Teaching Guide					
Identifying Data					2021/22
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	Rodriguez Aros, Angel Daniel		E-mail	angel.aros@udc.es	
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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.				

Contingency plan	In this section, we collect the adaptations that will be carried out in teaching and evaluation, were we faced with a scenario of non-presence due to a new clash of the pandemic. 1. Modifications to the contents No changes will be made. 2. Methodologies *Teaching methodologies that are maintained Collaborative learning, Seminaries, Supervised projects, Document analysis. *Teaching methodologies that are modified Guest lecture/ keynote speech. they will be replaced by virtual videos and videoconferences with students through the Teams platform. They will be recorded in Stream. They will always be held at the official time set by the calendar's classroom. ? Solving problems. They will become virtual sessions about doubts in solving problems. They will always be held at the official time set by the School Board. ? Objective test. If it cannot be done in person, the objective test will be carried out with the online assessment tools that the University makes available to the community. 3. Mechanisms for personalized attention to students - E-mail: During working hours. To make brief questions and request virtual meetings to solve doubts during supervising hours. - Moodle: Daily. According to the needs of the students. They have ?thematic forums associated with the modules ?of the subject, to formulate the necessary queries. - Teams: Weekly single group sessions and interactive teaching groups for the advancement of theoretical and practical content in the time slot assigned to the subject in the faculty classroom calendar. This dynamic allows a standardized follow-up and adjusted to the learning needs of the students to develop the works of the subject. 4. Modifications in the evaluation Two possible itineraries are established: 1) Students who have carried out continuous assessment during the course: a) Methodology: supervised project and problem solving Qualification weight: 50% Description: Students who take the continuous assessment tests during the course (face-to-face and / or virtual) will be qualified with the weighted average mark they obtained b)Methodology: objective test Qualification weight: 50% Description: Individual test of assimilation of theoretical-practical knowledge and problem solving, with the possibility of oral defense of any of the proposed problems. 2) Students who did not carry out continuous assessment during the course or renounce to it. 2a) Methodology: objective test Qualification weight: 50% Description: Individual test of assimilation of theoretical-practical knowledge. 2b) Methodology: Solving exercises.

Qualification weight: 50%
Description: Resolution of practical problems.

*Evaluation observations: IF any online material was requested, oral defense might be necessary to prove authorship.

5. Modifications to the bibliography or webgraphy No changes will be made. They already have all the materials for the subject Digitized in Moodle as well as various links to electronic books available through the UDC Library to facilitate access to the bibliography for students.

Study programme competences	
Code	Study programme competences
A2	Interpretar e representar correctamente o espazo tridimensional, coñecendo os obxectivos e o emprego de representación gráfica.
A8	Modelizar situacións e resolver problemas con técnicas ou ferramentas físico-matemáticas.
A9	Avaliación cualitativa e cuantitativa de datos e resultados, así como representación e interpretación matemática de resultados obtidos experimentalmente.
B1	Aprender a aprender.
B2	Resolver problemas de xeito efectivo.
B3	Aplicar un pensamento crítico, lóxico e creativo.
B4	Comunicarse de xeito efectivo nun ámbito de traballo.
B5	Traballar de forma autónoma con iniciativa.
B6	Traballar de forma colaboradora.
B7	Comportarse con ética e responsabilidade social como cidadán e como profesional.
B9	Capacidade para interpretar, seleccionar e valorar conceptos adquiridos noutras disciplinas do ámbito marítimo, mediante fundamentos físico-matemáticos.
B10	Versatilidade.
B11	Capacidade de adaptación a novas situacións.
B12	Uso das novas tecnoloxías TIC, e de Internet como medio de comunicación e como fonte de información.
B13	Comunicar por escrito e oralmente os coñecementos procedentes da linguaxe científica.
B14	Capacidade de análise e síntese.
B15	Capacidade para adquirir e aplicar coñecementos.
B16	Organizar, planificar e resolver problemas.
B17	Expresarse correctamente, tanto de forma oral coma escrita, nas linguas oficiais da comunidade autónoma
B19	Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.
B22	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
B23	Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.
B24	Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.
C9	Posuír e comprender coñecementos que aporten unha base ou oportunidade de ser originais no desenvolvemento e/ou aplicación de ideas, a miúdo nun contexto de investigación
C10	Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornas novas ou pouco coñecidas dentro de contextos máis amplas (ou multidisciplinares) relacionados coa súa área de estudo

