Linear Algebra

Academic Year: (2022 / 2023) **Review date: 10-04-2022**

Department assigned to the subject: Department of Mathematics

Coordinating teacher: MOSCOSO CASTRO, MIGUEL ANGEL

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 1

Branch of knowledge: Engineering and Architecture

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

None.

OBJECTIVES

By the end of this content area, students will be able to have:

1. Knowledge and understanding of the mathematical principles of linear algebra underlying Engineering;
2. The ability to apply their knowledge and understanding to identify, formulate and solve mathematical problems of linear algebra using established methods;
3. The ability to select and use appropriate tools and methods to solve mathematical problems using linear algebra;
4. The ability to combine theory and practice to solve mathematical problems of linear algebra.

DESCRIPTION OF CONTENTS: PROGRAMME

Chapter 0. Real and complex numbers
0.1. Definition. Sum and product.
0.2. Conjugate, modulus and argument.
0.3. Complex exponential.
0.4. Powers and roots of complex numbers.

Chapter 1. Systems of linear equations.
1.1. Introduction to the systems of linear equations.
1.2. Row reduction and echelon forms.
1.3. Vector equations.
1.4. The matrix equation Ax=b.
1.5. Solution sets for linear systems.
1.6. Linear mappings.

Chapter 2. Matrix algebra
2.1. Matrix operations.
2.2. Inverse of a matrix.
2.3. Block matrices.
2.4. Determinants.

Chapter 3. Vector spaces.
3.1. Vector spaces and subspaces.
3.2. Linearly independent sets and bases.
3.3. Coordinate systems and dimension.
3.4. Linear transformations.

Chapter 4. Orthogonality and least-square problems.
4.1. Scalar product, norm and orthogonality.
4.2. Orthogonal sets.
4.3. Orthogonal projections.
4.4. The Gram-Schmidt method.
4.5. Least-square problems.

Chapter 5. Eigenvalues and eigenvectors.

5.1. Introduction to eigenvalues and eigenvectors.
5.2. The characteristic equation.
5.3. Diagonalization of square matrices.
5.4. Complex diagonalization.
5.5. Symmetric matrices. Spectral properties.

LEARNING ACTIVITIES AND METHODOLOGY

THEORETICAL PRACTICAL CLASSES.
Knowledge and concepts students must acquire. Receive course notes and will have basic reference texts. Students partake in exercises to resolve practical problems.

TUTORING SESSIONS.
Individualized attendance (individual tutoring) or in-group (group tutoring) for students with a teacher. Subjects with 6 credits have 4 hours of tutoring/ 100% on- site attendance.

STUDENT INDIVIDUAL WORK OR GROUP WORK.
Subjects with 6 credits have 98 hours/0% on-site.

WORKSHOPS AND LABORATORY SESSIONS.
Subjects with 3 credits have 4 hours with 100% on-site instruction. Subjects with 6 credits have 8 hours/100% on-site instruction.

ASSESSMENT SYSTEM

FINAL EXAM.
Global assessment of knowledge, skills and capacities acquired throughout the course. The percentage of the evaluation varies for each subject between 60% and 0%.

CONTINUOUS EVALUATION.
Assesses papers, projects, class presentations, debates, exercises, internships and workshops throughout the course. The percentage of the evaluation varies for each subject between 40% and 100% of the final grade.

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- David C. Lay, Steven R. Lay and Judy J. McDonald Linear algebra and its applications, Addison Wesley, 2015

ADDITIONAL BIBLIOGRAPHY

- Gilbert Strang Introduction to Linear Algebra, ¿Wellesley-Cambridge Press, 2016

- Jorge Arvesú, Francisco Marcellán and Jorge Sánchez Problemas Resueltos de Álgebra Lineal, Ediciones Paraninfo, 2015