Universidad Zaragoza

Academic Year/course: 2023/24

30005 - Mathematics III

Syllabus Information

Academic year: 2023/24
Subject: 30005 - Mathematics III
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 436 - Bachelor's Degree in Industrial Engineering Technology
ECTS: 6.0
Year: 1
Semester: 436-First semester o Second semester
107-Second semester
Subject type: Basic Education
Module:

1. General information

The main objective of the subject is to introduce students to the resolution of Differential Equations problems, providing them with the appropriate methods for their resolution, both exact and numerical. The aim is for students to be able to select the most appropriate techniques in each case, promoting critical reasoning. Another purpose is to introduce students to the use of mathematical software, in order to facilitate the resolution of problems and the analysis of the results obtained.

This is a subject whose evaluable contents alone do not yet provide the student with direct capabilities to contribute to the achievement of the 2030 Agenda , however, they are essential to base the subsequent knowledge of the rest of the degree that is more directly related to the SDGs and therefore to the 2030 Agenda

2. Learning results

The student, in order to pass this subject, must demonstrate the following results...

Solve mathematical problems that may arise in Engineering.

Apply the acquired knowledge of Differential and Partial Differential Equations, Numerical Methods and Numerical Algorithms.

Use numerical methods in the solution of some mathematical problems.

Know the reflexive use of symbolic and numerical calculation tools.

Possess scientific-mathematical thinking skills that allow them to ask and answer certain mathematical questions.

Handle mathematical language with dexterity, particularly symbolic and formal language.

3. Syllabus

The subject is divided into two parts.

1. Ordinary Differential Equations (ODE):

- First order equations: Geometric aspects. Existence and uniqueness of solution of Initial Value Problems. Elementary integration methods.

- Homogeneous and non-homogeneous linear equations with constant coefficients of higher order. Method of the indeterminate coefficients. Linear equations of variable coefficients. Parameter variation.

- Linear systems: Homogeneous and non-homogeneous linear systems with constant coefficients. Stability. Parameter variation.

- Laplace transform. Applications to the resolution of Initial Value Problems.

- Numerical resolution of ODE systems: Runge-Kutta methods.

- Numerical resolution of boundary problems: difference methods.

2. Partial Differential Equations (PDE):

- Fourier series.

- Separation of variables for second order equations.

4. Academic activities

Theory classes (T1) 40 hours, 3 per week and problem classes (T2) in small groups, 8 hours

Group work supervised by the teacher (T6).

Computer practices: There will be 6 practical computer sessions of 2 hours each using a mathematical softwaresuitable for symbolic, numerical and graphical calculations.

Prior to each session, the teacher will provide the students with the script of the practice with the necessary theoretical indications, a description of the mathematical software commands that are considered appropriate and several problems

proposed for their resolution.

In the practices T3 of the course, mathematical algorithms are analyzed and programmed by means of symbolic and numerical programming software installed in the computer laboratories of EINA.

5. Assessment system

A global assessment system composed of the following tests is proposed:

1. Written test: questionnaire on the theoretical and practical contents of the subject. The grade (E) will account for 70% of the final grade.

2. Tests in which the student will have to solve problems similar to those of the practical sessions. The grade (L) will account for 20% of the final grade.

3.Group work, with the elaboration of a final report. The grade obtained (T) will account for 10% of the final grade.

4. Voluntary tests to evaluate the student's follow-up of the classes received. The grade (O) may have up to 10% weight in the final grade.

5. All tests will be evaluated from 0 to 10. In order to pass the subject, the student must obtain in the written testa grade (E) of no less than 4.

The final grade, if E is not less than 4, will be obtained by performing the following operation: F=

0.7*E+0.2*L+0.1*T+0.1*O

In case E<4, the final grade will be F=E.

In order to facilitate the gradual overcoming of the subject, voluntary activities may be programmed that will involve an anticipation of some parts of the global test.