Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

| UČNI NAČRT PREDMETA / COURSE SYLLABUS | |
|---|---|
| **Predmet:** | **Algebraične strukture** |
| **Course title:** | **Algebraic structures** |

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

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| **Vrsta predmeta / Course type** | Obvezni / Obligatory |
| **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** | **-** | **30** | **-** | **-** | **75** | **5** |

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| **Nosilec predmeta / Lecturer:** | dr. Dušan Pagon |

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

| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | **Prerequisits:** |
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| Ne | None |

| **Vsebina:** | **Content (Syllabus outline):** |
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| Vektorski prostori: prostori in podprostori; baza; dimenzija; vsote in direktne vsote.<br><br>Linearne preslikave: primeri in osnovne lastnosti; jedro in slika; prostori linearnih preslikav; izomorfizmi vektorskih prostorov.<br><br>Linearne preslikave in matrike: matriki prirejena preslikava; preslikavi prirejena matrika; sprememba baze in podobne matrike.<br>Lastne vrednosti in lastni vektorji: osnovne lastnosti; karakteristični polinom;diagonalizacija.<br>Prostori s skalarnim produktom: Evklidski prostori; unitarni prostori; pravokotnost in ortogonalne baze.<br><br>Grupe in podgrupe. Osnovni pojmi in primeri. Red elementa, ciklična grupa.<br>Kolobarji, obsegi in polja: osnovni pojmi in primeri. | Vector spaces: spaces and subspaces; base; dimension; sums and direct sums.<br><br>Linear transformations: examples and basic properties; kernel and image; spaces of linear transformations; isomorphisms.<br><br>Linear transformations and matrices: transformation of a matrix; matrix of a transformation; base change and similar matrices.<br>Eigenvalueas and eigenvectors: basic properties; characteristic polynomial; diagonalization.<br>Spaces with inner product: Euclidean spaces; unitary spaces; orthogonality and orthogonal bases.<br><br>Groups and subgroups. Basic concepts and examples. Order of an element, cyclic.<br>Rings, division rings and fields: basic concepts and examples. |

**Temeljni literatura in viri / Readings:**

S. Lipschutz, M.L. Lipson, Linear algebra, McGraw-Hill, New York, 2009
S. Lang, Undergraduate Algebra, Springer, 2005 (elektronski vir).
B. Evans, J. Johnson, Linear algebra with derive, J. Wiley, New York, 1994

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:** |
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| 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:<br>• Razumevanje vektorskih prostorov in linearnih transformacij.<br>• Poznavanje grup, kolbarjev in obsegov.<br>• Povezovanje teorije s predmetom Matrični račun. | Knowledge and understanding:<br>• To be able to understand vector spaces and linear transformations.<br>• To know groups, rings and fields.<br>• To be able to connect the theory with the subject Matrix Algebra. |

| **Metode poučevanja in učenja:** | **Learning and teaching methods:** |
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| • Predavanja<br>• Seminarske vaje<br>• Individualno delo | • Lectures<br>• Excersises<br>• Individual work |

| **Načini ocenjevanja:** | Delež (v %) / Weight (in %) | **Assessment:** |
|---|---|---|
| Način (pisni izpit, ustno izpraševanje, naloge, projekt):<br><br>Pisni izpit – praktični del<br>Ustni izpit – teoretični del<br><br>Pisni izpit – praktični del se lahko nadomesti z dvema delnima testoma (sprotni obveznosti).<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. | **50%**<br>**50%** | Type (examination, oral, coursework, project):<br><br>Written exam – practical part<br>Oral exam – theoretical part<br><br>Written exam – practical part can be replaced by two partial tests (mid-term testing).<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. |

**Reference nosilca / Lecturer's references:**


1. PAGON, Dušan. Simplified square equation in the quaternion algebra. *International journal of pure and applied mathematics*, 2010, vol. 61, no. 2, str. 231-240. [COBISS.SI-ID 17718024]

2. PAGON, Dušan. Performing operations with matrices on spreadsheets. *Math. Teach. 4.*, 1998, 91, št. 4, str. 338-341. [COBISS.SI-ID 8166152]

3. PAGON, Dušan. Solving algebraic equations over the field of quaternions. V: *Algebra i ee priloženija : trudy Meždunarodnoj algebraičeskoj konferencii, posvjaščennoj 80-letiju so dnja roždenija A. I. Kostrikina*. Nal´čik: Kabardino-Balkarskij gosudarstvennyj universitet, cop. 2009, str. 104-108. [COBISS.SI-ID 15250521]

4. PAGON, Dušan. The theory of groups with Sagemath software. V: ŽURTOV, A. X. (ur.). *Teorija grupp i ee priloženija : trud´y vos'moj Meždunarodnoj škol´y-konferencii, posvjašennoj 75-letiju V. A. Belonogova, Nal'čik, 4-10 ijulja 2010 g.*. Naučnoe izd. Nal'čik: Kabardino-Balkarskij gosudarstvenn´yj universitet, 2010, str. 233-235. [COBISS.SI-ID 17817352]

5. PAGON, Dušan. *New approaches to teaching algebra, based on the use of CAS : invited paper at the 9th International Congress on Mathematical Education ICME 9, Tokyo / Makuhari, Japan, July 31 - August 6, 2000*. Tokyo; Makuhari, 2000. [COBISS.SI-ID 10551560]