Learning outcomes			
Learning outcomes	Study programme competences		
Do listado de competencias da titulación	A2 A8 A9	B11 B17 B19 B22 B23 B24	

Do listado de competencias da titulación		B1 B2 B3 B4 B5 B6 B7 B9 B10 B12 B13 B14 B15 B16	
Do listado de competencias da titulación			C9 C10

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. Circular 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.- Double integrals. 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
Lesson 13.- Triple Integrals. Calculus and applications.	13.1.- General definitions 13.2.- Properties 13.3.- Iterated Integrals. Fubini?s Theorem 13.4.- Change of Variables 13.5.- Applications
Lesson 14.- First order Differential Equations.	14.1.- General definitions 14.2.- First order Differential Equations. 14.3.- Special cases of first order ODEs
Lesson 15.- High order Differential Equations.	15.1.- Homogeneous and Nonhomogeneous Second Order EDO?s 15.2.- Higher order linear equations with constant coefficients 15.3.- Higher order Nonhomogeneous equations

Lesson 16.- Systems of Differential Equations.	16.1.- Systems of Ordinary Differential Equations. 16.2.- Systems of Linear Differential Equations with constant coefficients.
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	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A8 A2 B1 B2 B3 B4 B15 B22 C10	28	28	56
Collaborative learning	A9 B1 B3 B4 B6 B7 B23 B24 C9 C10	16	32	48
Problem solving	A2 A8 A9 B5 B6 B10 B11 B12 B13 B15 B16 B17 B19 C10	8	12	20
Supervised projects	A2 A8 A9 B24 B23 B22 B19 B17 B16 B15 B14 B13 B12 B9 B6 B5 B4 B3 B2 B1 C10	0	10	10
Seminar	A2 A8 A9 B5 B6 B10 B11 B12 B13 B15 B16 B17 B19 C10	0	10	10
Document analysis	B19 B17 B16 B15 B14 B12 B11 B10 B7 B6 B5 B4 B2 B1	0	3	3
Objective test	A2 A8 A9 B2 B4 B5 B11 B12 B13 B14 B16 B17 B19 B22 C10	2	0	2
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
Guest lecture / keynote speech	Exposition in the classroom of the fundamental concepts.
Collaborative learning	Group work with presentation of the results when appropriate.
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. Due to the health situation caused by COVID-19, and following the recommendations of the Center, the attention to students will preferably be held through computer hardware and the Internet (email and meetings by MS Teams), in order to avoid face-to-face interaction in office.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Objective test	A2 A8 A9 B2 B4 B5 B11 B12 B13 B14 B16 B17 B19 B22 C10	Proba individual de asimilación de coñecementos.	60
Supervised projects	A2 A8 A9 B24 B23 B22 B19 B17 B16 B15 B14 B13 B12 B9 B6 B5 B4 B3 B2 B1 C10	Realización dos traballos propostos.	15
Problem solving	A2 A8 A9 B5 B6 B10 B11 B12 B13 B15 B16 B17 B19 C10	Capacidade para resolver problemas.	20
Collaborative learning	A9 B1 B3 B4 B6 B7 B23 B24 C9 C10	Participación en traballos grupais.	5
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) 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 these sessions, they should attend tutorials at the proffesor office or by TEAMS, where they will perform equivalent tests.

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 - García García-López Pellicer (). ÁLGEBRA LINEAL Y GEOMETRÍA. Marfil - Granero, F. (). ÁLGEBRA Y GEOMETRÍA ANALÍTICA. Mac Graw Hill - Fernández Viña, J.A. (). ANÁLISIS MATEMÁTICO II . Tecnos - Larson-Hostetler-Edwards (). CÁLCULO (2) . Mac Graw Hill - James Stewart (). CALCULO MULTIVARIABLE . Thomson Editores - 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 - D.G. Zill, W.S. Wright (). Cálculo de Varias Variables. McGraw Hill
Complementary	

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
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.