UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	**Linearna algebra**
Course title:	Linear Algebra

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Matematika		**1.**	**2.**
Mathematics		**1.**	**2.**

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
60		**60**			**120**	**8**

Nosilec predmeta / Lecturer: Daniel Eremita

Jeziki / Languages:	Predavanja / Lectures:	SLOVENSKO/SLOVENE
	Vaje / Tutorial:	SLOVENSKO/SLOVENE

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisits:
Jih ni.	There are none.

Vsebina:	Content (Syllabus outline):
Vektorski prostori: prostori in podprostori; baza; dimenzija; vsote in direktne vsote. Linearne preslikave: primeri in osnovne lastnosti; jedro in slika; prostori linearnih preslikav; izomorfizmi vektorskih prostorov. Linearne preslikave in matrike: matriki prirejena preslikava; preslikavi prirejena matrika; sprememba baze in podobne matrike. Lastne vrednosti in lastni vektorji: osnovne lastnosti; zgornje trikotne matrike; minimalni	Vector spaces: spaces and subspaces; base; dimension; sums and direct sums. Linear transformations: examples and basic properties; kernel and image; spaces of linear transformations; isomorphisms. Linear transformations and matrices: transformation of a matrix; matrix of a transformation; base change and similar matrices.

polinom; karakteristični polinom; Cayley-Hamiltonov izrek; diagonalizacija; Jordanova kanonična forma. Prostori s skalarnim produktom: Evklidski prostori; unitarni prostori; pravokotnost in ortogonalne baze; ortogonalni komplementi; dualni prostor in Rieszov izrek. Preslikave v Evklidskih in unitarnih prostorih: adjungirane; normalne; sebi-adjungirane; ortogonalne in unitarne; pozitivno (semi)definitne.	Eigenvalueas and eigenvectors: basic properties; upper triangular matrices; minimal polynomial; characteristic polynomial; Cayley-Hamilton theorem; diagonalization; Jordan canonical form. Spaces with inner product: Euclidean spaces; unitary spaces; orthogonality and orthogonal bases; orthogonal complement; dual spaces and Riesz theorem. Transformations in Euclidean and unitary spaces: adjoint; normal; self-adjoint; orthogonal and unitary; positive (semi)definite.

Temeljni literatura in viri / Readings:

T. Košir, Linearna algebra (spletna skripta)
http://www.fmf.unilj.si/~kosir/poucevanje/0607/linalg.html
http://www.fmf.uni-lj.si/~kosir/poucevanje/0809/alg1-fm.html
M. Kolar, B. Zgrablič, Več kot nobena, a manj kot tisoč in ena rešena naloga iz linearne algebre, Pedagoška fakulteta Ljubljana, Ljubljana, 1996.
C. Scheiderer, Lineare Algebra I und II (spletna skripta)
http://www.uni-duisburg.de/FB11/LEHRE/LINALG/LA.public.pdf
M. Dobovišek, D. Kobal, B. Magajna, Naloge iz algebre I, DMFA založništvo, Ljubljana, 2005.
R. Kaye, R. Wilson, Linear Algebra, Oxford University Press, Oxford, 1998.

Cilji in kompetence:	**Objectives and competences:**
Temeljito spoznati vektorske prostore in linearne preslikave.	To know thoroughly vector spaces and linear transformation.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: • Razumevanje vektorskih prostorov in linearnih transformacij. • Povezovanje teorije s predmetov »Vektorji in matrike«. Prenesljive/ključne spretnosti in drugi atributi: • Pridobljena znanja so podlaga za večino predmetov v nadaljevanju študija.	Knowledge and Understanding: • Be able to understand vector spaces and linear transformations. • Be able to connect the theory with the subject »Vectors and Matrices«. Transferable/Key Skills and other attributes: • The obtained knowledge is a basis for most of the later subjects.

Metode poučevanja in učenja:	**Learning and teaching methods:**

• Predavanja • Teoretične vaje	• Lectures • Theoretical exercises

Načini ocenjevanja: | **Assessment:**

Izpit:	Delež (v %) / Weight (in %)	Exams:
Pisni izpit – problemi, Ustni izpit – teorija.	50% 50%	Written exam – problems, Oral exam – theory.
Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.		Each of the mentioned assessments must be assessed with a passing grade.
Opravljen pisni izpit – problemi je pogoj za pristop k ustnemu izpitu – teorija.		Passing grade of written exam – problems is required to take the oral exam – theory.
Pisni izpit – problemi se lahko nadomesti z dvema delnima testoma (sprotne obveznosti).		Written exam – problems can be repalced with two mid-term tests.

Reference nosilca / Lecturer's references:

1. EREMITA, Daniel. Biderivations on tensor products of algebras. *Communications in algebra*, ISSN 0092-7872, 2018, vol. 46, iss. 4, str. 1722-1726. http://doi.org/10.1080/00927872.2017.1355375, doi: 10.1080/00927872.2017.1355375.

2. EREMITA, Daniel. Commuting traces of upper triangular matrix rings. *Aequationes mathematicae*, ISSN 0001-9054, June 2017, vol. 91, iss. 3, str. 563-578. http://doi.org/10.1007/s00010-016-0462-7, doi: 10.1007/s00010-016-0462-7.

3. EREMITA, Daniel. Biderivations of triangular rings revisited. *Bulletin of the Malaysian Mathematical Society*, ISSN 0126-6705, Apr. 2017, vol. 40, iss. 2, str. 505-522. http://doi.org/10.1007/s40840-017-0451-6, doi: 10.1007/s40840-017-0451-6.

4. EREMITA, Daniel. Functional identities in upper triangular matrix rings. *Linear Algebra and its Applications*, ISSN 0024-3795. [Print ed.], 2016, vol. 493, str. 580-605. http://dx.doi.org/10.1016/j.laa.2015.12.022.

5. EREMITA, Daniel. Functional identities of degree 2 in triangular rings revisited. *Linear and Multilinear Algebra*, ISSN 0308-1087, 2015, vol. 63, iss. 3, str. 534-553. http://dx.doi.org/10.1080/03081087.2013.877012.