

Academic Year: ( 2024 / 2025 )

Review date: 17-01-2025

Department assigned to the subject: Mathematics Department

Coordinating teacher: QUINTANA MATO, YAMILET DEL CARMEN

Type: Electives ECTS Credits : 3.0

Year : Semester :

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Linear algebra, Calculus I and II

## LEARNING OUTCOMES

CB1: Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study

CB2: Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.

CG3: Knowledge of basic and technological subject areas which enable acquisition of new methods and technologies, as well as endowing the technical engineer with the versatility necessary to adapt to any new situation.

CG10: Ability to solve mathematical problems arising in engineering. Aptitude for applied knowledge in: linear algebra, geometry; differential geometry; differential and integral calculus; differential equations and partial derivatives; numerical methods; numerical algorithms; statistics and optimization.

RA1: Knowledge and understanding of the general fundamentals of engineering, scientific and mathematical principles, as well as those of their branch or specialty, including some knowledge at the forefront of their field.

RA5: Applications. Graduates will have the ability to apply their knowledge and understanding to solve problems, conduct research, and design engineering devices or processes. These skills include knowledge, use and limitations of materials, computer models, process engineering, equipment, practical work, technical literature and information sources. They must be aware of all the implications of engineering practice: ethical, environmental, commercial and industrial.

## 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 weekly 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

<b>% end-of-term-examination:</b>	50
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	50
Final exam: 50%	
Lab Work and Assignments: 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