Universidad Zaragoza

**Academic Year/course: 2024/25**

# 28905 - Mathematics II

## Syllabus Information

**Academic year:** 2024/25
**Subject:** 28905 - Mathematics II
**Faculty / School:** 201 - Escuela Politécnica Superior
**Degree:** 583 - Degree in Rural and Agri-Food Engineering
**ECTS:** 6.0
**Year:** 1
**Semester:** Second semester
**Subject type:** Basic Education
**Module:**

## 1. General information

The aim of this subject is to provide mathematical tools that serve as a basis to build and/or study certain mathematical models related to the degree. Ability to apply knowledge of Integral Calculus and Differential Equations by choosing appropriate methods for problem-solving, both exact and numerical. Additionally, the objective of the course is to introduce the knowledge and use of mathematical software that facilitates the resolution of the problems and the analysis of the results obtained.

## 2. Learning results

The student, passing this course, achieves the acquisition of the basic knowledge of Integral Calculus, Differential and Partial Derivative Equations, Geometric Applications and Numerical Calculus.

Interpret quantitatively and qualitatively the results obtained in the satisfactory resolution of certain problems based on phenomena and processes related to agrifood and rural engineering.

## 3. Syllabus

**Block 1. Integral Calculus**

- Indefinite Integral
- Definite Integral. Applications
- Multiple Integration. Applications
- Vectorial calculus. Line Integral.

**Block 2. Differential Equations**

- First-order Ordinary Differential Equations. Applications.
- Second-order Ordinary Differential Equations. Applications.
- Systems of Ordinary Differential Equations. Applications and Stability Study.
- Partial Differential Equations.

**Lab sessions**

- Numerical Integration.
- Exact Solution of Ordinary Differential Equations. Numerical Methods.
- Qualitative Study of First-order Differential Equations.
- Qualitative Behaviour of Solutions of Autonomous Differential Systems
- Applied Problems. Practical Cases.

## 4. Academic activities

*Lectures: 30 hours*

The topics of the program will be presented in class with the support of varied examples to facilitate the understanding of the subject.

*Problem solving in the classroom: 18 hours*

A collection of problems will be provided to the students to work on during problem-solving sessions with more individualized attention.

*Lab sessions: 12 hours*

There will be 6 practical computer sessions to work with on application problems, using symbolic and numerical programming software.

*Study: 87 hours*

*Assessment 3 hours*

## 5. Assessment system

The course will be evaluated using a global assessment modality with an intermediate exam. The evaluation is divided into two parts:

Part 1. Evaluation of the theoretical-practical part (85% of the grade)

- Midterm exam: During the lecture period, an intermediate test will be conducted. It will be related to Block I. Integral Calculus, and will be assessed through a written problem-solving exam. This test will be conducted after the corresponding material for that block is completed and will account for 50% of the overall grade.
- The official exam, on the date that the EPSH imposes for this purpose, will consist of a part related to the theoretical-practical content of Block I. Integral Calculus, with a weight of 50%, and a part related to Block II. Differential Equations, with a weight of 35%.

Part 2. Evaluation of lab computer sessions (15% of the grade)

- The student can complete the evaluation of all practices during the last lab session or in the official exams on the date that the EPSH imposes for this purpose,. This test will account for 15% of the overall grade.

The final grade will be obtained as the weighted average of the parts.

$$\text{Final grade} = 0.5*\text{BlockI} + 0.35*\text{BlockII} + 0.15*\text{Lab}$$

In the last three years, the success rates have been 87.30%, 37.50% and 64.86%

## 6. Sustainable Development Goals

4 - Quality Education
9 - Industry, Innovation and Infrastructure