



Univerza v Mariboru



Univerza v Mariboru

Fakulteta za naravoslovje in  
matematiko

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

|                      |                      |
|----------------------|----------------------|
| <b>Predmet:</b>      | Vektorji in matrike  |
| <b>Course title:</b> | Vectors and Matrices |

| Študijski program in stopnja<br>Study programme and level | Študijska smer<br>Study field | Letnik<br>Academic year | Semester<br>Semester |
|-----------------------------------------------------------|-------------------------------|-------------------------|----------------------|
| Matematika                                                | Splošna matematika            | 1.                      | 1.                   |
| Mathematics                                               | General Mathematics           | 1.                      | 1.                   |

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

| Predavanja<br>Lectures | Seminar<br>Seminar | Sem. vaje<br>Tutorial | Lab. vaje<br>Laboratory work | Teren. vaje<br>Field work | Samost. delo<br>Individ. work | ECTS |
|------------------------|--------------------|-----------------------|------------------------------|---------------------------|-------------------------------|------|
| 45                     |                    | 45                    |                              |                           | 180                           | 9    |

Nosilec predmeta / Lecturer:

Jeziki /

Languages:

Predavanja /

Lectures:

Vaje / Tutorial:

SLOVENSKO/SLOVENE

SLOVENSKO/SLOVENE

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

Jih ni.

Prerequisites:

There are none.

Vsebina:

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.

Content (Syllabus outline):

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.

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| <p>Enačba premice v ravnini, medsebojna lega premic.</p> <p>Razdalja med točko in premico, kot med dvema premicama. Premice in ravnine v prostoru, koordinatni zapis in medsebojna lega.</p> <p>Matrike. Seštevanje matrik in množenje s skalarji. Transponirana matrika. Rang matrike. Množenje matrik, inverzna matrika.</p> <p>Linearna enačba. Sistemi linearnih enačb in njihov matrični zapis. Množici rešitev homogenega in nehomogenega sistema linearnih enačb.</p> <p>Gaussova eliminacijska metoda. Elementarne transformacije nad vrsticami matrike in elementarne matrike.</p> <p>Determinanta kvadratne matrike in njene značilne lastnosti. Determinanta produkta matrik. Obrazec za inverzno matriko in rešitev kvadratnega sistema linearnih enačb.</p> | <p>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.</p> <p>Matrices. Matrix addition and scalar multiplication. The transpose matrix. Rank of a matrix. Matrix multiplication, the inverse matrix.</p> <p>Linear equation. Systems of linear equations and their matrix form. The sets of solutions of a homogeneous and a non-homogeneous system of linear equations.</p> <p>The Gauss elimination method. Elementary transformations of matrix rows and elementary matrices.</p> <p>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.</p> |
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### Temeljni literatura in viri / Readings:

J. Grasselli. Linearna algebra, DMFA založništvo. Ljubljana, 1994 (tudi kot ustrezno poglavje v knjigi I. Vidav: Višja matematika III, 1981)

L.P. Eisenhart. Coordinate Geometry. Dover Publications, 2005

F.E. Hohn. Elementary Matrix Algebra. Collier-Macmillan, London 1973

M.L. Krasnov, A.I. Kisilov et al. Mathematical Analysis for Engineers, Vol 1: Analytical Geometry and Linear Algebra. Kniga, Moscow, 1991

M. Kolar, B. Zgrablić. Več kot nobena, a manj kot tisoč in ena rešena naloga iz linearne algebre, PeF Lj, Ljubljana, 1996

D. L. Vossler, Exploring Analytical Geometry with Mathematica. Academic Press, London, 1999

### Cilji in kompetence:

Študent obvlada osnove vektorskega in matričnega računa.

### Objectives and competences:

The students get familiar with the basic concepts of vector and matrix computations.

