



Teaching Guide				
Identifying Data				2022/23
Subject (*)	Mathematics III	Code	631G02260	
Study programme	Grao en Tecnoloxías Mariñas			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Second	Basic training	6
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Matemáticas			
Coordinador	Cao Rial, María Teresa	E-mail	teresa.cao@udc.es	
Lecturers	Cao Rial, María Teresa	E-mail	teresa.cao@udc.es	
Web				
General description	This course is devoted to the study of basic concepts of Numerical Analysis and Statistics Methods. Even though theoretical results are given, the course is mainly of a practical nature. The students will implement the numerical methods in a computer (by using Octave). This way the students will become confident in the use of tools which are of paramount importance for the current academic life and their future professional life.			

Study programme competences / results	
Code	Study programme competences / results
A12	CE12 - Interpretar e representar correctamente o espazo tridimensional, coñecendo os obxectivos e o emprego dos sistemas de representación gráfica.
A14	CE14 - Avaliación cualitativa e cuantitativa de datos e resultados, así como a representación e interpretación matemáticas de resultados obtidos experimentalmente.
A17	CE17 - Modelizar situacións e resolver problemas con técnicas ou ferramentas físico-matemáticas.
A18	CE18 - Redacción e interpretación de documentación técnica.
B1	CT1 - Capacidad para gestionar los propios conocimientos y utilizar de forma eficiente técnicas de trabajo intelectual
B2	CT2 - Resolver problemas de forma efectiva.
B3	CT3 - Comunicarse de xeito efectivo nun ámbito de traballo.
B4	CT4 - Traballar de forma autónoma con iniciativa.
B5	CT5 - Traballar de forma colaboradora.
B6	CT6 - Comportarse con ética e responsabilidade social como cidadán e como profesional.
B7	CT7 - Capacidade para interpretar, seleccionar e valorar conceptos adquiridos noutras disciplinas do ámbito marítimo, mediante fundamentos físico-matemáticos.
B8	CT8 - Versatilidade.
B9	CT9 - Capacidade para a aprendizaxe de novos métodos e teorías, que lle doten dunha gran versatilidade para adaptarse a novas situacións.
B10	CT10 - Comunicar por escrito e oralmente os coñecementos procedentes da linguaxe científica.
B11	CT11 - Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e de comunicar e transmitir coñecementos habilidades e destrezas.
C1	C1 - Expresarse correctamente, tanto de forma oral coma escrita, nas linguas oficiais da comunidade autónoma.
C2	C2 - Dominar a expresión e a comprensión de forma oral e escrita dun idioma estranxeiro.
C3	C3 - 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.
C4	C4 - Desenvolverse para o exercicio dunha cidadanía aberta, culta, crítica, comprometida, democrática e solidaria, capaz de analizar a realidade, diagnosticar problemas, formular e implantar solucións baseadas no coñecemento e orientadas ao ben común.
C5	C5 - Entender a importancia da cultura emprendedora e coñecer os medios ao alcance das persoas emprendedoras.
C6	C6 - Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
C7	C7 - Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.



C8	C8 - Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.
C9	CB1 - Demostrar que posúen e comprenden coñecementos na área de estudo que parte da base da educación secundaria xeneral, e que inclúe coñecementos procedentes da vangardia do seu campo de estudo
C10	CB2 - Aplicar os coñecementos no seu traballo ou vocación dunha forma profesional e poseer competencias demostrables por medio da elaboración e defensa de argumentos e resolución de problemas dentro da área dos seus estudos
C11	CB3 - Ter a capacidade de reunir e interpretar datos relevantes para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética
C12	CB4 - Poder transmitir información, ideas, problemas e solucións a un público tanto especializado como non especializado.
C13	CB5 - Ter desenvolvido aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores con un alto grao de autonomía.

