Numerical calculus in Engineering

Academic Year: (2022 / 2023) **Review date: 06-04-2022**

Department assigned to the subject: Mathematics Department

Coordinating teacher: ARVESU CARBALLO, JORGE

Type: Electives ECTS Credits : 3.0

Year : Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Linear algebra, Calculus I and II

OBJECTIVES

1. Basic numerical skills to solve problems in Engineering.
2. The use of MATLAB to solve numerical problems.
3. Basic solving skills to solve counting problems.
4. Be able to model, pose and solve problems of communication, sound and image technologies.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to Matlab and floating point arithmetic.
Polynomial interpolation. Fourier series and trigonometric polynomial.
Representation and approximation of signals.

2. Numerical integration methods.
Simple and composite rules. Adaptive quadrature.

3. Initial value problems.
The Euler, Taylor and Runge-Kutta methods.
Prediction and correction methods.

4. Boundary value problems.
Method of finite differences. Resolution of the wave equation.
Finite element method and its applications.

LEARNING ACTIVITIES AND METHODOLOGY

There will be weakly sessions:
- Theory sessions: the teacher will explain the fundamental concepts and results of the theory.
- Exercise/Lab sessions: the students will work in solving exercises or writing codes to solve problems proposed by the professor.

ASSESSMENT SYSTEM

Final exam: 50%
Lab Work and Assignments: 50%

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

BASIC BIBLIOGRAPHY

- C. Moler Numerical Computing with MATLAB, SIAM, 2004
- D. J. Higham N. J. Higham Matlab Guide, SIAM, 2000
- J.H. Mathews y K.D. Fink Numerical Methods using Matlab, Prentice Hall, 1999
- T. Sauer Numerical Analysis, Pearson, 2012

ADDITIONAL BIBLIOGRAPHY

- G. W. Stewart Afternotes on Numerical Analysis, SIAM, 1996
- G. W. Stewart Afternotes goes to Graduate School, SIAM, 1998
- J.M. Sanz-Serna Diez Lecciones de Cálculo Numérico, , Universidad de Valladolid, 2010