INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Algebra

Introducing

Description

Solving Linear Systems

Gaussian elimination, row and column operations, matrix interpretation

Pre-Hilbert and Euclidean Spaces

Scalar product: examples and properties

Orthogonality: Pythagoras' theorem, orthogonal bases, orthogonal projection

Reduction of Endomorphisms

Eigen-elements: eigenvalues, eigenvectors, characteristic polynomial

Diagonalization, triangularization

Applications: differential systems and linear recurrences

Endomorphisms of Euclidean Spaces

Isometries, orthogonal matrices

Reduction

Bilinear Algebra

Symmetric positive definite matrices: definition, properties, characterization

Orthogonality

List of Competencies:

1_1: Master the mathematical concepts and computational tools of the engineer

1_2: Develop rigorous scientific reasoning and the capacity for abstraction

2_1: Master the fundamental tools of the mathematical engineer

Objectives

The student should be able to:

Solve linear systems using row and column operations and provide a matrix-based interpretation.

Compute an orthogonal basis and perform orthogonal projections.

Provide a matrix interpretation of the main classes of endomorphisms in Euclidean spaces.

Diagonalize and triangularize simple matrices.

The student should have understood and be able to explain (main concepts):

The main results concerning matrix reduction.

The concept of scalar product and orthogonality.

The notion of Euclidean space and isometry.

Necessary prerequisites

First-year Linear Algebra: Vector spaces, linear maps, matrices, the concepts of image and kernel of a linear transformation.

First-year Analysis: Functions, limits, continuity, differentiability in one dimension, linear algebra (vector spaces, linear maps, matrices, vectors).

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

Toulouse