

Course Specification Document

Title	Matrix Numerical Analysis
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Credits	4 ECTS
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Aims	This course aims to study analysis and stability of numerical methods in solving numerical linear algebra problems.
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Intended learning outcomes

On successful completion of this course, the student will be able to:

- Understand numerical methods for solving system of linear equations
- Understand the implications behind these modalities.
- Employ studied algorithms in finding appropriate solutions to applied problems.
- Correct use of numerical methods in solving engineering problems.

Syllabus

- **Representation of numbers and the concept of stability in numerical analysis:** IEEE standard in representation of numbers, errors from the numerical point of view, the concept of stability in numerical analysis, the concept of stability of numerical methods.
- **Elementary concepts in matrix numerical analysis:** Representation of a linear application with a matrix, square matrices on the field \mathbb{K} , properties of symmetric and hermetic matrices - matrix norms, the concept of sensitivity in linear algebra.
- **Direct methods for solving systems of linear equations:** Principle of direct methods for solving systems of linear equations, examples of direct methods, methods using orthogonal linear transformations, least squares method, QR factorization, Householder algorithm.
- **Iterative methods for solving systems of linear equations:** An overview of iterative methods, a description of some typical traditional methods, a study of convergence of iterative methods, error estimation and convergence speed, case of matrices with a dominant diagonal, case of symmetric and positive definite matrices, case of three block-diagonal matrices.
- **The eigenvalues and eigenvectors:** The sensitivity of the eigenvectors of a square matrix, iterative powers method, orthogonal iterative method.