Linear Algebra

Academic Year: (2020 / 2021) **Review date: 08-07-2020**

Department assigned to the subject: Mathematics Department

Coordinating teacher: MARTINEZ DOPICO, FROILAN CESAR

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)

It is not expected to have completed any subject since this is a first term/first year subject.

OBJECTIVES

1. Students have shown that they know and understand the mathematical language and the abstract-rigorous reasoning, as well as to apply them to state and prove precise results in several areas of mathematics.
2. Students have shown that they understand the fundamental results of linear algebra and matrix theory concerning vector spaces, inner product spaces, solving systems of linear equations and linear least squares problems.
3. Students have shown that they understand the basic arithmetic operations between complex numbers, that they are able to compute with them and to interpret geometrically such computations.
4. Students are able to use techniques from linear algebra and matrix theory to construct mathematical models of processes that appear in real world applications.
5. Students are able to communicate, in a precise and clear manner, ideas, problems and solutions related to linear algebra and matrix theory to any kind of audience (specialist or not).

DESCRIPTION OF CONTENTS: PROGRAMME

1. Complex numbers
2. Systems of linear equations
3. Matrix algebra and the LU factorization
4. Determinants
5. Vector spaces in applied settings
6. Linear transformations
7. Inner product spaces: norms and orthogonality
8. Orthogonal and unitary matrices
9. QR factorization

LEARNING ACTIVITIES AND METHODOLOGY

1. THEORETICAL-PRACTICAL CLASSES, where the knowledge that the students must acquire is explained and developed. Students will have basic reference texts to facilitate the understanding of the classes and the development of follow up work. The teacher and the students will solve exercises and practical problems, previously suggested by the teacher. There will be mid term tests for evaluating the competences and skills acquired by the students and for helping the students to improve their learning strategies.

2. TUTORING SESSIONS. Individualized attendance for students with a teacher for at least two hours a week.

3. STUDENT INDIVIDUAL OR GROUP WORK. Each student's individualized study, understanding of results and proofs, and exercise and problem solving is fundamental in mathematics, both for learning and for self-evaluation of acquired competences and skills. Solving exercises and problems and discussing theoretical results inside small groups of students is an excellent complementary activity for improving the learning.

ASSESSMENT SYSTEM

- Continuous evaluation: It corresponds to 50% of the final mark. It consists of two mid-term exams held along the course to assess the student's progression. Continuous evaluation also allows students themselves to modify their learning strategies, in case it is necessary.

- Final end-of-term exam: It corresponds to 50% of the final mark. It allows to assess the student's general understanding of the subject.

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

BASIC BIBLIOGRAPHY

- B. Noble, J.W. Daniel Applied Linear Algebra, Prentice-Hall, 1988
- C.D. Meyer Matrix Analysis and Applied Linear Algebra, SIAM, 2000
- D.C. Lay, S.R. Lay and J.J. McDonald Linear Algebra and its Applications, 5th edition, Pearson, 2016
- G. Strang Introduction to Linear Algebra, Wellesley-Cambridge Press, 2016
- S.R. García and R.A. Horn A Second Course in Linear Algebra, Cambridge University Press, 2017

ADDITIONAL BIBLIOGRAPHY

- P. Lancaster and M. Tismenetsky The Theory of Matrices with Applications, 2nd edition, Academic Press, Inc., 1985
- R.A. Horn and C.R. Johnson Matrix Analysis, 2nd edition, Cambridge University Press, 2013