Universidad Zaragoza

Academic Year/course: 2023/24

30000 - Mathematics I

Syllabus Information

Academic year: 2023/24
Subject: 30000 - Mathematics I
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-First semester
Subject type: Basic Education
Module:

1. General information

The purpose of this subject is for students to acquire a solid foundation in the fundamentals of Differential and Integral Calculus of functions of one and several variables and in the numerical solution of problems in these disciplines; learn to solve a problem in a rigorous way, selecting the most efficient techniques and strategies; and to be able to use a mathematical software for its solution.

The assessable contents do not provide direct capabilities for the achievement of the 2030 Agendathe assessable contents do not provide direct skills for the achievement of the 2030 Agenda; however, they are essential to base subsequent knowledge that is related to the SDGs.

It is recommended to master the knowledge and skills acquired in Mathematics of the Bachelor of Science, such as:

- Complex numbers
- Trigonometry.
- Analysis of elementary functions.
- Derivation and integration of functions of one variable.
- Affine geometry.

2. Learning results

- Solve mathematical problems of differential and integral calculus of functions of one and several variables that may arise in Industrial Technologies.
- Apply numerical methods in the resolution of the corresponding mathematical problems.
- To use symbolic and numerical calculation tools in a reflexive way.
- Possess scientific-mathematical thinking skills that allow them to ask and answer certain mathematical questions.
- To handle mathematical language proficiently, in particular the language of basic mathematical applications.

3. Syllabus

The contents of the subject cover the following topics:

1. Basic concepts of calculation. Real and complex numbers.
2. Successions and series of real numbers. Power series.
3. Real functions of a real variable. Derivation. Taylor's formula.
4. Integral calculus of one variable.
5. Differential and integral calculus of functions of several variables.

The following topics will be worked on during the computer exercises:

1. Introduction to mathematical software. Elementary functions.
2. Approximate sum of series of real numbers.
3. Numerical methods for solving nonlinear equations.
4. Polynomial approximation: Taylor's polynomial. Interpolation.
5. Applications of the definite integral. Numerical integration.
6. Study of scalar fields.

4. Academic activities

Theoretical and practical classes (40 h)

Presentation of theoretical contents accompanied by illustrative examples and problem solving.

Problem sessions (8 h)

Problem solving by students organized in subgroups and guided by the teacher.

Computer practices (12 h)

Analysis and programming of mathematical algorithms using symbolic and numerical programming software installed in the computer laboratories of EINA. The chosen software will allow working with symbolic, numerical and graphical calculations, facilitating the understanding of the proposed learning outcomes. Each practice will consist of an exposition of the contents and the resolution of problems related to them.

Supervised work

Deliverable tasks supervised by the teaching team.

Personal study

Assessment tests.

5. Assessment system

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

- Test on the theoretical and practical contents of the subject. Its score will represent 75% of the final grade of the subject. The exam will be mainly practical, although it may contain theoretical or theoretical-practical questions . It will be evaluated:
    - understanding of the mathematical concepts used to solve the problems, the use of efficient strategies and procedures in their resolution,
    - clear and detailed explanations,
    - the absence of mathematical errors in the solutions,
    - correct use of terminology and notation,
    - orginsed and clear presentation.
- Test on the topics developed in the practical sessions. Its score will represent 20% of the final grade. Consideration will be given to:
    - knowledge of the mathematical software commands needed to solve the problems, the correct interpretation of the results obtained,
    - the ability to select the most appropriate method,
    - clear and detailed explanations and/or reasoning to the questions asked.
- Completion of teacher-directed work. Its score will represent 5% of the final grade of the subject . This section can be replaced by a test of equal weight on any content of the subject.

The grade for the first call will be determined by the percentages indicated.

The assessment in the second call will be carried out by means of a global test similar to the exam mentioned above.