M019	Obligatory - Semester 3	**Linear Algebra II**	L+P+S 2+2+0	ECTS 6

Course objectives. Adopting concepts of vector and unitary space, introducing concepts of linear operators over finite-dimensional spaces. Understanding the importance of the matrix when working with such operators and the ability to apply what has been learned from matrix calculus in the course Linear Algebra I.

Course prerequisites. *Geometry of Plane and Space,* Linear Algebra I.

Syllabus.

1. Linear operators: Basic properties of linear operators. Rank-Nullity Theorem. The space of linear operators. Matrix representation of linear operator. Transition matirx. *Similar matrices*. Spectrum. Characteristic polynomial. Diagonalization. Hamilton-Cayley theorem. Minimal polynomial.
2. Unitarny spaces: Inner product. Norm. Orthogonality. *Gram-Schmidt orthogonalization*. Orthogonal complement. Operators in unitary space. Unitary operators. Hermitian adjoint. Hermitian operators. Diagonalization of symmetric matrices.

Expected learning outcomes.

After completing the course, students are expected to:

- check linearity of the operator;
- explain the concepts of rank and nullity of linear operators;
- determine the matrix form of linear operators;
- demonstrate the definition of eigenvalues and eigenvectors;
- describe the finding of the characteristic and minimal polynomial of a linear operator;
- state the definition and examples of the inner product;
- implement Gram-Schmidt orthogonalization;
- explain the procedure of diagonalization;
- implement mathematical proof of soundness of procedures and formulas used in this course.

Teaching methods and student assessment. Lectures and exercises are obligatory. The exam consists of a written and an oral part and it is taken after the completion of lectures. During the semester, students can take two mid-term exams (quizzes) that replace the written exam.

Can the course be taught in English: Yes.

Basic literature:

1. D. Bakić, Linearna algebra, Školska knjiga, Zagreb, 2008.

Recommended literature :

1. S. Kurepa, Uvod u linearnu algebru, Školska knjiga, Zagreb, 1987.
2. S. Kurepa, Konačno dimenzionalni vektorski prostori i primjene, Liber, Zagreb, 1992.
3. N. Bakić, A. Milas, Zbirka zadataka iz linearne algebre, PMF-Matematički odjel Sveučilišta u Zagrebu, 1995.
4. L. Čaklović, Zbirka zadataka iz linearne algebre, Školska knjiga, 1992.
5. K. Horvatić, Linearna algebra, Golden marketing, Tehnička knjiga, Zagreb, 2004.
6. G. Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press, 2009.
7. J. Hefferon, Linear Algebra, http://joshua.smcvt.edu/linearalgebra/
8. S. Axler, Linear Algebra Done Right, Springer, 2009.
9. C. Meyer, Matrix Analysis and Applied Linear Algebra, SIAM, 2001.
10. N. Elezović, A. Aglić, Linearna algebra: zbirka zadataka, Element, Zagreb, 1999.

V. Proskurjakov, Problems in linear algebra, Mir, Moskva, 1978.