

## SUBJECT TEACHING GUIDE

G328 - Calculus

Degree in Civil Engineering

Academic year 2019-2020

### 1. IDENTIFYING DATA

Degree	Degree in Civil Engineering			Type and Year	Core. Year 1
Faculty	School of civil Engineering				
Discipline	Subject Area: Basic Mathematics in Engineering Basic Training Module				
Course unit title and code	G328 - Calculus				
Number of ECTS credits allocated	6	Term	Semester based (1)		
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	JOAQUIN BEDIA JIMENEZ
E-mail	joaquin.bedia@unican.es
Office	E.T.S. de Ingenieros de Caminos, Canales y Puertos. Planta: + 1. DESPACHO PROFESORES (1042)
Other lecturers	CATHARINA ELISABETH GRAAFLAND

### 3.1 LEARNING OUTCOMES

- To know and to operatively work with elementary univariate functions. To understand and use the concepts of limit and continuity of a function at a point. To skilfully differentiate real functions. To perform implicit differentiation. To analyze the differentiability of a real function at a point and within an interval. To apply the Theorems of Rolle, the Mean Value and the L'Hôpital Rule to root separation, inequality analysis and to the calculation of limits. To use Taylor series for the local approximation of real functions. The ability to work with power sums.
- To calculate partial derivatives, gradients and Jacobian matrices. To apply change of variable formulae to polar and spheric coordinates. To determine the tangent plane to the graph of a function at a point. To calculate higher order partial derivatives and Hessian matrices. Taylor series expansion. To propose and solve optimization problems using differential calculus.
- To use the most usual techniques of analytical integration to univariate functions and to be able to calculate longitudes , areas and volumes using integral calculus.
- To learn how to use calculus software to complete the assimilation of the concepts studies during the theoretical lectures ; to be able to solve similar exercises to those already solved in the classroom. To recognize the importance of software as an operative tool to efficiently solve complex problems , once the underlying theoretical foundations have been understood.

### 4. OBJECTIVES

Within the framework of the Bachelor in Civil Engineering, the subject of Calculus aims at introducing some of the main mathematical tools and skills that the student will need to master in order to fulfill her/his studies. The main objectives are: to become familiar with mathematical language and reasoning; acquiring a habit of intellectual work; get introduced into the potential of calculus as a modeling tool; to acquire the ability to work operatively with mathematical functions according to their main properties; to know, assimilate and deal with the basic elements of differential and integral calculus of one and several variables.

### 6. COURSE ORGANIZATION

#### CONTENTS

1	<b>BLOCK 1. REAL AND COMPLEX NUMBERS. REAL FUNCTION. LIMIT. CONTINUITY. DERIVATIVES.</b> Theme 1. Real and Complex numbers. Series and power sums Theme 2. Real functions of one variable
2	<b>BLOCK II. INTEGRAL CALCULUS</b> Theme 3. Integral Calculus
3	<b>BLOCK III. REAL FUNCTIONS OF SEVERAL VARIABLES</b> Theme 4. Real functions of two and more variables. Vector fields.

**7. ASSESSMENT METHODS AND CRITERIA**

Description	Type	Final Eval.	Reassesssn	%
Exam Block I (written)	Written exam	No	Yes	25,00
Exam Block II (written)	Written exam	No	Yes	25,00
Final Exam	Written exam	Yes	Yes	40,00
Lab Assignment Report	Laboratory evaluation	No	No	10,00
<b>TOTAL</b>				<b>100,00</b>

**Observations**

There will be three written exams throughout the course, two of them partial (each representing 25% of the total grade of the subject), and a final exam that will encompass all the contents of the subject, with a weight of 40% on the final note.

Therefore, the partial exams will not be in any case eliminatory. The remaining 10% will be completed with laboratory practice reports. The qualification of the subject will be obtained as the weighted average of all the previous evaluation activities, provided that, for said computation, it is fulfilled:

- Exams score greater than or equal to 2.5.
- Reports of favorable laboratory practices.

In any case, the recovery of any of the evaluation activities of the subject will take place on the date established for it by the University (September). Only those activities that are not approved can be recovered (rating below 5 out of 10). This includes the practice reports and exams.

In the tests with an established format (templates for practice reports, space reserved for answers in written exams), the non-adaptation to the format will be expressly penalized. Likewise, they will be penalized (among others):

- The answers that are not duly justified.
- The inadequate use of terminology and mathematical notation.
- Messy work, difficult to read, excessive striking, etc.
- The excessive presence of spelling / grammar errors.
- The procedures that demonstrate the lack of acquisition of basic mathematical competences.

**Observations for part-time students**

Part-time students must take the same assessment tests as the rest of the students. Optionally, and in addition to the laboratory practices, they may be submitted to a single written exam that includes the contents of the three thematic blocks, with a weight of 90% of the overall mark, to be done on the date of the final exam. In any case, this option is exclusive of the exam modality by blocks.

**8. BIBLIOGRAPHY AND TEACHING MATERIALS**
**BASIC**

Larson, L. y Edwards, B. H. Cálculo I y II. 9<sup>a</sup> ed. Mc Graw Hill.

Material puesto a disposición para clase (presentaciones, ejercicios, programas de software y código)