Tárgytematika / Course Description

Numerical Analysis

GKNM_MSTA003

Tárgyfelelős neve / Teacher's name: dr. Gáspár Csaba

Félév / Semester: 2020/21/2

Beszámolási forma / Assesment: Vizsga

Tárgy heti óraszáma / Teaching hours(week): 2/2/0

Tárgy féléves óraszáma / Teaching hours(sem.): 0/0/0

OKTATÁS CÉLJA / AIM OF THE COURSE

The aim of the course is to provide an introduction to the tools of the classical and modern numerical analysis. The students can implement a part of the investigated methods in MATLAB language.

TANTÁRGY TARTALMA / DESCRIPTION

Week 1: Vector norms (Euclidean, sum, maximum norm). Matrix norms induced by vector norms.

Week 2: Banach's fixed point theorem and its applications.

Week 3: Direct mothods for linear systems of equations. The Gaussian elimination and its variants.

Week 4: Gaussian elimination for regular and singular matrices. Inversion of matrices.

Week 5: Iterative methods for linear systems of equations. Fixed point iteration, Ricardson's iteration, optimal choice of the iteration parameter. The Jacobi and Seidel iterations.

Week 6: Iterative methods for linear systems of equations. Variational methods, the (conjugate) gradient method. The method of least squares.

Week 7: Approximation of the extremal eigenvalues. The power iteration and the inverse iteration.

Week 8: Univariate interpolation problems. Lagrange, Hermite and cubic spline interpolation.

Week 9: Multivariate interpolation. Shepard's method and the Method of Radial Basis Functions.

Week 10: Nonlinear equations. Fixed point iteration. Newton's method andt its variants.

Week 11: Numerical solution of ordinary differential equations. Euler's method and its imprevements.

Week 12: Partial differential equations. Initial and boundary conditions.

Week 13: Numerical solution of partial differential equations by finite difference schemes.

Week 14: The priciples of the finite element method.

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESMENT'S METHOD

KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL