**Study programme(s)**: Applied Mathematics – Data Science

**Level**: master studies

**Course title:** Numerical linear algebra 2

**Lecturer:** Vladimir R. Kostić

**Status**: elective

**ECTS**: 6

**Requirements**: Numerical methods of linear algebra 1

**Learning objectives**
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**
*Theoretical instruction*
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. Non-normal matirces and pseudospectral computations. Implementation of algorithms in MATLAB.

*Practical instruction*
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.

**Literature**
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 teaching load** | | | | Other: 0 |
|---|---|---|---|---|
| Lectures: 2 | Exercises 3 | Other forms of teaching: 0 | Student research: 0 | |

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

**Grading method (maximal number of points 100)**

| **Pre-exam obligations** | **points** | **Final exam** | **points** |
|---|---|---|---|
| Colloquia | 50 | written exam | 50 |