Course Unit Descriptor

Study Programme: Applied Mathematics – Data Science

Course Unit Title: Numerical linear algebra 2

Course Unit Code: MDS15

Name of Lecturer(s): Vladimir R. Kostić

Type and Level of Studies: master studies

Course Status (compulsory/elective): elective

Semester (winter/summer): summer

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): face-to-face

Number of ECTS Allocated: 6

Prerequisites: Numerical methods of linear algebra 1

Course Aims:

Mastering basic algorithms of numerical linear algebra for large eigenvalue problems and thier implementation in MATLAB.

Learning Outcomes:

Students will be able to use successfully algorithms of numerical linear algebra for eigenvalue computations built-in in MATLAB, to independently solve problems in the field of applied linear algebra and to construct advanced numerical tehcniques for large eigenvalue and singular value problems.

Syllabus:

Theory

Basis of iterative methods for solving eigenvalue and singular value problems. Krylov subspace methods for sparse matrces and their paralelization. Preconditioning. Non-standard eigenvalue techniques. Nonnormal matirces and pseudospectral computations. Implementation of algorithms in MATLAB

Practice

Use of built-in functions in MATLAB for solution of large eigenvalue and singular value problems arising in applications (dynamical systems, control theory, signal processing, network theory). Implementation of advanced numerical algorithms in MATLAB.

Required Reading:

1. Lloyd N. Trefethen and David Bau, III: Numerical Linear Algebra, SIAM, 1997.
2. James W. Demmel: Applied Numerical Linear Algebra, SIAM, 1997.
3. Yousef Saad: Numerical Methods for Large Eigenvalue Problems, Revised Edition (Classics in Applied Mathematics), SIAM, 2011

Weekly Contact Hours:	**Lectures:** 2	**Practical work:** 3

Teaching Methods:

Lectures, revisions of the material, active student participation in problem solving, knowledge tests - colloquia.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class participation		written exam	50
Practical work		oral exam	
Preliminary exam(s)	50	…….	
Seminar(s)			
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			