Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Vektorji in matrike**
Course title:	Vectors and Matrices

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

Vrsta predmeta / Course type	obvezni/compulsory
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		**45**			**150**	**8**

Nosilec predmeta / Lecturer:	Dominik BENKOVIČ

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):**
Vektorji v ravnini in prostoru, linearne kombinacije, kolinearnost in koplanarnost. Linearna neodvisnost vektorjev, baza in dimenzija prostora. Koordinate vektorja, zamenjava baze. Skalarni produkt vektorjev, ortonormirana baza prostora in pravokotni koordinatni sistem. Vektorski in mešani produkt vektorjev, ploščina paralelograma, prostornina prizme.	Vectors on the plane and in the space, linear combinations, colinearity and coplanarity. Linear independency of vectors, the basis and the dimension of a space. Coordinates of a vector, the change of basis. Inner product of vectors, an orthonormal basis of the space, a rectangular coordinate system. Cross product of vectors and mixed product, the area of a parallelogram and the volume of a prism.

Enačba premice v ravnini, medsebojna lega premic. Razdalja med točko in premico, kot med dvema premicama. Premice in ravnine v prostoru, koordinatni zapis in medsebojna lega. Matrike. Seštevanje matrik in množenje s skalarji. Transponirana matrika. Rang matrike. Množenje matrik, inverzna matrika. Linearna enačba. Sistemi linearnih enačb in njihov matrični zapis. Množici rešitev homogenega in nehomogenega sistema linearnih enačb. Gaussova eliminacijska metoda. Elementarne transformacije nad vrsticami matrike in elementarne matrike. Determinanta kvadratne matrike in njene značilne lastnosti. Determinanta produkta matrik. Obrazec za inverzno matriko in rešitev kvadratnega sistema linearnih enačb.	Equation of a line in the plane, the interrelation of lines. The distance between a point and a line, the angle between two lines. Lines and planes in the space, their equations and interrelations. Matrices. Matrix addition and scalar multiplication. The transpose matrix. Rank of a matrix. Matrix multiplication, the inverse matrix. Linear equation. Systems of linear equations and their matrix form. The sets of solutions of a homogeneous and a non-homogeneous system of linear exuations. The Gauss elimination method. Elementary transformations of matrix rows and elementary matrices. Determinant of a square matrix, characteristic properties. The determinant of a product. Formula for an inverse matrix and for solutions of a square system of linear equations.

Temeljni literatura in viri / Readings:

- D. Benkovič, *Vektorji in matrike*, Fakulteta za naravoslovje in matematiko, Maribor 2014.
- D. Benkovič, *Algebra I: zbrano gradivo*, Fakulteta za naravoslovje in matematiko, Maribor 2010.
- J. Grasselli, *Linearna algebra*, DMFA založništvo. Ljubljana, 1994 (tudi kot ustrezno poglavje v knjigi I. Vidav: *Višja matematika III*, 1981)
- F.E. Hohn, Elemen*tary Matrix Algebra*, 3rd Edition, Dover Publications, 2013.
- M. Kolar, B. Zgrablič, *Več kot nobena, a manj kot tisoč in ena rešena naloga iz linearne algebre*, 4. natis, Pedagoška fakulteta, Ljubljana 2004.
- S. Lange, *Introduction to linear algebra*, Springer-Verlag, New York 1993.
- B. Orel, *Linearna algebra*, Fakulteta za računalništvo in informatiko, Ljubljana 2012.

Cilji in kompetence:	**Objectives and competences:**
Študent obvlada osnove vektorskega in matičnega računa.	The students get familiar with the basic concepts of vector and matrix computations.

Predvideni študijski rezultati:	**Intended learning outcomes:**

Znanje in razumevanje: • Razumevanje geometrijskih vektorjev in sposobnost posplošitve osnovnih konceptov na več dimenzij. • Poznavanje matričnega računa in njegove uporabe na različnih področjih. Prenesljive/ključne spretnosti in drugi atributi: • Pridobljena znanja so podlaga za večino predmetov v nadaljevanju študija.	Knowledge and Understanding: • To understand geometric vectors and be able to generalize the main concepts in higher dimensions • To know matrix computations and be able to apply them in various fields. 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:**

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

Reference nosilca / Lecturer's references:

1. BENKOVIČ, Dominik. Lie **σ**-derivations of triangular algebras. *Linear and Multilinear Algebra*. 2022, vol. 70, iss. 15, str. 2966-2983. ISSN 0308-1087. https://www.tandfonline.com/doi/full/10.1080/03081087.2020.1820431, DOI: 10.1080/03081087.2020.1820431. [COBISS.SI-ID 127110659], [JCR]

2. BENKOVIČ, Dominik, GRAŠIČ, Mateja. Jordan {g,h}-derivations of unital algebras. *Operators and matrices*. 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], [JCR]

3. BENKOVIČ, Dominik. Generalized Lie n-derivations of triangular algebras. *Communications in algebra*. 2019, vol. 47, iss. 12, str. 5294-5302. ISSN 0092-7872. https://doi.org/10.1080/00927872.2019.1617875, DOI: 10.1080/00927872.2019.1617875. [COBISS.SI-ID 18879833], [JCR]

4. 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], [JCR]

5. BENKOVIČ, Dominik. Generalized Lie derivations of unital algebras with idempotents. *Operators and matrices*. 2018, vol. 12, no. 2, str. 357-367. ISSN 1846-3886. https://doi.org/10.7153/oam-2018-12-23, DOI: 10.7153/oam-2018-12-23. [COBISS.SI-ID 18506073], [JCR]