Learning outcomes			
Learning outcomes	Study programme competences / results		
		A12 A14 A17 A18	
		B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11	
			C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13

Contents	
Topic	Sub-topic



Lesson 1.- Introduction to MATLAB and Octave	1.1.- Types of data. Basic operations. 1.2.- Vectors and matrices 1.3.- Functions 1.4.- Logical operators
Lesson 2.- Number, Algorithm and Errors	2.1.- Introduction 2.2.- Numbers: Representation and Storage 2.3.- Algorithms 2.4.- Errors: Classification and Propagation
Lesson 3.- Numerical Solution of Systems of Linear Equations	3.1.- General considerations 3.2.- Direct methods 3.2.1.- Systems with Immediate Solution 3.2.1.1.- Diagonal matrix 3.2.1.2.- Upper Triangular matrix 3.2.1.2.- Inferior Triangular matrix 3.2.2.- Methods of Elimination or Transformation 3.2.2.1.- Method of Gauss 3.2.2.1.- Method of Gauss-Jordan 3.2.3.- Methods of Decomposition: Factorisation LU 3.2.3.1.- Method of Doolittle 3.2.3.2.- Method of Crout 3.2.3.3.- Method of Cholesky 3.3.- Iterative methods 3.3.1.- Method of Jacobi 3.3.2.- Method of Gauss-Seidel
Lesson 4.- Numerical Interpolation	4.1.- Introduction 4.2.- Lagrange Interpolating Polynomial 4.3.- Hermite Interpolating Polynomial 4.4.- Divided Differences. Newton Formula
Lesson 5.- Numerical solution of nonlinear equations	5.1.- Introduction 5.2.- Method of the Bisection 5.3.- Method of Newton-Raphson 5.4.- Method of the Secante. It regulates Falsi. 5.5.- Method of the Fixed Point
Lesson 6.- Numerical Differentiation and Numerical Integration	6.1.- Finite differences. Derivación Numerical. 6.2.- Numerical integration. General concepts. 6.3.- Rectangular approximations 6.4.- Method of the Trapezes 6.5.- Rule of Simpson 6.6.- Formulas of Quadrature
Lesson 7.- Numerical Solution of Ordinary Differential Equations	7.1.- Introduction: General Definitions 7.2.- Methods of Taylor 7.3.- Method of Euler 7.4.- Method of Heun 7.5.- Methods of Runge-Kutta



Lesson 8.- Statistics Methods	<p>8.1 Descriptive Statistics</p> <p>8.1.1 Generalities</p> <p>8.1.2 Treatment of the information and graphic representations</p> <p>8.1.3 Measures of centralisation. Measures of dispersion</p> <p>8.1.4 Binomial and Normal Distributions</p> <p>8.2 Curve Adjustment</p> <p>8.2.1 Linear Regression.</p> <p>8.2.2 Least Squares Method</p> <p>8.2.3 Measures of Accuracy</p> <p>8.2.4 Nonlinear Measures of Accuracy</p>
<p>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 AIII / 2, of the STCW Convention, related to the level of management of First Engineer Officer of the Merchant Navy, on ships without power limitation of the main propulsion machinery and Chief Engineer officer of the Merchant Navy up to a maximum of 3000 kW.</p>	<p>Table A-III / 2 of the STCW Convention.</p> <p>Specification of the minimum standard of competence for Chief Engineer Officers and First Engineer Officers on ships powered by main propulsion machinery of 3000 kW or more.</p>

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Collaborative learning	A12 A14 A17 A18 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13	2	15	17
ICT practicals	A12 A14 A17 A18 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13	14	25	39
Problem solving	A12 A14 A17 A18 B1 B2 B3 B4 B5 B7 B8 B9 B10 B11 C1 C2 C3 C6 C7 C8 C10 C11 C12 C13	14	25	39
Guest lecture / keynote speech	A12 A14 A17 A18 B1 B3 B4 B6 B7 B9 B10 B11 C1 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13	20	10	30



Objective test	A12 A14 A17 A18 B1 B2 B4 B6 B7 B10 B11 C1 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13	4	0	4
Online discussion	A12 A14 A17 A18 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 C1 C3 C4 C5 C6 C7 C8 C10 C11 C12	0	10	10
Document analysis	A12 A14 A17 A18 B1 B4 B5 B7 B9 C1 C2 C3 C4 C5 C6 C7 C8 C11	0	5	5
Personalized attention		6	0	6

