



Teaching Guide

Teaching Guide				
Identifying Data				2022/23
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 acquiring 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

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 orixinais 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		
Escribir y transmitir conocimientos correctamente.		B4 B13 B14 B17	
Realizar eficazmente las tareas asignadas como parte del grupo.		B3 B4 B6 B10 B16	
Ser capaz de resolver y analizar los resultados de los problemas matemáticos que puedan plantearse en la ingeniería.	A2 A8 A9	B2 B5 B9 B15	C9
Usar modelos matemáticos e identificar el caso en que deben aplicarse.	A8	B11 B22 B24	C10
Conocer los conceptos fundamentales de Trigonometría Plana y Esférica, Lugares Geométricos en el Plano y el Espacio. Cónicas y Cuádricas, Derivación e Integración de funciones de varias variables y Estadística.	A2 A8 A9	B1 B2 B3 B9 B13 B14 B15 B16 B17	
Mejorar habilidades en el aprendizaje y desarrollo de nuevos métodos y tecnologías necesarias para continuar su formación.		B7 B12 B19 B23	
Trabajar con material bibliográfico y recursos informáticos.		B12 B15 B19 B22 B24	
Elaborar una memoria/informe de modo riguroso y sistemático.		B14 B15 B16 B17	



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 properties 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	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A2 A8 B1 B2 B3 B4 B15 B22 C9 C10	30	30	60
Problem solving	A2 A8 A9 B5 B6 B10 B11 B12 B13 B15 B16 B17 B19 C10	24	36	60
Supervised projects	A2 A8 A9 B1 B2 B3 B4 B5 B6 B9 B12 B13 B14 B15 B16 B17 B19 B22 B23 B24 C10	0	10	10



Seminar	A2 A8 A9 B5 B6 B10 B11 B12 B13 B15 B16 B17 B19 C10	0	10	10
Document analysis	B1 B2 B4 B5 B6 B7 B10 B11 B12 B14 B15 B16 B17 B19	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		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, according 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).

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
Guest lecture / keynote speech	A2 A8 B1 B2 B3 B4 B15 B22 C9 C10	Resolución de cuestións teóricas ou prácticas breves relacionadas cos contidos da sesión maxistral	10
Supervised projects	A2 A8 A9 B1 B2 B3 B4 B5 B6 B9 B12 B13 B14 B15 B16 B17 B19 B22 B23 B24 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.	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 the 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.

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 professor office or by TEAMS, where they will perform equivalent tests.

Fraudulent conduct in tests or activities, once verified, will cause a final mark of 0, invalidating any mark obtained in the previous activities, as established in the current academic regulations at UDC.

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 Trigonometría 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 Manoeuvring 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.