SUBJECT TEACHING GUIDE

G2061 - Mathematics III

Degree in Maritime Engineering and Naval Architecture

Academic year 2025-2026

1. IDENTIFYING DATA					
Degree	Degree in Maritime Engineering and Naval Architecture			Type and Year	Core. Year 2
Faculty	School of Maritime Engineering				
Discipline					
Course unit title and code	G2061 - Mathematics III				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Knowledge Field	Industrial engineering, mechanical engineering, automation engineering, industrial organization engineering and navigation engineering				
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICAS, ESTADISTICA Y COMPUTACION
Name of lecturer	TOMAS MARTIN HERNANDEZ
E-mail	tomas.martin@unican.es
Office	E.T.S. de Náutica. Planta: + 2. DESPACHO (234)
Other lecturers	JOSE MARIA HERRERA MURO

4. OBJECTIVES
Know and handle the basic topics of Statistics and Partial Differential Equations necessary for the mathematical modeling of scientific and technical problems with implications for engineering.

6. SUBJECT PROGRAM	
CONTENTS	
1	A. Differentiation and Numerical Integration (7 weeks) A1. Numerical Differentiation A2. Numerical Integration. Trapezoidal and Simpson's Rules. Runge's Rule. A3. Numerical Integration of Ordinary Differential Equations. Euler and Runge-Kutta Methods for Solving the Cauchy Problem. A4. Phase and Flow Space of an Ordinary Differential Equation. Differential Field Associated with an Ordinary Differential Equation: Geometrical Interpretation of What It Means to Solve the Cauchy Problem of an Ordinary Differential Equation. A5. Numerical Integration of Partial Differential Equations (PDEs). Concept of the Gradient Field of a Function and Obtaining its Geometric Properties. Gauss's Divergence Theorem. Obtaining the PDEs that govern the Electric-Gravitational Field and Heat Transmission. Description of Other Classical and Important PDEs in Engineering. Computerized solution of PDEs in two and three spatial dimensions, with initial conditions and Dirichlet, Newmann, and mixed boundary conditions. A6. Computerized implementation of engineering problems that can be modeled using the methods explained in this section A.
2	B. Statistics (7 weeks) B1. Initial definitions: Probability, Laplace's rule. Concept of conditional probability and independent events. Mean, variance, and characteristic functions, density (or probability), and distribution of a random variable. B2. Definition and description of the most important distribution properties for engineering: discrete uniform, discrete sampling, binomial, Poisson, uniform continuous, normal, exponential, Weibull, gamma, Pearson's chi-square. B3. Mouïve-Laplace limit theorem and central limit theorem. Confidence intervals. B4. Discrete two-dimensional variables. Linear goodness-of-fit. B5. Statistical hypothesis testing. Goodness-of-fit test of the chi-square distribution. Kolmogorov-Semirnov goodness-of-fit test. Testing means and proportions. B6. Computer implementation of engineering problems that can be modeled using the methods explained in this section B.

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Evaluation of work (Tasks and 1Ex. Computers)	Activity evaluation with Virtual Media	No	No	35,00
Written evaluation (Final Exam)	Written exam	Yes	Yes	45,00
Practical evaluation (1Theory Exam)	Written exam	No	Yes	20,00
TOTAL				100,00
Observations				
Observations for part-time students				
Part-time students will have facilities to carry out virtual activities.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
T. Martín: "Prácticas de Computación Matemática con Scilab/Octave-Matlab. E.T.S. de Náutica de Cantabria". 2025.
D. Borthwick: "Introduction to Partial Differential Equations". Springer. 2016.
R. L. Burden, D. J. Faires: "Análisis Numérico". Cengage Learning. 2017.
I. Peral: "Primer curso de ecuaciones en derivadas parciales". Universidad Autónoma de Madrid, Departamento de Matemáticas. 2001. https://matematicas.uam.es/~ireneo.peral/libro.pdf
G. Schay: "Introduction to Probability with Statistical Applications". Birkhäuser. 2016
J. L. Devore: "Probabilidad y Estadística para Ingeniería y Ciencias". Cengage Learning. 2008.