(\*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
Methodologies	Description
Collaborative learning	Traballo en grupo
ICT practicals	Prácticas na Aula de Informática cos programas Matlab e Calc
Problem solving	Resolver problemas propostos
Guest lecture / keynote speech	Exposición inicial de cada tema
Objective test	Proba individual de coñecementos adquiridos
Online discussion	Participación nos foros abertos en Moodle
Document analysis	Valoración da información obtida en libros e internet

Personalized attention	
Methodologies	Description
Problem solving ICT practicals	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.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Problem solving	A12 A14 A17 A18 B1 B2 B3 B4 B5 B7 B8 B9 B10 B11 C1 C2 C3 C6 C7 C8 C10 C11 C12 C13	Plantexar os problemas que logo se resolverán coas TIC.	10
Guest lecture / keynote speech	A12 A14 A17 A18 B1 B3 B4 B6 B7 B9 B10 B11 C1 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13	Asistencia e participación nas clases teóricas.	5



Collaborative learning	A12 A14 A17 A18 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13	Realización de traballos grupais	9
ICT practicals	A12 A14 A17 A18 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13	Realización das prácticas propostas na aula de Informática.	45
Objective test	A12 A14 A17 A18 B1 B2 B4 B6 B7 B10 B11 C1 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13	Resposta sobre os coñecementos adquiridos.	30
Online discussion	A12 A14 A17 A18 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 C1 C3 C4 C5 C6 C7 C8 C10 C11 C12	Participación nos debates abertos no Campus Virtual.	1

### Assessment comments

Students who participate in the EHEA system must attend a minimum of 80% of the total classes. Continuous evaluation gives 70% of the final marks, and throughout the course there will be partial tests that grant the remaining 30%.

Students who passed the continuous evaluation but failed to pass the partial tests, will have the opportunity to achieve the remaining 30% of the final marks in a final exam of the whole subject, at first or second opportunity.

Students who decide NOT to participate in the EHEA system will be evaluated through two tests. The first test is devoted to questions of theoretical-practical knowledge and problem solving, and provides 30% of the final marks. The second test concerns the implementation of some of the numerical methods studied in the course, and provides the remaining 70% of the final marks.

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 graduate 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 in previous activities, as established in the current academic regulations at UDC.

### Sources of information



<b>Basic</b>	<ul style="list-style-type: none"><li>- Huerta-Sarrate-Rodríguez Ferrán (1998). Métodos Numéricos. Edicions UPC</li><li>- Michavila-Gavete (1992). Programación y Cálculo Numérico. Reverté</li><li>- Curtis F. Gerald (1991). Análisis Numérico. Alfaomega</li><li>- Burden-Faires (1998). Análisis Numérico. Thomson</li><li>- García Merayo-Nevot Luna (1992). Análisis Numérico. Paraninfo</li><li>- Spiegel (1991). Estadística. McGraw-Hill</li><li>- Cordero-Hueso-Martínez-Torregrosa (2005). Métodos Numéricos con Matlab. Universidad Politécnica de Valencia</li><li>- Mathews-Fink (1999). Métodos Numéricos con Matlab. Prentice Hall</li><li>- J.M. Viaño (1995). Lecciones de Métodos Numéricos Vol 1: Introducción general y análisis de errores. Tórculo Edicións</li><li>- J.M. Viaño (1997). Lecciones de Métodos Numéricos Vol 2: Resolución de ecuaciones numéricas. Tórculo Edicións</li><li>- J.M. Viaño, M. Burgurea (1999). Lecciones de Métodos Numéricos Vol 3: Interpolación. Tórculo Edicións</li><li>- S. C. Chapra, R. P. Canale (2015). Métodos Numéricos para Ingenieros. Mc-Graw-Hill</li></ul>
<b>Complementary</b>	

## Recommendations

### Subjects that it is recommended to have taken before

Mathematics I/631G02151

Informatics/631G02154

Mathematics II/631G02156

### Subjects that are recommended to be taken simultaneously

### Subjects that continue the syllabus

### 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.