Study programmes: Bachelor studies – Mathematics

Course name: M4.07 – Numerical Analysis 1A

Lecturers: Zorica Dražić

Status: Compulsory

ECTS: 5

Attendance prerequisites: -

Course aims: Acquisition of general and specific knowledge of numerical methods for linear algebra.

Course outcome: At the end of the course, a student will have a basic knowledge of numerical methods for linear algebra. Further, student will be able to solve real problems by implementing adequate numerical methods in computer program and using existing software packages.

Course content:

N**umerical methods for solving linear algebraic equations.**
Introduction to systems of linear algebraic equations. Overview of basic methods for solving the systems of linear algebraic equations. Othogonalization method. Conjugate gradient method. Steepest descent method. Relaxation method. Least squares method. Monte-Carlo method. The convergence of iterative methods for solving systems of linear equations. Optimization of convergence rate for the iteration method. Error estimates for the solution of linear algebraic systems. Conditionality of matrices and systems of linear algebraic equations. The infinite systems of linear algebraic equations.

N**umerical methods for evaluation of a determinant and an inverse of a matrix.**
Application of direct methods for solving linear system of equation in order to evaluate the determinant. Simultaneous solving multiple systems of linear algebraic equations. Finding an inverse of a matrix. Block matrices.

N**umerical methods for eigenvalue and eigenvector problems.**
Eigenvalue and eigenvector problems. The Method of Danilevsky. Krylov method. Leverrier method and its modification. The interpolation method. General eigenvalue problem. Iterative method for solving the eigenvalue problem. Power method. Trace method. Inner product method. Deflation method. Computing the second largest eigenvalue and corresponding eigenvector. Computing the second largest eigenvalue and corresponding eigenvector of a symmetric positive definite matrices. The reduction method. LR and QR algorithms. Jacobi method. Gershgorin circle theorem. Limits of the eigenvalues.

Literature:
A. Zolić, *Numerička matematika I,* Beograd 2008.
D. Radunović, *Numeričke metode,* Beograd 2003.

Number of hours: 4	**Lectures: 2**	**Exercises: 2**	**Laboratory: -**	**Research: -**

Teaching and learning methods: Frontal

Assessment (maximal 100 points)

Course assignments	**points**	**Final exam**	**points**
Lectures	-	Written exam	30
Exercises / Tutorials	-	Oral exam	40
Colloquia	-	Written-oral exam	-
Essay / Project	30		