Universidad Zaragoza

Year : 2019/20

30369 - Algebra

Syllabus Information

Academic Year: 2019/20
Subject: 30369 - Algebra
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 581 - Bachelor's Degree in Telecomunications Technology and Services Engineering
ECTS: 6.0
Year: 1
Semester: First semester
Subject Type: Basic Education
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The learning process that has been designed for this subject is based on the following:

Continuous work of the student; study of the theory using the provides notes and the bibliography; realization of problems and exercises; query and resolution of doubts.

Master classes in which the contents will be developed, illustrating them with examples and counter-examples sufficient, to facilitate their comprehension; exercises in group will be carried out.

Practices in which, with the help of the computer, problems on different questions will be solved and numerical methods will be implemented using the free software Maxima.

Sessions of problems in which, in a participative way, problems that demand the comprehension of the concepts and the relations between concepts and techniques of the different subjects will be solved.

4.2.Learning tasks

The program offered to the student to help him achieve the expected results includes the following activities:

Type I: Master class (42 hours). Three hours by week will be devoted to theory and problem classes. These will be master classes in which the contents and theoretical results will be presented, complemented with the resolution of problems and practical exercises with an active participation of the student.

Type II: Problem's classes (6 hours). Models will be presented to students, with problems and exercises, in which some of the mathematical aspects appear of the subject. Some of them will be solved in class and others will serve as autonomous work material recommended for the student.

Type III: Practical classes (6 sessions of 2 hours each). With the students distributed in three subgroups, they will be developed in the classroom and schedule set by the center. In these sessions the students will use the Maxima free software to perform the proposed exercises.

4.3.Syllabus

Theme 1. Sets and relationships
1. Sets. Subsets. Operations between sets.
2. Correspondences and applications. Composition of applications.
3. Equivalence and order relations

Theme 2. Groups and rings
1. Groups
2. Rings
3. Divisibility in the ring of the integers and in the ring of the polynomials.
4. Modular arithmetic

Theme 3. Matrices and linear systems
1. Matrices. Operations with matrices
2. Linear systems. The Rouché-Frobenius theorem
3. The Gauss method
4. LU factorization
5. Iterative methods: Jacobi, Gauss-Seidel, relaxation.

Theme 4. Vector spaces
1. Vector space. Examples
2. Vector subspaces
3. Dependence and linear independence
4. Bases and dimension
5. Operations between vector subspaces

Theme 5. Linear applications
1. Linear application between vector spaces
2. The kernel and the image of a linear application
3. The matrix representation
4. Composition of linear applications

Theme 6. Spectral theory: eigenvalues ??and eigenvectors
1. Eigenvalues ??and eigenvectors of an endomorphism
2. Subspaces associated with an eigenvalue

3. Diagonalization of endomorphism
4. Applications

Theme 7. Euclidean space
1. Scalar product
2. Length and distance
3. Orthogonality
4. The method of orthogonalization of Gram-Schmidt
5. Orthogonal projections
6. The least squares method

PRACTICES
1. Operations with matrices
2. Linear systems. The Gauss method
3. LU factorization
4. Iterative methods for solving linear systems.
5. Related transformations
6. Iteratives methods for eigenvalues

4.4.Course planning and calendar

Master classes and problems in the classroom and laboratory sessions are taught according to the schedule established by the center (available on their website).

Each professor will inform about his tutoring schedule.

The rest of the activities will be planned according to the number of students and will be announced in advance.

The information will be available at http://add.unizar.es

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=30369&year=2019