



Univerza v Mariboru



Univerza v Mariboru

Fakulteta za naravoslovje in  
matematiko

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

|                      |         |
|----------------------|---------|
| <b>Predmet:</b>      | Algebra |
| <b>Course title:</b> | Algebra |

| Študijski program in stopnja<br>Study programme and level | Študijska smer<br>Study field | Letnik<br>Academic year | Semester<br>Semester |
|-----------------------------------------------------------|-------------------------------|-------------------------|----------------------|
| Matematika                                                | Splošna matematika            | 2.                      | 3.                   |
| Mathematics                                               | General Mathematics           | 2.                      | 3.                   |

**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 |
|------------------------|--------------------|-----------------------|------------------------------|---------------------------|-------------------------------|------|
| 60                     |                    | 45                    |                              |                           | 135                           | 8    |

**Nosilec predmeta / Lecturer:**

Dušan PAGON

**Jeziki /**

**Languages:**

**Predavanja /**

**Lectures:**

**Vaje / Tutorial:**

SLOVENSKO/SLOVENE

SLOVENSKO/SLOVENE

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

Izpit iz Matematičnih principov

**Prerequisites:**

Exam from Mathematical Principles

**Vsebina:**

Številске množice kot algebrske strukture. Polino- mi ene spremenljivke. Reševanje algebrskih enačb.

Grupoidi in polgrupe. Grupe in podgrupe. Red elementa, ciklična grupa. Simetrična grupa. Podgrupe edinke in faktorske grupe. Homomorfizmi in izomorfizmi grup.

Kolobarji, ideali in faktorski kolobarji: osnovni pojmi in primeri. Karakteristika kolobarja.

**Content (Syllabus outline):**

Sets of numbers as algebraical structures. Polynomials in one variable. Solving algebraic equations.

Groupoids and semigroups. Groups and subgroups. Order of an element, cyclic group. Symetric group. Normal subgroups and factor groups. Homomorphisms and isomorphisms of groups.

Rings, ideals and factor rings: basic concepts

|                                                   |                                                                                                                 |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Obsegi in polja. Polje ulomkov celega kolobarja.  | and examples. The characteristics of a ring. Division rings and fields. The fractions field of an integer ring. |
| Mreže: osnovni pojmi in primeri. Boolove algebre. | Lattices: basic concepts and examples. Boolean algebras.                                                        |

### Temeljni literatura in viri / Readings:

W. Y. Gilbert, W. K. Nicholson, Modern Algebra with Applications, Wiley, Chichester 2004  
S. Lang, Undergraduate Algebra, Springer, 2005  
A. I. Kostrikin, Introduction to Algebra, Springer-Verlag, New York 1982  
I. Vidav, Algebra, DMFA, Ljubljana 1980

### Cilji in kompetence:

Študentje spoznajo osnovne algebrske strukture skupaj s spremljajočimi pojmi kot so podstruktura, homomorfizem, kvocientna struktura.

### Objectives and competences:

The students get familiar with the main algebraic structures including such related topics as substructure, homomorphism and factorstructure.

### Predvideni študijski rezultati:

Znanje in razumevanje:

- Razumevanje pojmov algebrske strukture, njene podstrukture in izomorfnih struktur.
- Poznavanje osnovnih značilnosti in tipičnih primerov grup, kolobarjev in mrež.

Prenesljive/ključne spretnosti in drugi atributi:

- Pridobljena znanja so podlaga za večino predmetov v nadaljevanju študija.

### Intended learning outcomes:

Knowledge and Understanding:

- The notion of an algebraic structure, its substructure and isomorphic structures.
- To recognize the typical properties and main examples of groups, rings and lattices.

Transferable/Key Skills and other attributes:

- The obtained knowledge is a basis for most of the later subjects.

### Metode poučevanja in učenja:

- Predavanja
- Teoretične vaje

### Learning and teaching methods:

- Lectures
- Theoretical exercises

### Načini ocenjevanja:

|                                                                         |                             |                                                                          |
|-------------------------------------------------------------------------|-----------------------------|--------------------------------------------------------------------------|
| Način (pisni izpit, ustno izpraševanje, naloge, projekt)                | Delež (v %) / Weight (in %) | Type (examination, oral, coursework, project):                           |
| Pisni test – praktični del                                              | 50%                         | Written test – practical part                                            |
| Izpit (ustni) – teoretični del                                          | 50%                         | Exam (oral) – theoretical part                                           |
| Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno. |                             | Each of the mentioned commitments must be assessed with a passing grade. |
| Pozitivna ocena pri pisnem testu je pogoj za pristop k izpitu.          |                             | Passing grade of the written test is required for taking the exam.       |

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| <b>Reference nosilca / Lecturer's references:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |
| <p>1. PAGON, Dušan, REPOVŠ, Dušan, ZAICEV, Mikhail. On the codimension growth of simple color Lie superalgebras. <i>J. Lie theory</i>, 2012, vol. 22, no. 2, str. 465-479. <a href="http://www.heldermann.de/JLT/JLT22/JLT222/jlt22017.htm">http://www.heldermann.de/JLT/JLT22/JLT222/jlt22017.htm</a>. [COBISS.SI-ID <a href="#">16070233</a>]</p> <p>2. PAGON, Dušan. Simplified square equation in the quaternion algebra. <i>International journal of pure and applied mathematics</i>, 2010, vol. 61, no. 2, str. 231-240. [COBISS.SI-ID <a href="#">17718024</a>]</p> <p>3. GUTIK, Oleg, PAGON, Dušan, REPOVŠ, Dušan. On chains in H-closed topological pospaces. <i>Order (Dordr.)</i>, 2010, vol. 27, no. 1, str. 69-81. <a href="http://dx.doi.org/10.1007/s11083-010-9140-x">http://dx.doi.org/10.1007/s11083-010-9140-x</a>. [COBISS.SI-ID <a href="#">15502169</a>]</p> <p>4. GUTIK, Oleg, PAGON, Dušan, REPOVŠ, Dušan. The continuity of the inversion and the structure of maximal subgroups in countably compact topological semigroups. <i>Acta math. Hung.</i>, 2009, vol. 124, no. 3, str. 201-214. <a href="http://dx.doi.org/10.1007/s10474-009-8144-8">http://dx.doi.org/10.1007/s10474-009-8144-8</a>, doi: <a href="http://dx.doi.org/10.1007/s10474-009-8144-8">10.1007/s10474-009-8144-8</a>. [COBISS.SI-ID <a href="#">15212121</a>]</p> <p>5. PAGON, Dušan. The dynamics of selfsimilar sets generated by multibranching trees. <i>International journal of computational and numerical analysis and applications</i>, 2004, vol. 6, no. 1, str. 65-76. [COBISS.SI-ID <a href="#">14037081</a>]</p> |  |  |