ERASMUS+
EU programme for education, training, youth and sport

Incoming student mobility

UNIOS University Unit: SCHOOL OF APPLIED MATHEMATICS AND INFORMATICS

COURSES OFFERED IN FOREIGN LANGUAGE
FOR ERASMUS+ INDIVIDUAL INCOMING STUDENTS

Department or Chair within the UNIOS Unit	School of Applied Mathematics and Informatics

Study program	Graduate university study programme in mathematics (Master level) Branch: • Mathematics and Computer Science-obligatory

Study level	Graduate (master)

Course title	Applied linear algebra and scientific computing
Course code (if any)	MI009
Language of instruction	English
Brief course description	Syllabus. 1. Introduction. Basic algorithms, structure exploitation, vectorization. Floating point arithmetic. Matrix analysis. Basic ideas of linear algebra. Norm of vectors and matrices. Matrix condition and sensitivity of quadratic and linear systems. 2. Solving a system of linear equations. Triangular systems, LU-decomposition, Gaussian algorithm, pivoting. QR decomposition, Householder matrices. Positive definitive systems. Cholesky decomposition. 3. Iterative methods for solving linear systems. Standard methods (Jacobi and Gauss-Seidel). Relaxation methods. Large sparse linear systems of equations. Preconditioning. Methods based on Krylov subspaces. 4. Linear least squares problem. Orthogonality. Givens matrices, SVD decomposition. Linear least squares linear problem. 5. Eigenvalue problems. General eigenvalue problems, properties and decomposition. Schur decomposition, matrix reduction on Hessenberg and triangular form. Symmetric eigenvalue problem, properties and decompositions. Power method, Rayleigh quotient. Iterative methods for finding eigenvalues. Reduction to bilinear form, QR algorithm. 6. Models with applications of numerical linear algebra. Heat

	dissipation of electronic components. Numerical solution of the Poisson equation. System of masses with elastic springs. Material density calculation. 7. Models with differential equations. Approximation of boundary problems by finite differences, finite elements. Wave equation, conduction equation. 8. Discrete Fourier transform. Trigonometric interpolation. Fast Fourier Transform (FFT). 9. Case studies. Models are studied including image deblurring, clustering, and the epidemiological model.
Form of teaching	
Form of assessment	Lectures and exercises are obligatory. The exam consists of a written and an oral part. After completion of lectures and exercises students can take the exam. Acceptable mid-term exam scores replace the written examination.
Number of ECTS	9
Class hours per week	4+2+1
Minimum number of students	
Period of realization	Summer semester
Lecturer	Ninoslav Truhar