



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Algebraične strukture

Course title: Algebraic structures

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester
Enovit magistrski študijski program druge stopnje Predmetni učitelj	/	1.	2.
Five-year master's degree program Subject Teacher	/		

Vrsta predmeta / Course type

Obvezni / Obligatory

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
45	-	30	-	-	75	5

Nosilec predmeta / Lecturer:

Mateja Grašič

Jeziki / Predavanja / Lectures: slovenski / Slovene

Languages: Vaje / Tutorial: slovenski / Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Pogojev ni.

Prerequisites:

None.

Vsebina:

Content (Syllabus outline):

Vektorski prostori: prostori in podprostori, baza, dimenzija, vsote in direktne vsote podprostorov.

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, karakteristični polinom, diagonalizacija.

Prostori s skalarnim produktom: Evklidski prostori, unitarni prostori, pravokotnost in ortogonalne baze.

Vector spaces: spaces and subspaces, basis, dimension, sums and direct sums of subspaces.

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; change of basis and similar matrices.

Eigenvalues and eigenvectors: basic properties, characteristic polynomial, diagonalization.

Spaces with inner product: Euclidean spaces, unitary spaces, orthogonality and orthogonal bases.

Temeljni literatura in viri / Readings:

S. Axler, Linear algebra done Right, 2nd Edition, Springer, 1997.

T. Košir, Linearna algebra (spletna skripta)
<http://www.fmf.uni-lj.si/~kosir/poucevanje/0809/alg1-fm.html>

M. Dobovišek, D. Kobal, B. Magajna, Naloge iz algebre I, DMFA založništvo, Ljubljana, 2005.

M. Kolar, B. Zgrablič, Več kot nobena, a manj kot tisoč in ena rešena naloga iz linearne algebre, Pedagoška fakulteta Ljubljana, Ljubljana, 1996.

Cilji in kompetence:

Spoznati temeljne koncepte v povezavi z vektorskimi prostori (linearna neodvisnost, baza, razsežnost) in linearnimi preslikavami (matrika linearne preslikave, matrika prehoda med bazama, lastne vrednosti, diagonalizabilnost), s poudarkom na končno razsežnih vektorskih prostorih.

Objectives and competences:

To know the fundamental concepts related to vector spaces (linear independence, basis, dimension) and linear transformations (matrix of a linear transformation, change of basis, eigenvalues, diagonalizability), with an emphasis on finite-dimensional vector spaces.

Predvideni študijski rezultati:

Znanje in razumevanje:
Po zaključku tega predmeta bo študent sposoben

- razumeti osnovne pojme iz teorije vektorskih prostorov in linearnih preslikav;
- razložiti in uporabljati osnovne rezultate teorije končno razsežnih vektorskih prostorov in linearnih preslikav;
- za reševanje problemov uporabiti teorijo končno razsežnih vektorskih prostorov in linearnih preslikav.

Intended learning outcomes:

Knowledge and understanding:
On completion of this course, the student will be able to

- understand the basic concepts of the vector space theory and linear transformations;
- explain and apply basic results from the theory of finite dimensional vector spaces and linear transformations;
- apply the theory of finite dimensional vector spaces and linear transformations to solve problems.

<p>Prenosljive/ključne spretnosti in drugi atributi:</p> <ul style="list-style-type: none"> • Spretnosti komuniciranja: ustni zagovor izpita, pisno izražanje pri pisnem izpitu. • Uporaba informacijske tehnologije: uporaba računalna ali računalniških aplikacij pri reševanju problemov. • Reševanje problemov: reševanje problemov s pomočjo metod iz teorije vektorskih prostorov in linearnih preslikav.

<p>Transferable/key skills and other attributes:</p> <ul style="list-style-type: none"> • Communication skills: oral defence of the examination, written expression in the written examination. • Use of information technology: use of a calculator or computer applications in problem solving. • Problem solving: problem solving using methods from vector space theory and linear transformations.

Metode poučevanja in učenja:

Learning and teaching methods:

<ul style="list-style-type: none"> • Predavanja • Seminarske vaje • Individualno delo

<ul style="list-style-type: none"> • Lectures • Excercises • Individual work

Delež (v %) /
Weight (in %)

Načini ocenjevanja:

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Pisni izpit – praktični del Ustni izpit – teoretični del</p> <p>Pisni izpit – praktični del se lahko nadomesti z dvema delnima testoma (sprotni obveznosti).</p> <p>Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.</p> <p>Positivna ocena pri pisnem testu je pogoj za pristop k izpitu.</p>	<p>50% 50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Written exam – practical part Oral exam – theoretical part</p> <p>Written exam – practical part can be replaced by two partial tests (mid-term testing).</p> <p>Each of the mentioned commitments must be assessed with a passing grade.</p> <p>Passing grade of the written test is required for taking the exam.</p>
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Reference nosilca / Lecturer's references:

<ol style="list-style-type: none"> 1. BENKOVIČ, Dominik, GRAŠIČ, Mateja. Jordan $\{g,h\}\{\diamond,h\}$-derivations of unital algebras. <i>Operators and matrices</i>. 2022, vol. 16, no. 2, str. 415-428. ISSN 1846-3886. http://oam.ele-math.com/16-32/Jordan-g,h-derivations-of-unital-algebras, DOI: 10.7153/oam-2022-16-32. [COBISS.SI-ID 114972163], 2. GRAŠIČ, Mateja, TRATNIK, Niko. <i>Zbrano gradivo : vaje pri predmetu Osnove linearne algebre in vektorske analize</i>. Maribor: Fakulteta za naravoslovje in matematiko, Oddelek za matematiko in računalništvo, 2021. 1 spletni vir (1 datoteka PDF (IV, 49 str.)). https://omr.fnm.um.si/wp-content/uploads/2019/01/olava_gradivo_vaje.pdf. [COBISS.SI-ID 73445123] 3. XIA, Yong-Hui, GRAŠIČ, Mateja, HUANG, Wentao, ROMANOVSKI, Valery. Limit cycles in a model of olfactory sensory neurons. <i>International journal of bifurcation and chaos in applied sciences and engineering</i>. 2019, vol. 29, no. 3, str. 1950038-1-1950038-9. ISSN 0218-1274. DOI: 10.1142/S021812741950038X. [COBISS.SI-ID 22250006], 4. BENKOVIČ, Dominik, GRAŠIČ, Mateja. Generalized skew derivations on triangular algebras determined by action on zero products. <i>Communications in algebra</i>. 2018, vol. 46, iss. 5, str. 1859-1867. ISSN 0092-

7872. <https://doi.org/10.1080/00927872.2017.1360334>, DOI: [10.1080/00927872.2017.1360334](https://doi.org/10.1080/00927872.2017.1360334).
[COBISS.SI-ID [18505817](#)].