



Teaching Guide

Teaching Guide				
Identifying Data				2019/20
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	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Matemáticas			
Coordinador	Rodríguez Aros, Angel Daniel	E-mail	angel.aros@udc.es	
Lecturers	Cao Rial, María Teresa	E-mail	teresa.cao@udc.es	
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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	
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 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 study 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 polynomial 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
Objective test	A2 A8 A9 B2 B4 B5 B11 B12 B13 B14 B16 B17 B19 B22 C1 C3 C10	4	0	4
Guest lecture / keynote speech	A2 A8 B1 B2 B3 B4 B15 B22 C10	27	27	54
Supervised projects	A2 A8 A9 B1 B2 B3 B4 B5 B6 B8 B9 B12 B13 B14 B15 B16 B17 B19 B22 B23 B24 C1 C3 C6 C7 C10	4	20	24



Problem solving	A2 A8 A9 B5 B6 B10 B11 B12 B13 B15 B16 B17 B19 C1 C3 C10	9	27	36
Collaborative learning	A9 B1 B3 B4 B6 B7 B23 B24 C9 C10	6	6	12
Document analysis	B1 B2 B4 B5 B6 B7 B8 B10 B11 B12 B14 B15 B16 B17 B19 C3 C8	0	2	2
Online discussion	A8 A9 B2 B3 B4 B6 B8 B9 B10 B12 B13 B14 B15 B19 B22 B24 C3 C6 C8 C10	0	6	6
Directed discussion	A2 A8 A9 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B12 B14 B15 B19 B22 B24 C1 C3 C6 C7 C8 C9 C10	2	0	2
Diagramming	A8 A9 B1 B2 B4 B5 B8 B9 B11 B12 B13 B14 B16 C1 C3	2	4	6
Personalized attention		4	0	4
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Objective test	Resolver de forma individual un test de coñecementos teóricos e prácticos.
Guest lecture / keynote speech	Exposición dos temas.
Supervised projects	Seguimento e corrección de traballos propostos.
Problem solving	Resolución de exercicios tipo e proposta de outros a resolver por os estudantes.
Collaborative learning	Resolver cuestións propostas en grupo e plantexar dudas.
Document analysis	Seleccionar libros e páxinas web a utilizar
Online discussion	Plantexar e resolver dudas en Moodle
Directed discussion	Discusión na aula do plantexado previamente en Moodle.
Diagramming	Rematar cada tema con un esquema dos conceptos básicos aprendidos.

Personalized attention	
Methodologies	Description
Guest lecture / keynote speech Supervised projects Problem solving Collaborative learning	The students are encouraged to attend in small groups or individually to the professors' office to solve questions that may arise, thus obtaining a more specific guidance, according to their specific difficulties.

Assessment			
Methodologies	Competencies	Description	Qualification



Objective test	A2 A8 A9 B2 B4 B5 B11 B12 B13 B14 B16 B17 B19 B22 C1 C3 C10	Proba individual de asimilación de coñecementos.	70
Supervised projects	A2 A8 A9 B1 B2 B3 B4 B5 B6 B8 B9 B12 B13 B14 B15 B16 B17 B19 B22 B23 B24 C1 C3 C6 C7 C10	Realización dos traballos propostos.	10
Problem solving	A2 A8 A9 B5 B6 B10 B11 B12 B13 B15 B16 B17 B19 C1 C3 C10	Capacidade para resolver problemas.	10
Collaborative learning	A9 B1 B3 B4 B6 B7 B23 B24 C9 C10	Participación en traballos grupais.	5
Directed discussion	A2 A8 A9 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B12 B14 B15 B19 B22 B24 C1 C3 C6 C7 C8 C9 C10	Participación nos debates na aula.	5
Others			

Assessment comments

The course is divided into two parts: Part 1 (lessons 1-9) and part 2 (lessons 10-16). To pass it, it will be necessary to reach in each part a minimum of 3,5 points and afterwards obtain an average of, at least, 5 points following the formula $(2 \times \text{part 1} + \text{part 2})/3$.

In the unlikely case of reaching an arithmetic average of 5 but not having, at least, 3,5 points in each one of the parts, the result of the evaluation will be of fail and the final qualification will be calculated with a suitable geometric average.

The students that do not participate in the EHEA will be evaluated through a written test that will constitute 100% of the evaluation. For those who participate in the EHEA, the written tests will constitute 70% of the final marks. In order to add the qualification of the continuous assessment to the qualification of the written test, the latter must be at least 2,4 points (approximately 35% of 7) for each part, otherwise the final mark will only account for the written test.

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 benefit from continuous assessment, must attend at least 50% of the course, exempting them from attending the theoretical classes, if they can not attend them. In case of not being able to attend the practical tests, they should attend tutorials at the professor's office, where they will perform equivalent tests.

Sources of information



Basic	- 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 - A. R. Arós, F. Blanco, M.J. Muiños (). TRIGONOMETRÍA PLANA Y ESFÉRICA CON APLICACIONES A LA NAVEGACIÓN. Paraninfo - 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 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.