

29905 - Mathematics II

Syllabus Information

Academic year: 2024/25

Subject: 29905 - Mathematics II

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 435 - Bachelor's Degree in Chemical Engineering

ECTS: 6.0

Year: 1

Semester: 435-First semester o Second semester

107-First semester

Subject type: Basic Education

Module:

1. General information

Mathematics II is a basic subject of 6 ECTS credits of the first semester that, together with Mathematics I and III, constitutes the basic mathematical formation of the degree, with great practical application in other subjects. The language and way of reasoning and relating mathematical concepts provides students with a fundamental basis for a scientific method of work.

A contextualized mathematical example will be proposed to help students learn about some SDGs. The assessable contents of this subject are essential to base the subsequent knowledge of the degree, which is more directly related to the SDGs and, therefore, to the 2030 Agenda.

Knowledge and skills acquired in Mathematics I and II of Bachillerato are recommended, preferably with a scientific-technological orientation.

2. Learning results

Upon completion of this subject, the student will be able to:

- Solve mathematical problems that may arise in Engineering.
- Ability to apply acquired knowledge of linear algebra; geometry; numerical methods.
- Know how to 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 him/her to ask and answer certain mathematical questions.
- Skilled in handling mathematical language; in particular, symbolic and formal language.

3. Syllabus

- Matrices, determinants and linear systems. Types and operations with matrices. Elementary matrices. LU factorization. Solving linear systems.
- Vector spaces over \mathbb{R} and \mathbb{C} . Vector subspace. Linear dependence, generator systems and bases. Coordinates. Base changes.
- Linear applications. Core and image. Coordinate isomorphism. Coordinate matrix. Matrices equivalent.
- Eigenvalues and eigenvectors. Characteristic polynomial. Multiplicities. Proper subspaces. Matrix and diagonalizable endomorphism.
- Scalar product. Euclidean space. Standard, distance, angle. Orthogonality and orthonormality. Method of Gram-Schmidt. Orthogonal subspace. Orthogonal projection. Curves in the plane and in space.

4. Academic activities

Face to face sessions: 2.4 ECTS (60 hours)

- Classroom sessions (48 hours): 42 hours of participative lecture (to the group) and 6 hours of problems' sessions (in two subgroups). Individual and cooperative active methodologies to train in Theory/Problems of the subject and in Teamwork competence will be applied during the sessions.
- Computer room sessions (12 hours): 6 practices in small groups with Maxima software, for symbolic, numerical and graphical calculation, understanding of concepts and problem solving.

Autonomous work: 3.6 ECTS (90 hours)

- Study of theoretical and practical contents.
- Realization of Teamwork.
- Continuous self-learning activities through ADD.
- Assessment

5. Assessment system

The final assessment consists of the following parts:

- 65%- Theory and problems
- 20%- Laboratory practices
- 15%- Teamwork throughout the semester

The Theory and Problems grade (65%) will be divided into two parts:

- (max. 25%) is obtained by passing the midterm exam to be held in the middle of the term. The student who passes the midterm exam can choose to keep that grade or retake that part in the final test.
- (max. 40%) all students will be tested on this part in the final test.

The internship grade (20%) can be obtained by:

- (max. 10%) by performing continuous activities in the internship. Students who pass these continuous activities can choose to keep that grade or take that percentage in the final test.
- (max. 10%) all students will be tested on this part in the final test.

Students who wish may sit the final test directly (100%) (in first and/or second call), which will include questions, theoretical-practical exercises and problems on everything taught in the subject (100%), as well as questions on laboratory practices.

6. Sustainable Development Goals

4 - Quality Education