

30369 - Algebra

Syllabus Information

Academic year: 2024/25

Subject: 30369 - Algebra

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 581 - Bachelor's Degree in Telecommunications Technology and Services Engineering

ECTS: 6.0

Year: 1

Semester: First semester

Subject type: Basic Education

Module:

1. General information

The objective of Algebra is for the student to consolidate and learn the basic knowledge related to vector spaces, linear and bilinear applications, quadratic forms, Euclidean space and the ring of integers and its applications. In addition, they must learn to relate this knowledge in order to acquire the ability to adapt it to the resolution of the problems of Telecommunication Engineering.

These goals are aligned with the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda, insofar as mathematics is a tool used by engineers and scientists to model, analyze and optimize a multitude of systems.

It is recommended to have a precise knowledge of the contents of the Mathematics I and II subjects included in High school curriculum.

2. Learning results

The contents of this subject should provide the student with sufficient techniques and skills to enable him/her to address the following issues and problems related to the following aspects:

- 1.- To know the basic algebraic structures and modular arithmetic.
- 2.- Solve systems of linear equations exactly and with numerical methods.
- 3.- Operate with matrices.
- 4.- Know the properties of vector spaces.
- 5.- Know the linear applications between vector spaces and know how to represent them.
- 6.- Determine whether a matrix or an endomorphism is diagonalizable by calculating its eigenvalues and eigenvectors.
- 7.- Know and apply the properties of vector spaces endowed with a scalar product.
- 8.- Use scientific software to solve problems related to linear algebra.

As a consequence of the previous learning results, the student should recognize and know how to apply the properties of elementary algebraic structures, know how to work with polynomials and remainder classes, know how to apply the concepts and techniques of linear algebra, Euclidean geometry and its matrix representation.

3. Syllabus

The program of the course is divided into the following topics:

Topic 1: ALGEBRAIC STRUCTURES

Topic 2: MATRIXES AND LINEAR SYSTEMS

Topic 3: VECTOR SPACES

Topic 4: EUCLIDEAN VECTOR SPACE

Topic 5: LINEAR APPLICATIONS

Topic 6: SPECTRAL THEORY: EIGENVALUES AND EIGENVECTORS

4. Academic activities

The subject is developed through an appropriate combination of the following activities:

Participatory lectures 40 hours

Theoretical contents and results are presented, complemented with some problems and practical exercises.

Problem solving classes: 8 hours

In small groups, models are presented in which some of the mathematical aspects of the subject are presented, solved in class or as autonomous work material for the student.

Practical classes: 12 hours

In small groups a scientific software is used to solve the proposed exercises related to some numerical methods and applications in Telecommunications of the mathematical contents.

Teaching jobs: 17 hours

Preparation of the final questionnaires for the laboratory sessions

Personal study: 70 hours

Evaluation tests: 3 hours

5. Assessment system

The subject is evaluated in the global evaluation modality through the following activities:

* **Final exam (80%)** with theoretical-practical questions, exercises and problems corresponding to the topics developed in the master classes and in the problem classes.

* **Laboratory practical work (20%)**. The requested reports will be evaluated. Students who do not complete or do not pass this evaluation activity will be able to take an exam.