Numerical Computing

Academic Year: (2022 / 2023) **Review date: 16-05-2022**

Department assigned to the subject: Mathematics Department

Coordinating teacher: GONZALEZ RODRIGUEZ, PEDRO

Type: Electives ECTS Credits : 3.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Linear Algebra, Calculus I, Programming, Calculus II, Statistics, Calculus III

OBJECTIVES

1- Basic numerical techniques for solving problems in engineering.
2- The mathematical foundations of the algorithms implemented in the most usual commands of the software MATLAB.
3- To learn how to use MATLAB both at the level of direct use of basic commands and at programming level.
4- To be able of solving numerically different practical problems by combining the algorithms introduced in this course and the software MATLAB.
5- To acquire the needed knowledge for understanding and implementing in practice in the future mathematical algorithms more sophisticated than the ones introduced in this course.

DESCRIPTION OF CONTENTS: PROGRAMME

1- Introduction to MATLAB and to floating point arithmetic.
2- Numerical solution of linear systems and least squares problems in MATLAB.
3- Interpolation in MATLAB.
4- Numerical solution of nonlinear equations in MATLAB.
5- Quadrature in MATLAB.
6- Solving ordinary differential equations in MATLAB.

LEARNING ACTIVITIES AND METHODOLOGY

This is a "hands on" course. Students follow the explanations of the instructor performing in real time the exercises, examples and other proposed activities in the computer. Thus the course takes place in the computer Lab while the students run MATLAB simultaneously to the explanations of the instructor.

In addition, every three weeks, a computing long problem related to the subject will be proposed to the students. The students will have one week to solve it using MATLAB and return it to the instructor for evaluation.

Officce hours will follow the rules of Universidad Carlos III de Madrid and intend to solve doubts of individual students.

ASSESSMENT SYSTEM

Final Exam: 40%.
Computational problems proposed along the course: 60%.
To pass the course it is needed to get at least an score of 3 out of 10 in the final exam.

% end-of-term-examination:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

BASIC BIBLIOGRAPHY

- Cleve Moler Numerical Computing with MATLAB, SIAM, 2004

- John H. Mathews and Kurtis K. Fink Numerical Methods using MATLAB (4th Edition), Pearson, 2004

ADDITIONAL BIBLIOGRAPHY

- G. W. Stewart Afternotes on Numerical Analysis, SIAM, 1996
- G. W. Stewart Afternotes goes to graduate school, SIAM, 1998
- Uri M. Ascher and Chen Greif A first course in Numerical Methods, SIAM , 2011