# UNIVERSIDADE DA CORUÑA

| Teaching Guide | | | | |
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| **Identifying Data** | | | | 2023/24 |
| 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 | E-mail | angel.aros@udc.es | |
| | Cao Rial, María Teresa | | 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 | |
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| Code | Study programme competences |
| 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 | | |
| 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 | |
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| 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 | |
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| **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 |

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| 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.<br><br>Mandatory minimum requirements for certification of masters and chief mates on chief on ships of 500 gross tonnage or more. |

| Planning | | | | |
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| Methodologies / tests | Competencies | Ordinary class hours | Student?s personal work hours | Total hours |
| Guest lecture / keynote speech | A55 A57 B30 B32 | 30 | 30 | 60 |
| Problem solving | A54 B36 B35 B33 B32 B31 B30 | 24 | 36 | 60 |
| Supervised projects | A57 A54 B36 B35 B34 B32 B31 B30 C14 | 0 | 10 | 10 |
| Seminar | A54 A55 B36 B35 B34 B33 B32 B31 B30 | 0 | 10 | 10 |
| Document analysis | A55 A57 B34 B35 B36 | 0 | 3 | 3 |

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| Objective test | A54 B30 B31 B32 | 2 | 0 | 2 |
| Personalized attention | | 5 | 0 | 5 |

| Methodologies | |
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| **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 | |
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| **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. <br><br> 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 | | | |
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| **Methodologies** | **Competencies** | **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 | A57 A54 B36 B35 B34 B32 B31 B30 C14 | Realización dos traballos propostos. | 15 |
| Problem solving | A54 B36 B35 B33 B32 B31 B30 | Capacidade para resolver problemas. | 15 |
| Others | | | |

| Assessment comments |
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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.

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.

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 | - A. R. Arós, F. Blanco, M.J. Muiños (2012). TRIGONOMETRÍA PLANA Y ESFÉRICA CON APLICACIONES A LA NAVEGACIÓN. Paraninfo<br>- M.T. Cao Rial, Á. D. Rodríguez Arós (2020). Problemas de Trrigonometría Esférica. Aplicaciones a la navegación. Universidade da Coruña<br>- Larson-Hostetler-Edwards (). CÁLCULO (2) . Mac Graw Hill<br>- D.G. Zill, W.S. Wright (). Cálculo de Varias Variables. McGraw Hill<br>- 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.<br>- Gutiérrez Gómez-García Castro (). GEOMETRÍA. Pirámide<br>- Villa, A. de la (). PROBLEMAS DE ÁLGEBRA LINEAL. Glagsa<br>- Swokowski-Kole (). TRIGONOMETRÍA. Thomson<br>- Ayres, F. (). TRIGONOMETRÍA PLANA Y ESFÉRICA. Mac Graw Hill<br>- James Stewart (). CALCULO MULTIVARIABLE. Thomson Editores |

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