

## SUBJECT TEACHING GUIDE

### G264 - Mathematical Analysis and Numerical Methods

#### Degree in Computer Systems Engineering First Degree in Computer Systems Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Degree in Computer Systems Engineering First Degree in Computer Systems Engineering			Type and Year	Core. Year 1 Core. Year 1
Faculty	Faculty of Sciences				
Discipline	Subject Area: Mathematical Foundations of Computer Science Basic Training Module				
Course unit title and code	G264 - Mathematical Analysis and Numerical Methods				
Number of ECTS credits allocated	6	Term	Semester based (2)		
Web	<a href="https://moodle.unican.es/">https://moodle.unican.es/</a>				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICAS, ESTADISTICA Y COMPUTACION
Name of lecturer	MONICA BLANCO GOMEZ
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Other lecturers	RAFAEL GRANERO BELINCHON

3.1 LEARNING OUTCOMES
- Handle basic concepts of univariate and multivariate calculus, being able to extract basic information from the definitions of the functions,
- Be able to express lengths and compute mean values using approximate and exact integral calculus
- Solve numerically equations using Newton's method
- Get familiar with the basic concepts from multidimensional calculus (curves, length, speed, several variable functions)
- Get familiar with the programming of numerical calculus algorithms. Have criteria to compare and evaluate different methods according to the problem to be solved, its complexity and the errors in the process

#### 4. OBJECTIVES

The students are expected to get more profound knowledge on one variable calculus, as well as acquire the fundamental concepts of numerical analysis and vector calculus.

Other goals involve improving the calculation abilities, work on the deductive process, search for examples and counterexamples, and learn how to use mathematics to solve physical and engineering problems.

We will also study some simple numerical methods that will be used to approximate the solution of applied problems

#### 6. COURSE ORGANIZATION

CONTENTS	
1	Study of the exact and approximate solution to simple one-point dynamics in a computer: trajectories under gravitational and dumping forces. We will use the mathematical tools of derivatives and primitives, basic theory of ordinary differential equations and numerical methods for this problem.
2	Some basic concepts about curves and moving points on curves at a given speed. To this end we will study polynomial interpolation, cubic splines, definite integrals and fundamental theorem of calculus, parametrized curves, arc-length parametrization, approximate integral computations.
3	Study of some mathematical methods for the programming of a basic artificial intelligence for videogames. To this end we will study approximate derivative calculations, Taylor's theorem, solution of equations and systems of equations, optimization and gradient method.
4	Final exam

#### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Final exam	Written exam	Yes	Yes	60,00
Several quizzes during the course	Written exam	No	Yes	40,00
TOTAL				100,00
Observations				
The part of continuous evaluation can be improved in the final exam. The examination process in the extraordinary period will be similar to the examination process in the ordinary period.				
Observations for part-time students				
Part time students can either follow the regular evaluation process or have a unique exam				

#### 8. BIBLIOGRAPHY AND TEACHING MATERIALS

##### BASIC

Apuntes de la asignatura