### Predvideni študijski rezultati:

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:

### Intended learning outcomes:

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:

|                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                     |                                                                                                                                                                                                                                                                             |
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| <ul style="list-style-type: none"><li>• Pridobljena znanja so podlaga za večino predmetov v nadaljevanju študija.</li></ul>                                                                                                                                                                                                                                            | <ul style="list-style-type: none"><li>• The obtained knowledge is a basis for most of the later subjects.</li></ul> |                                                                                                                                                                                                                                                                             |
| <b>Metode poučevanja in učenja:</b>                                                                                                                                                                                                                                                                                                                                    | <b>Learning and teaching methods:</b>                                                                               |                                                                                                                                                                                                                                                                             |
| <ul style="list-style-type: none"><li>• Predavanja</li><li>• Teoretične vaje</li></ul>                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"><li>• Lectures</li><li>• Theoretical exercises</li></ul>                          |                                                                                                                                                                                                                                                                             |
| <b>Načini ocenjevanja:</b>                                                                                                                                                                                                                                                                                                                                             | <b>Assessment:</b>                                                                                                  |                                                                                                                                                                                                                                                                             |
| Način (pisni izpit, ustno izpraševanje, naloge, projekt)<br>Pisni test – praktični del<br>Izpit (ustni) – teoretični del<br><br>Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.<br><br>Pozitivna ocena pri pisnem testu je pogoj za pristop k izpitu.                                                                                          | Delež (v %) /<br>Weight (in %)<br>50%<br>50%                                                                        | Type (examination, oral, coursework, project):<br>Written test – practical part<br>Exam (oral) – theoretical part<br><br>Each of the mentioned commitments must be assessed with a passing grade.<br><br>Passing grade of the written test is required for taking the exam. |
| <b>Reference nosilca / Lecturer's references:</b>                                                                                                                                                                                                                                                                                                                      |                                                                                                                     |                                                                                                                                                                                                                                                                             |
| <b>1.</b> BENKOVIČ, Dominik, EREMITA, Daniel. Multiplicative Lie n-derivations of triangular rings. <i>Linear algebra appl.</i> . [Print ed.], 2012, vol. 436, iss 11, str. 4223-4240. <a href="http://dx.doi.org/10.1016/j.laa.2012.01.022">http://dx.doi.org/10.1016/j.laa.2012.01.022</a> . [COBISS.SI-ID <a href="#">16278361</a> ]                                |                                                                                                                     |                                                                                                                                                                                                                                                                             |
| <b>2.</b> BENKOVIČ, Dominik. Lie triple derivations on triangular matrices. <i>Algebra colloq.</i> , 2011, vol. 18, spec. iss. 1, str. 819-826. <a href="http://www.worldscinet.com/ac/18/preserved-docs/18spec01/S1005386711000708.pdf">http://www.worldscinet.com/ac/18/preserved-docs/18spec01/S1005386711000708.pdf</a> . [COBISS.SI-ID <a href="#">16204377</a> ] |                                                                                                                     |                                                                                                                                                                                                                                                                             |
| <b>3.</b> LI, Yanbo, BENKOVIČ, Dominik. Jordan generalized derivations on triangular algebras. <i>Linear multilinear algebra</i> , 2011, vol. 59, no. 8, str. 841-849. <a href="http://dx.doi.org/10.1080/03081087.2010.507600">http://dx.doi.org/10.1080/03081087.2010.507600</a> . [COBISS.SI-ID <a href="#">16006233</a> ]                                          |                                                                                                                     |                                                                                                                                                                                                                                                                             |
| <b>4.</b> BENKOVIČ, Dominik. Generalized Lie derivations on triangular algebras. <i>Linear algebra appl.</i> . [Print ed.], 2011, vol. 434, iss 6, str. 1532-1544. [COBISS.SI-ID <a href="#">15863897</a> ]                                                                                                                                                            |                                                                                                                     |                                                                                                                                                                                                                                                                             |
| <b>5.</b> BENKOVIČ, Dominik. Biderivations of triangular algebras. <i>Linear algebra appl.</i> . [Print ed.], 2009, vol. 431, iss. 9, str. 1587-1602. <a href="http://dx.doi.org/10.1016/j.laa.2009.05.029">http://dx.doi.org/10.1016/j.laa.2009.05.029</a> . [COBISS.SI-ID <a href="#">15259481</a> ]                                                                 |                                                                                                                     |                                                                                                                                                                                                                                                                             |