

SUBJECT TEACHING GUIDE

G272 - Calculus I

Degree in Industrial Electronic Engineering and Automatic Control Systems

Academic year 2019-2020

1. IDENTIFYING DATA					
Degree	Degree in Industrial Electronic Engineering and Automatic Control Systems			Type and Year	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)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICA APLICADA Y CIENCIAS DE LA COMPUTACION				
Name of lecturer	VERA EGOROVA				
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Other lecturers	FRANCISCO JAVIER GONZALEZ ORTIZ RODRIGO GARCIA MANZANAS				

3.1 LEARNING OUTCOMES

- Understand and work with different numerical sets: Natural, Real, Rational, Irrational and Complex. Definition and structure of complex numbers.
- Know and manipulate the elementary functions of one variable. Understand and use the concepts of limit and continuity of a function at a point. Calculate derivatives of real functions with singularities. Derive an implicitly defined function. Study the derivability of functions at a point and in an interval. Know how to apply Rolle's Theorems, Medium Value and L'Hopital Rule to the separation of roots, the study of inequalities and the calculation of limits. Use Taylor's developments to approximate real functions. Know how to numerically implement Taylor approximations to calculate functions. Understand and manipulate power series.
- Calculate partial derivatives, gradients and Jacobians. Know how to apply change of variables to polar and spherical coordinates. Determine the tangent plane to the surface at a point. Compute higher order partial derivatives and Hessian matrices. Taylor series. Propose and solve, using differential calculus, problems of maximum and minimum.
- Use the most usual techniques of analytical integration of functions of a variable and know how to calculate length, area and volume using integral calculus

4. OBJECTIVES

In the context of a curriculum of a degree in Engineering, the subject of Calculus serves as an introduction to an important part of the main mathematical tools that students will need throughout their studies.

The objectives are:

- Introduction to mathematical language and reasoning;
- Obtain habits of intellectual work;
- Understand the potential of calculus as a modelling tool;
- Obtain an operational management of mathematical functions and their main properties;
- Know, understand and manage the basic elements of differential and integral calculus in one and several variables.

6. COURSE ORGANIZATION

CONTENTS

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	Real Functions of one 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. Derivation 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.
2.4	Power series: sequences and numerical series. Field of convergence. Development in power series of a function. Sum of a power series.
3	Vector Functions
3.1	Real function of two or more real variables. Vector function of vector variable. Limit. Continuity. Partial derivatives. Tangent plane.
3.2	Taylor series. Differentiability. Relative and absolute extrema. Conditioned Extreme
4	Integration
4.1	Concept of antiderivative. Properties of the indefinite integral. Methods of integration: Immediate, by parts, by substitution, integration of rational, irrational and trigonometric functions.
4.2	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.

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
First partial exam	Written exam	No	Yes	30,00
Second partial exam	Written exam	No	Yes	30,00
There will be three partial exams throughout the course, apart from the final exam of the subject. Each partial exam will represent 30% of the grade, the remaining 10% of the student's grade will be completed with class attendance and homeworks.	Written exam	No	Yes	30,00
Final exam	Written exam	Yes	No	0,00
Exercises	Others	No	No	10,00
TOTAL				100,00
Observations				
<p>There will be three partial exams throughout the course, apart from the final exam of the subject. Each partial exam will represent 30% of the grade, the remaining 10% of the student's grade will be completed with class attendance and homeworks.</p> <p>The grade of the subject will be obtained as the weighted average of all previous evaluation activities, provided that, for said computation, it is fulfilled:</p> <ul style="list-style-type: none"> - Note of the first partial examination greater than or equal to 3.5. - Note of the second partial examination greater than or equal to 3.5. - Final exam grade greater than or equal to 3.5 <p>Note: According to the Royal Decree RD 1125/2003 on the European credit system and the system of qualifications in university degrees of official character and validity throughout the national territory, the results obtained by the student in each of the subjects of the plan Of studies will be graded according to the following numerical scale from 0 to 10, with an expression of a decimal, to which their corresponding qualitative qualification can be added:</p> <p>0.0-4.9: Fail (SS). 5.0-6.9: Pass (AP). 7.0-8.9: Mention 9.0-10: Outstanding (SB).</p>				
Observations for part-time students				
Part-time students may choose to attend the two partial exams and the final exam, with respective weights 20%, 20% and 50% respectively, or attend only the final exam with 100% weight. Understanding that both options are exclusive.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
de Burgos, J., Cálculo infinitesimal de una variable. Ed. McGraw-Hill. 1994.
de Burgos, J., Cálculo infinitesimal de varias variables. Ed. McGraw-Hill. Madrid 1995.
García, A. y otros. CALCULO I. Ed. CLAGSA. Madrid. 1998
García, A. y otros. CALCULO II. Ed. CLAGSA. Madrid. 1998
Tomeo Perucha, V. y otros. Cálculo en una variable. Ed. Garceta, Madrid. 2011
Besada Moráis, M. y otros. Cálculo diferencial en varias variables. Ed. Garceta, Madrid. 2011

