



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

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			150	9

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:

Vsaka izmed naštetih obveznosti v načinih ocenjevanja mora biti opravljena s pozitivno oceno.

Pozitivna ocena pri pisnem izpitu je pogoj za pristop k ustnemu izpitu.

Vsebina:

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.

Prerequisites:

Each of the mentioned assessments must be assessed with a passing grade.

Passing grade of written exam is required to take the oral exam.

Content (Syllabus outline):

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.

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 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.	Linear transformations and matrices: transformation of a matrix; matrix of a transformation; base change and similar matrices. Eigenvalues 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.
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Temeljni literatura in viri / Readings:

J. Grasselli, A. Vadnal: Linearna algebra, linearno programiranje, DMFA Slovenije, Ljubljana, 1994.
R. Kaye, R. Wilson: Linear Algebra, Oxford University Press, Oxford, 1998.
S. Lang: Introduction to linear algebra, Springer-Verlag, New York [etc.], 1986.

Dodatna literatura / Additional Readings:

S. H. Friedberg, L. E. Spence, A. J. Insel: Linear algebra, 4th ed., Pearson, Harlow (Essex), 2014.
T. Košir: Linearna algebra (spletna skripta)
<https://users.fmf.uni-lj.si/kosir/poucevanje/0910/alg1-fm.html>
M. Kolar, B. Zgrablić: Več kot nobena, a manj kot tisoč in ena rešena naloga iz linearne algebre, Pedagoška fakulteta Ljubljana, Ljubljana, 1996.

Cilji in kompetence:

Temeljito spoznati vektorske prostore in linearne preslikave.

Objectives and competences:

To know thoroughly vector spaces and linear transformation.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Razumevanje vektorskih prostorov in linearnih transformacij.
- Povezovanje teorije s predmetov »Vektorji in matrike«.

Intended learning outcomes:

Knowledge and Understanding:

- Be able to understand vector spaces and linear transformations.
- Be able to connect the theory with the subject »Vectors and Matrices«.

Prenesljive/ključne spretnosti in drugi atributi: Pridobljena znanja so podlaga za večino predmetov v nadaljevanju študija.		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:	
Pisni izpit Ustni izpit		Delež (v %) / Weight (in %)	Written exam Oral exam
		50% 50%	

Opombe:

Pisni izpit se lahko nadomesti s kolokviji v enakem deležu 50%.

Comments:

Written exam can be replaced by written midterm examination in the weight of 50%.

Reference nosilca / Lecturer's references:

- EREMITA, Daniel. Biderivations and commuting linear maps on current Lie algebras. *Journal of Lie theory*. 2021, vol. 31, no. 1, str. 119-126. ISSN 0949-5932. [COBISS.SI-ID [100444419](#)]
- BENKOVIČ, Dominik, EREMITA, Daniel. Generalized derivations of current Lie algebras. *Communications in algebra*. 2024, vol. 52, iss. 11, str. 4603-4611. ISSN 0092-7872. [COBISS.SI-ID [200554755](#)]
- EREMITA, Daniel. Dhara, B. (6-BELDC-M); Ghosh, S. (6-JDVP); Sandhu, G. S. (6-PMNC-M): On Lie ideals satisfying certain differential identities in prime rings. (English summary). - Extracta Math. 38 (2023), no. 1, 67–84. *MathSciNet : Mathematical Reviews on the Web*. [Spletna izd.]. 2024, 1 spletni vir (mr4608757). ISSN 2167-5163. [COBISS.SI-ID [200562435](#)]
- EREMITA, Daniel. Krempa, Jan (PL-WASW-IM): On nil algebras and a problem of Passman concerning nilpotent free algebras. (English summary). - Algebra and coding theory, 197-204, Contemp. Math., 785, Amer. Math. Soc., [Providence], RI, [2023], ©2023. *MathSciNet : Mathematical Reviews on the Web*. [Spletna izd.]. 2024, 1 spletni vir (mr4586441). ISSN 2167-5163. [COBISS.SI-ID [215992579](#)]
- EREMITA, Daniel. Tiwari, S. K. (6-IITPT-DM): Product and commuting generalized derivations in prime rings. (English summary). - Rend. Circ. Mat. Palermo (2) 72 (2023), no. 2, 1377–1397. *MathSciNet : Mathematical Reviews on the Web*. [Spletna izd.]. 2024, 1 spletni vir (mr4559105). ISSN 2167-5163. [COBISS.SI-ID [200564227](#)]