

SUBJECT TEACHING GUIDE

G61 - Numerical Methods

Degree in Physics

Academic year 2022-2023

| 1. IDENTIFYING DATA | | | | | |
|----------------------------------|---|------------------|--------------------|------------------|--------------------|
| Degree | Degree in Physics | | | Type and Year | Compulsory. Year 3 |
| Faculty | Faculty of Sciences | | | | |
| Discipline | Subject Area: Advanced Mathematics for Science Central Module | | | | |
| Course unit title and code | G61 - Numerical Methods | | | | |
| Number of ECTS credits allocated | 6 | Term | Semester based (1) | | |
| Web | https://moodle.unican.es/ | | | | |
| Language of instruction | Spanish | English Friendly | No | Mode of delivery | Face-to-face |

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|------------------|---|--|--|--|--|
| Department | DPTO. MATEMATICAS, ESTADISTICA Y COMPUTACION | | | | |
| Name of lecturer | CARLOS BELTRAN ALVAREZ | | | | |
| E-mail | carlos.beltran@unican.es | | | | |
| Office | Facultad de Ciencias. Planta: + 1. DESPACHO CARLOS BELTRAN ALVAREZ (1040) | | | | |
| Other lecturers | FATIMA LIZARTE LOPEZ | | | | |

3.1 LEARNING OUTCOMES

- Learn the theory, practice and implementation of the most basic computational tools for Scientific Computation: solving systems of equations, interpolation, derivation and integration, ODE solving.
- The student is expected to learn how to process the results of numerical programs taking care of rounding errors
- Know and understand some basic mathematical techniques for the solution of different problems, both from a theoretical and experimental point of view,

4. OBJECTIVES

The goal is that the students learn the techniques which allow to analyse a physical problem from its numerical simulation, understanding the errors intrinsic to the process. He/she must also get familiar with the solution to some concrete problems, the most basic ones, related to interpolation, system solving, derivatives, integrals, numerical linear algebra and ODE solving.

6. COURSE ORGANIZATION

CONTENTS

| | |
|---|--|
| 1 | Introduction to the problems of numerical calculus and its applications, with practical examples |
| 2 | Lagrange interpolation: computation and applications |
| 3 | Numerical derivatives, different formulae for the first and second derivative. Numerical integration: Mid-point, Trapezoid and Simpson's rule (simple and composite). |
| 4 | Non linear equation solving: bisection, Newton's method. |
| 5 | Numerical solution of ODE systems. Euler's method, Runge-Kutta method, applications |
| 6 | Final exam |

7. ASSESSMENT METHODS AND CRITERIA

| Description | Type | Final Eval. | Reassessn | % |
|-----------------|--|-------------|-----------|--------|
| Final exam. | Laboratory evaluation | Yes | Yes | 60,00 |
| Short questions | Activity evaluation with Virtual Media | No | No | 10,00 |
| Short questions | Activity evaluation with Virtual Media | No | Yes | 30,00 |
| TOTAL | | | | 100,00 |

Observations

The tests will be most likely in each student's laptop.

The recoverable part of the continuous evaluation can be improved in the final exam.

The extraordinary exam will have similar conditions to those of the ordinary one.

Observations for part-time students

Part time students can follow the regular course or just present to the final exam.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Apuntes de la asignatura proporcionados por el profesor, tanto en versión documento como en versión web (Moodle)