Linear Algebra

Academic Year: (2024 / 2025) **Review date: 09-05-2024**

Department assigned to the subject: Mathematics Department

Coordinating teacher: GUERRERO CONTRERAS, MARIA PILAR

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 1

Branch of knowledge: Engineering and Architecture

OBJECTIVES

The student should acquire the background in linear algebra needed to understand and apply concepts and techniques for the solution of problems arising in the different areas of aerospace engineering.

A) Learning objectives

- To solve systems of linear equations and to interpret the results
- To determine whether a square matrix is invertible or not, and to compute the inverse matrix (if it exists)
- To understand the notion of bases and coordinates in a vector space
- To represent a linear transformation by a matrix
- To compute the image and kernel of a linear transformation
- To compute the eigenvalues and eigenvectors of a matrix
- To compute the SVD decomposition of a matrix
- To find an approximate solution to an overdetermined system by least-square fitting

B) Specific skills

- To be able to solve systems of linear equations
- To be able to model real-world problems using linear algebra techniques, and solve them using algorithmic procedures.
- To be able to handle the abstract properties of vector spaces.

C) General skills

- To be able to think abstractly, and to use induction and deduction.
- To be able to communicate in oral and written forms using appropriately mathematical language.
- To be able to model a real situation using linear algebra techniques.
- To be able to interpret a mathematical solution of a given problem, its accuracy, and its limitations.
- To be able to use mathematical software.

DESCRIPTION OF CONTENTS: PROGRAMME

0. Complex Numbers
1. Systems of Linear Equations
2. Vector spaces
3. Matrix Algebra
4. Linear transformations
5. Basis
6. Orthogonality and Least-Squares
7. Eigenvalues and Eigenvectors
8. Pseudoinverse and singular value decomposition

LEARNING ACTIVITIES AND METHODOLOGY

Lecture sessions: 3 credits
Problem sessions: 3 credits

ASSESSMENT SYSTEM

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

We follow a continuous-assessment system plus a final exam:

- The continuous-assessment part consists of two written exams contributing with weight 40% to the final mark. The mid-term exams will be held in regular class hours, according to current regulations.

- The final exam (contributing with weight 60% to the final mark) will be held at the end of the semester. (PO: a.).

BASIC BIBLIOGRAPHY

- D. C. LAY "Linear Algebra and Its Applications", Addison Wesley; 3 edition (2002).

- D. POOLE "Linear Algebra: A Modern Introduction", Brooks Cole; 3 edition (2010).

ADDITIONAL BIBLIOGRAPHY

- B. KOLMAN and D. R. HILL "Introductory Linear Algebra: An Applied First Course", Prentice Hall; 8 edition (2006).

- O. BRETSCHER "Linear algebra with applications", Prentice Hall (2001).