

## SUBJECT TEACHING GUIDE

### G272 - Calculus I

Degree in Industrial Electronic Engineering and Automatic Control Systems

First Degree in Industrial Electronic Engineering and Automatic Control Systems

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Industrial Electronic Engineering and Automatic Control Systems First Degree in Industrial Electronic Engineering and Automatic Control Systems			Type and Year	Core. Year 1 Core. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Mathematics Basic Training Module				
Course unit title and code	G272 - Calculus I				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Knowledge Field					
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICA APLICADA Y CIENCIAS DE LA COMPUTACION				
Name of lecturer	VERA EGOROVA EGOROVA				
E-mail	vera.egorova@unican.es				
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 4. DESPACHO (S4016)				
Other lecturers	ANTONIO DIEZ PEDRERO				

4. OBJECTIVES
Understand and apply the main concepts of differential calculus in one and several variables
Understand and apply the main concepts of integral calculus in one variable
Use mathematical software as an auxiliary tool in problem-solving

6. SUBJECT PROGRAM	
CONTENTS	
1	PART 1: Sets of numbers
1.1	Concepts related to $\mathbb{R}$ . Natural numbers ( $\mathbb{N}$ ): Principle of Induction. Amplifications of the set $\mathbb{N}$ : integers ( $\mathbb{Z}$ ), rational ( $\mathbb{Q}$ ), irrational ( $\mathbb{I}$ ), real ( $\mathbb{R}$ ). Properties of the set $\mathbb{R}$ . Absolute value
1.2	Complex Numbers ( $\mathbb{C}$ ): Definition and structure. Types of representation. Elementary operations.
2	PART 2: Real Functions of a Real Variable
2.1	Real function of real variable: Elementary Functions; Even and odd functions; Periodic functions; Symmetries; Boundedness; Inverse function.
2.2	Limit: Concept, types of indeterminations. Continuity: properties, theorems
2.3	Derivative: concept. Geometric interpretation. Derivatives of elementary functions. Dederivation rules. Derivative of composite function; Implicit function. Derivatives of higher order. Leibniz formula for the product. Theorems on derivable functions: Rolle; Lagrange's Mean Value Theorem; Cauchy. Application of the derivative to Calculation of Limits: L'Hopital Rule. Taylor's formula: expression of Taylor's formula of functions Elemental Infinitésimos equivalentes: application to the calculation of limits.
3	PART 3: Integration of single-variable functions
3.1	Concept of antiderivative. Properties of the indefinite integral. Methods of integration: Immediate, by parts, by substitution, integration of rational, irrational and trigonometric functions.
3.2	Riemann Integral: interpretation and properties. Theorem of the mean value. Fundamental Theorem of Integral Calculus. improper Integrals. Applications of a simple Integral: calculation of areas, logitudes of curves, surfaces and volume of revolution.
4	PART 4: Series
4.1	Sequences and numerical series. Convergence field. Power series expansion of a function. Sum of a power series.
4.2	Fourier Series. Development of even and odd functions in Fourier series. Complex form of the Fourier series.
5	PART 5: Vector Functions
5.1	Real function of two or more real variables. Vector function of vector variable. Limit. Continuity. Partial derivatives. Tangent plane.
5.2	Taylor series. Differentiability. Relative and absolute extrema. Conditioned Extreme

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
First partial exam	Written exam	No	Yes	25,00
Second partial exam	Written exam	No	Yes	25,00
Final exam	Written exam	Yes	Yes	30,00
Computer practices	Others	No	Yes	20,00
TOTAL				100,00
Observations				
<p>The final grade is calculated by finding the average score of all assessments.</p> <p>During the final exam, students can retake partial exams to improve their semester score.</p> <p>Students who achieve an average grade above 5 but fail to meet the minimum grade in the final exam will receive a final grade of 4.9 (fail).</p> <p>If a student does not pass the subject in the regular examination, they can take an extraordinary exam to be evaluated on the activities they did not pass in the regular examination.</p> <p>According to Royal Decree RD 1125/2003, the grading system for official university degrees across the country follows a numerical scale from 0 to 10. This scale includes qualitative grades:</p> <p>0.0-4.9: Fail (F).            5.0-6.9: Pass (P).            7.0-8.9: Good (G).            9.0-10: Excellent (E).</p>				
Observations for part-time students				
<p>Part-time students have the option to take a single final exam, which will consist of a theoretical section (80%) and a practical section (20%). This exam represents 100% of the final grade.</p>				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
<p>Larson, Roland E; Edwards, Bruce H. Cálculo. CENGAGE Learning, 2016.  <a href="https://go.exlibris.link/J2TglcPJ">https://go.exlibris.link/J2TglcPJ</a></p>
<p>Larson, Roland E; Edwards, Bruce H; León Cárdenas, Javier ; García Hernández, Ana Elisabeth. Matemáticas I: cálculo diferencial. Cengage Learning, 2017.            eLibro: <a href="https://go.exlibris.link/dc1WS9tZ">https://go.exlibris.link/dc1WS9tZ</a></p>
<p>Larson, Roland E; Edwards, Bruce H; León Cárdenas, Javier ; García Hernández, Ana Elisabeth. Matemáticas II: cálculo integral. Cengage Learning, 2017.            eLibro: <a href="https://go.exlibris.link/WSb1K5NK">https://go.exlibris.link/WSb1K5NK</a></p>