Summary
The purpose of this course is to introduce the basic notions of linear algebra and to prove rigorously the main results of the subject.

Content
- Linear forms, dual space, bilinear forms, sesquilinear forms, symmetric and hermitian matrices, Sylvester's theorem.
- Inner products: orthonormal bases, orthogonal projections, orthogonal and unitary matrices.
- Adjoint operator, self-adjoint and normal operators, spectral theorem, singular values.
- Systems of linear differential equations with constant coefficients.
- Basics of multilinear algebra

Keywords
inner product, bilinearity, orthogonality, scalar product, spectral theorem

Learning Prerequisites
Required courses
Linear algebra I

Learning Outcomes
By the end of the course, the student must be able to:
• Give an example to illustrate the basic concepts of the course
• State all definitions and theorems from the course
• Reconstruct proofs from the course
• Apply techniques from the course to various problems in mathematics and physics
• Compute basechange for linear maps, bilinear forms, sesquilinear forms; Gram matrix of a bilinear or sesquilinear form, Sylvester basis for a symmetric form, orthonormal basis for a given symmetric or symplectic form, orthogonal projection on a vector subspace, singular values of a linear map, Jordan normal form of a matrix, exponential of a matrix.
• Formulate main ideas of the course
• Synthesize major results of the course to give a ‘big picture’ of the material and its potential applications
• Create new proof of correct statements in linear algebra
• Design counterexamples for wrong statements in linear algebra

Transversal skills
• Use a work methodology appropriate to the task.
• Assess one's own level of skill acquisition, and plan their on-going learning goals.
• Continue to work through difficulties or initial failure to find optimal solutions.
• Access and evaluate appropriate sources of information.

Teaching methods
Ex cathedra course, exercises in classroom

Expected student activities
Understanding the course notes, solving the exercises

Assessment methods
Written exam

Supervision
Office hours  Yes
Assistants    Yes
Forum        No

Resources
Bibliography

Ressources en bibliothèque
• Algèbre linéaire / Dalang
• Algèbre linéaire / Cairoli
• Linear Algebra / Hoffman