



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Algebra II
Course title:	Algebra II

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Matematika, 1. stopnja		2.	4..
Mathematics, 1 st cycle		2.	4.

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		30			135	7

Nosilec predmeta / Lecturer:

Matej BREŠAR

**Jeziki /
Languages:**

**Predavanja /
Lectures:**

SLOVENSKO/SLOVENE

Vaje / Tutorial:

SLOVENSKO/SLOVENE

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

Znanje predmeta Algebra I.

Oba izpita, pisni in ustni, morata biti opravljena s pozitivno oceno.

Opravljen pisni izpit je pogoj za pristop k ustnemu izpitu.

Vseбина:

Končne grupe: delovanja grup, Cauchyjev izrek in izreki Sylowa, končne Abelove grupe.

Kolobarji polinomov, nerazcepni polinomi. Deljivost v komutativnih kolobarjih. Evklidski in

Prerequisites:

Knowledge from the Algebra I course.

Each of the two exams, oral and written, must be assessed with a passing grade.

Passing the written exam is a prerequisite for taking the oral exam.

Content (Syllabus outline):

Finite groups: group action, Cauchy's theorem and Sylow theorems, finite Abelian groups.

Polynomial rings, irreducible polynomials. Divisibility in commutative rings. Euclidean rings

glavni kolobarji. Kolobarji z enolično faktorizacijo.

Polja: algebraični in transcendentni elementi, končne razširitve, konstrukcije z ravnilom in šestilom, razpadna polja in algebraično zaprta polja, končna polja, uvod v Galoisovo teorijo.

and principal ideal domains. Unique factorization domains.

Fields: algebraic and transcendental elements, finite extensions, straightedge and compass constructions, splitting fields and algebraically closed fields, finite fields, introduction to Galois theory.

Temeljni literatura in viri / Readings:

- M. Brešar, Uvod v Algebro, DMFA, 2018.
- M. Brešar, Undergraduate Algebra. A Unified Approach, Springer, 2019.
- Vidav, Algebra, DMFA, 1980.

Dodatna literatura / Additional Readings:

- D. S. Dummit, R. M. Foote, Abstract Algebra, Prentice-Hall International, Inc., 1991.
- J. Gallian: Contemporary Abstract Algebra, Brooks/Cole, 2013.

Cilji in kompetence:

Študent spozna pojme iz algebre, ki jih potrebuje pri nadaljnjem študiju matematike. Ob tem se uči abstraktnega načina razmišljanja.

Objectives and competences:

Students learn concepts of algebra that are needed for further study of mathematics. Through this, they also learn abstract thinking.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Študent pozna in zmore pojasniti osnove teorije končnih grup.
- Študent pozna in zmore pojasniti osnove teorije komutativnih kolobarjev.
- Študent pozna in zmore pojasniti osnove teorije razširitev polj.

Prenesljive/ključne spretnosti in drugi atributi:

Pridobljena znanja so podlaga za več predmetov na drugi stopnji.

Intended learning outcomes:

Knowledge and Understanding:

- The knowledge of and ability to explain the basic finite group theory.
- The knowledge of and ability to explain the basic commutative ring theory.
- The knowledge of and ability to explain the basic theory of field extensions.

Transferable/Key Skills and other attributes:

The obtained knowledge is a prerequisite for several courses at the second cycle level.

Metode poučevanja in učenja:

- Predavanja
- Teoretične vaje

Learning and teaching methods:

- Lectures
- Theoretical exercises

Načini ocenjevanja:**Assessment:**

Pisni izpit Ustni izpit	Delež (v %) / Weight (in %) 50% 50%	Written exam Oral exam
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Opombe:

Pisni izpit se lahko nadomesti z vsaj dvema delnima testoma (sprotne obveznosti) v enakem deležu (50%).

Comments:

Written exam can be replaced by two or more partial tests (mid-term testing) in the same weight (50%).

Reference nosilca / Lecturer's references:

1. BREŠAR, Matej. *Zero product determined algebras*. Cham: Birkhäuser: Springer, cop. 2021. VIII, 185 str. Frontiers in mathematics.
2. BREŠAR, Matej. Automorphisms and derivations of finite-dimensional algebras. *Journal of algebra*. June 2022, vol. 599, str. 104-121.
3. BREŠAR, Matej, GODOY, María Luisa Castillo, VILLENA, A. R. Maps preserving two-sided zero products on Banach algebras. *Journal of mathematical analysis and applications*. [Print ed.]. Nov. 2022, vol. 515, iss. 1, art. 126372 (16 str.).
4. BAJUK, Žan, BREŠAR, Matej. Two-sided zero product determined algebras. *Linear algebra and its applications*. [Print ed.]. June 2022, vol. 643, str. 125-136.
5. BREŠAR, Matej, ŠEMRL, Peter. The Waring problem for matrix algebras. *Israel journal of mathematics*. Mar. 2023, vol. 253, iss. 1, str. 381-405.