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 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 / Languages:	**Predavanja / Lectures:**	**slovenski / Slovene**
	Vaje / Tutorial:	**slovenski / Slovene**

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisits:
Ne	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; karakteristični polinom;diagonalizacija. Prostori s skalarnim produktom: Evklidski prostori; unitarni prostori; pravokotnost in ortogonalne baze. Grupe in podgrupe. Osnovni pojmi in primeri. Red elementa, ciklična grupa. Kolobarji, obsegi in polja: osnovni pojmi in primeri.	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. Eigenvalueas and eigenvectors: basic properties; characteristic polynomial; diagonalization. Spaces with inner product: Euclidean spaces; unitary spaces; orthogonality and orthogonal bases. Groups and subgroups. Basic concepts and examples. Order of an element, cyclic. Rings, division rings and fields: basic concepts and examples.

Temeljni literatura in viri / Readings:

S. Axler, Linear algebra done Right, 2nd Edition, Springler, 1997.
M. Brešar, Uvod v algebro, DMFA založništvo, Ljubljana, 2018.
S. Lang, Undergraduate Algebra, Springer, 2005.
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:	**Objectives and competences:**
Spoznati osnovne algebraične strukture s poudarkom na vektorskih prostorih in linearnih preslikavah.	To know basic algebraic structures with a special emphasize on vector spaces and linear transformations.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: • Razumevanje vektorskih prostorov in linearnih transformacij. • Poznavanje grup, kolbarjev in obsegov. • Povezovanje teorije s predmetom Matrični račun.	Knowledge and understanding: • To be able to understand vector spaces and linear transformations. • To know groups, rings and fields. • To be able to connect the theory with the subject Matrix Algebra.

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

• Predavanja • Seminarske vaje • Individualno delo	• Lectures • Excersises • Individual work

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

Reference nosilca / Lecturer's references:

1. XIA, Yong-Hui, GRAŠIČ, Mateja, HUANG, Wentao, ROMANOVSKI, Valery. Limit cycles in a model of olfactory sensory neurons. *International journal of bifurcation and chaos in applied sciences and engineering*. 2019, vol. 29, no. 3, str. 1950038-1-1950038-9. ISSN 0218-1274. DOI: 10.1142/S021812741950038X. [COBISS.SI-ID 22250006]

2. BENKOVIČ, Dominik, GRAŠIČ, Mateja. Generalized skew derivations on triangular algebras determined by action on zero products. *Communications in algebra*. 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. [COBISS.SI-ID 18505817]

3. GRAŠIČ, Mateja. Zero product determined Jordan algebras, II. *Algebra colloquium*. 2015, vol. 22, iss. 1, str. 109-118. ISSN 1005-3867. DOI: 10.1142/S1005386715000103. [COBISS.SI-ID 21136136]

4. BENKOVIČ, Dominik, GRAŠIČ, Mateja. Generalized derivations on unital algebras determined by action on zero products. *Linear Algebra and its Applications*. [Print ed.]. 2014, vol. 445, str. 347-368. ISSN 0024-3795. http://dx.doi.org/10.1016/j.laa.2013.12.010. [COBISS.SI-ID 20314120]

5. BIERWIRTH, Hannes, BREŠAR, Matej, GRAŠIČ, Mateja. On maps determined by zero products. *Communications in algebra*. 2012, vol. 40, no. 6, str. 2081-2090. ISSN 0092-7872. http://dx.doi.org/10.1080/00927872.2011.570833. [COBISS.SI-ID 16315481]