.2. Elipse 7.2.3. Hyperbola 7.2.4. Parabola

Lesson 9.-Loci in the space. Quadric surfaces.	9.1. Loci in the space 9.1.1. Quadric surfaces of revolution 9.1.3. Ruled surfaces 9.2. Particular estudy of Quadric surfaces 9.2.1. Sphere 9.2.2. Ellipsoid 9.2.3. Hyperboloids 9.2.4. Paraboloids 9.2.5. Degenerate quadric surfaces 9.3. General equation of Quadric surfaces 9.3.1. General equation 9.3.2. Invariantes métricos 9.3.3. Clasification 9.4.4. Reduction to Canonical form
Lesson 10.- Functions of several real variables. Limits and Continuity.	10.1.- General definitions 10.2.- Limits 10.3.- Continuity
Lesson 11. Partial and Directional Derivatives. Taylor?s formula. Extrema.	11.1.- Partial derivatives. Tangent plane 11.2.- Directional Derivatives. 11.3.- Higher order Derivatives 11.4.- Taylor?s polinomyal and theorem 11.5.- Relative extrema and conditioned extrema.
Lesson 12.- Integrals in two and three variables. Calculus and applications	12.1.- General definitions 12.2.- Properties 12.3.- Iterated Integrals. Fubini?s Theorem. 12.4.- Change of Variables 12.5.- Applications
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	30	30	60
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	A54 A55 B30 B31 B32 B33 B34 B35 B36	0	10	10
Document analysis	A55 A57 B34 B35 B36	0	3	3

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
Objective test	Knowledge assessment.

Personalized attention	
Methodologies	**Description**
Supervised projects Seminar	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. The attention to students will preferably be held through computer hardware and the Internet (email and meetings by MS Teams).

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Objective test	A54 B30 B31 B32	Proba individual de asimilación de coñecementos.	60
Guest lecture / keynote speech	A55 A57 B30 B32	Resolución de cuestións teóricas ou prácticas breves relacionadas cos contidos da sesión maxistral	10
Supervised projects	A54 A57 B30 B31 B32 B34 B35 B36 C14	Realización dos traballos propostos.	15
Problem solving	A54 B30 B31 B32 B33 B35 B36	Capacidade para resolver problemas.	15
Others			

Assessment comments
The students participants in the EHEA should attend a minimum of 80% of the lessons, being the continuous assessment of 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). A student who does not do at least one of hte partial exams or a final exam will be qualified as Not Presented. 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. All aspects related to "academic exemption", "dedication to study", "permanence" and "academic fraud" will be governed in accordance with the current academic regulations of the UDC. In any case, students with an academic dispensation are asked to indicate this to the teaching staff at the beginning of the semester.

Sources of information

Basic	- A. R. Arós, F. Blanco, M.J. Muiños (2012). TRIGONOMETRÍA PLANA Y ESFÉRICA CON APLICACIONES A LA NAVEGACIÓN. Paraninfo - M.T. Cao Rial, Á. D. Rodríguez Arós (2020). Problemas de Trrigonometría Esférica. Aplicaciones a la navegación. Universidade da Coruña - Larson-Hostetler-Edwards (). CÁLCULO (2) . Mac Graw Hill - D.G. Zill, W.S. Wright (). Cálculo de Varias Variables. McGraw Hill - Elizabeth Vargas, Luis A. Núñez (2020). Geometría III: geometría analítica plana y del espacio. UAPA
Complementary	- Vila Mitjá, A. (). ELEMENTOS DE TRIGONOMETRÍA ESFÉRICA. U.P.C. - Gutiérrez Gómez-García Castro (). GEOMETRÍA. Pirámide - Villa, A. de la (). PROBLEMAS DE ÁLGEBRA LINEAL. Glagsa - Swokowski-Kole (). TRIGONOMETRÍA. Thomson - Ayres, F. (). TRIGONOMETRÍA PLANA Y ESFÉRICA. Mac Graw Hill - James Stewart (). CALCULO MULTIVARIABLE. Thomson Editores

Recommendations
Subjects that it is recommended to have taken before
Mathematics I/631G01101
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Navigation I/631G01202 Ship Manoeuvering I/631G01207 Ship's Theory I/631G01208
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.