

## 28810 - Mathematics III

### Syllabus Information

**Academic year:** 2024/25

**Subject:** 28810 - Mathematics III

**Faculty / School:** 175 - Escuela Universitaria Politécnica de La Almunia

**Degree:** 424 - Bachelor's Degree in Mechatronics Engineering

**ECTS:** 6.0

**Year:** 2

**Semester:** First semester

**Subject type:** Basic Education

**Module:**

### 1. General information

Differential equations are one of the fundamental building blocks of modern mathematics. They are the basis for the analysis, modeling and resolution of complex problems in engineering, science, economics or business.

This subject deals with the ability to solve mathematical problems that may arise in engineering.

Ability to apply knowledge of: linear algebra; geometry; differential geometry; differential and integral calculus; differential and partial derivative equations; numerical methods; numerical algorithms; statistics and optimization. This capacity is covered by the subjects Mathematics I, Mathematics II, Mathematics III and Statistics.

### 2. Learning results

- Application of the basic concepts of differential and integral calculus, linear algebra, statistic and probability.
- Knowledge of the specific mathematical software and its use on the problem solving.
- Knowledge of mathematical terminology, notation and methods.
- Critical analysis of the obtained results.

### 3. Syllabus

1. Ordinary differential equations: basic concepts, existence and uniqueness, analytical solvability of some special equations.
2. Qualitative studies: fixed points and linear stability.
3. Numerical methods: Euler and Runge-Kutta.
4. EDO of order greater than one.
5. Laplace transform.
6. Applications of the Laplace transform: Oscillators and resonance.
7. Discrete-time systems: The Z-transform and its applications.
8. Series and Fourier transform. Applications.
9. Fourier transform in discrete time: FFT and applications.
10. Introduction to PDEs: Separation of variables, vibrations.

### 4. Academic activities

- Theoretical and practical lectures always in a computer classroom using algebraic and numerical manipulation software.
- Participation checks with guided and collaborative problem solving.
- Written assessment tests:
- Face-to-face and remote tutoring.
- Personal work.

### 5. Assessment system

- **Continuous assessment system**

To be eligible for continuous assessment it is necessary to attend at least 80% of the classroom activities.

The subject will be considered passed if 50% or more of the following score is obtained:

- **Written tests:** There will be two written tests on the content of the subject. Its weight in the final grade will be 80%.

- **Participatory controls:** There will be 4 guided and collaborative controls valued at 20% of the final grade, with problems or quizzes programmed through the ADD.

To add the grade of the controls to the final grade, the student must have obtained **at least 10 points out of 40** in each of the written tests.

- **Global assessment**

Those who have not passed the subject with the continuous assessment system will be required to take a compulsory written test equivalent to the written tests described above, whose weight in the final grade will be 100%.

The assessment criteria for **all** these tests will be:

- Understanding of the mathematical concepts used to solve the problems.
- The use of strategies and procedures in their resolution.
- Clear, organized and detailed explanations.
- Correct use of terminology and notation.

## **6. Sustainable Development Goals**

4 - Quality Education

5 - Gender Equality

9 - Industry, Innovation and Infrastructure