M099	**Vector Spaces**	L	S	E	ECTS
		2	0	2	6

The aim of the course. This course generalizes concepts and results the students have met in Linear Algebra courses. Through more abstract algebraic approach, followed by detailed proofs of given results related to the vector and inner spaces, our aim is to better and more clearly understand the material used in most modern mathematical disciplines.

Prerequisites. Linear Algebra I and II.

Course content.

1. Dual space, dual basis and dual operator. Canonical isomorphism between the vector space and its bidual space. Nilpotent operators, cyclic bases and elementary Jordan cells. Reduction of the nilpotent operators.
2. Semisimple operators. Polynomials of the operators. Relatively simple polynomials.
3. Hermitian and normal operators. Spectral theorems. Positive operators and isometries. Polar form.
4. Operators on complex and real vector spaces. Complexification of vector space and complexification of an operator. Operators on real unitary spaces. Operators on normed spaces.

LEARNING OUTCOMES

No.	**LEARNING OUTCOMES**
1.	Construct dual space and dual operator.
2.	Apply the properties of nilpotent operators.
3.	Construct the matrix of certain operators.
4.	Distinguish the basic properties of operators on inner spaces.
5.	Apply the spectral theorem.
6.	Analyze operators on real vector space and determine the corresponding complexification.

COUPLING OF THE EXPECTED LEARNING OUTCOMES, TEACHING PROCESS ORGANIZATION AND THE EVALUATION OF THE TEACHING OUTCOMES

TEACHING PROCESS ORGANIZATION	**ECTS**	**LEARNING OUTCOMES ****	**STUDENT ACTIVITIES***	**EVALUATION METHOD**	**SCORE**	
					Min	**max**
Lecture attendance	1	1-6	Lecture attendance, discussion, team work and independent work on given tasks.	Attendance sheets, tracking activities	0	4

Written exam (preliminary exam)	2	1-6	Preparing for written exam.	Evaluation.	25	48
Final exam.	3	1-6	Repetition of the subject matter.	Oral exam.	25	48
Total	6				50	100

Teaching and evaluation of knowledge. Attending lectures and exercises is required. The exam consists of a written and oral part, and can be taken after the completion of lectures and exercises. During the semester students can take preliminary exams that replace the written examination.

Can the course be taught in English: Yes

Basic literature:

1. H. Kraljević, Vektorski prostori, reviewed materials available at the web pages of Department of mathematics, University of Osijek, 2008.

Adittional literature:

1. D. Bakić, Linearna algebra, Školska knjiga, Zagreb, 2008.
2. N. Bakić, A. Milas, Zbirka zadataka iz linearne algebre, PMF-Matematički odjel Sveučilišta u Zagrebu, 1995.
3. N. Elezović, A. Aglić, Linearna algebra: zbirka zadataka, Element, Zagreb, 1999.
4. S. Axler, Linear algebra done right, Springer, 2009.