

Study programme(s): (Master in Mathematics Teaching MP)				
Level: master				
Course title: Numerical Solving of Equations (MP-08)				
Lecturer: Helena M. Zarin				
Status: obligatory				
ECTS: 5				
Requirements: none				
Learning objectives Introducing students to the specific procedures for the numerical solution of some classes of equations. The aim of practical exercises is mastering theoretical contents within an independent work on the computer.				
Learning outcomes Students should be qualified for the theoretical analysis and practical application of some numerical methods for solving systems of linear and nonlinear equations.				
Syllabus <i>Theoretical instruction</i> Norms of vectors and matrices. Systems of linear algebraic equations. Error bounds. Direct and iterative methods for solving linear systems. Convergence acceleration of iterative methods. Preconditioning. Krylov spaces approximations. Elements of differential calculus in higher-dimensional spaces. Systems of nonlinear equations. Banach contraction mapping principle. Newton's method. Quasi-Newton methods. Inexact Newton methods. Local and global convergence. <i>Practical instruction</i> Vector and matrix norms. Error bounds for solution of systems of linear equations. Gauss elimination method and its variants. LU matrix decomposition. Jacobi, Gauss-Seidel and relaxation methods and applications. Gradient methods and applications. General iterative method for nonlinear systems. Newton's method. Broyden's method. Nonlinear-linear methods. Local convergence and applications.				
Literature 1. A. Quarteroni, R. Sacco, F. Saleri, <i>Numerical Mathematics</i> , Springer, 2000. 2. J. Stoer, R. Bulirsch, <i>Introduction to Numerical Analysis</i> , Springer, 2002. 3. Z. Stojaković, D. Herceg, <i>Numeričke metode linearne algebre</i> , Građevinska knjiga, Beograd, 1985. 4. D. Herceg, Z. Stojaković, <i>Numeričke metode linearne algebre, zbirka zadataka</i> , Građevinska knjiga, Beograd, 1981.				
Weekly teaching load				Other: 0
Lectures: 3	Exercises: 1	Other forms of teaching: 0	Student research: 0	
Teaching methodology Lectures are presented using classical teaching methods and supported by beamer presentations. Exercises are used to practise and analyse typical problems and their solutions within the independent work on a computer using the adequate software packages. The ability of application of theoretical knowledge is verified through independent solving of exercises on two colloquia. At the final oral examination, students should demonstrate in-depth understanding of the presented theoretical material.				
Grading (maximum number of points 100)				
Pre-exam obligations	points	Final exam	points	
Colloquia	50	Oral exam	50	