



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Izbrana poglavja iz algebre
Course title: Selected Topics in Algebra

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Izobraževalna matematika – enopredmetna, 2. Stopnja		1. ali 2.	1. ali 3.
Educational mathematics - single- major, 2 nd cycle		1. or 2.	1. or 3.

Vrsta predmeta / Course type

izbirni / elective

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			105	6

Nosilec predmeta / Lecturer:

Matej BREŠAR

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

SLOVENSKO/SLOVENE

SLOVENSKO/SLOVENE

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

Prerequisites:

Poznavanje osnov teorije grup in teorije kolobarjev.

Vsaka izmed naštetih obveznosti mora biti
opravljena s pozitivno oceno.

Opravljen pisni izpit – problemi je pogoj za pristop
k ustnemu izpitu – teorija.

Knowledge of basic group theory and basic ring
theory.

A passing grade is required for each of the two
exams.

Passing the written test is required for taking the
oral exam.

Vsebina:

Galoisova teorija: osnovni izrek Galoisove teorije,
rešljivost polinomskih enačb z radikali, osnovni izrek
algebre.

Content (Syllabus outline):

Galois Theory: Fundamental Theorem of Galois
Theory, solvability of polynomial equations by
radicals, Fundamental Theorem of Algebra.

Moduli: osnovni pojmi in primeri, posebni razredi modulov (prosti, projektivni, enostavni itd.), moduli nad glavnimi kolobarji.	Modules: basic concepts and examples, special classes of modules (free, projective, simple, etc.), modules over principal ideal domains.
Tenzorski produkti vektorskih prostorov, modulov in algeber.	Tensor products of vector spaces, modules and algebras.

Temeljni literatura in viri / Readings:

• M. Brešar, Introduction to Noncommutative Algebra, Springer, 2014. • M. Brešar, Undergraduate Algebra. A Unified Approach, Springer, 2019. • M. Brešar, Uvod v algebro, DMFA, 2018.
Dodatna literatura / Additional Readings: • D. Dummit, R. Foote, Abstract Algebra, Prentice-Hall, 1991. • T. W. Hungerford, Algebra, Springer-Verlag, 1980.

Cilji in kompetence:

Poglobliti znanje osnovnih področij abstraktne algebre.

Objectives and competences:

Deepening the knowledge of fundamental areas of abstract algebra.

Predvideni študijski rezultati:

Znanje in razumevanje:
Po zaključku predmeta bo študent seznanjen s klasično abstraktno algebro in s tem pripravljen na študij njenih modernih vsebin.
Prenesljive/ključne spretnosti in drugi atributi:
Algebraične strukture so pojavljajo na vseh matematičnih področjih, zato mora biti z njimi seznanjen vsak matematik.

Intended learning outcomes:

Knowledge and Understanding:
On the completion of the course, the student will be acquainted with the classical abstract algebra and capable of tackling its modern areas.
Transferable/Key Skills and other attributes:
Algebraic structures occur in all mathematical areas, so their knowledge is a necessity for every mathematician.

Metode poučevanja in učenja:

• Predavanja • Seminarske vaje

Learning and teaching methods:

• Lectures • Tutorial
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Načini ocenjevanja:

Assessment:

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

Reference nosilca / Lecturer's references:

1. BREŠAR, Matej, ŠEMRL, Peter. The Waring problem for matrix algebras. *Israel journal of mathematics*. Mar. 2023, vol. 253, iss. 1, str. 381-405. ISSN 0021-2172. <https://link.springer.com/article/10.1007/s11856-022-2366-7>, DOI: [10.1007/s11856-022-2366-7](https://doi.org/10.1007/s11856-022-2366-7). [COBISS.SI-ID [149854467](https://cobiss.si/149854467)]
2. BREŠAR, Matej. Automorphisms and derivations of finite-dimensional algebras. *Journal of algebra*. June 2022, vol. 599, str. 104-121. ISSN 0021-8693. <https://www.sciencedirect.com/science/article/pii/S0021869322000746>, DOI: [10.1016/j.jalgebra.2022.02.010](https://doi.org/10.1016/j.jalgebra.2022.02.010). [COBISS.SI-ID [100274435](https://cobiss.si/100274435)]
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.). ISSN 0022-247X. <https://www.sciencedirect.com/science/article/pii/S0022247X22003869>, DOI: [10.1016/j.jmaa.2022.126372](https://doi.org/10.1016/j.jmaa.2022.126372). [COBISS.SI-ID [110484227](https://cobiss.si/110484227)]
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. ISSN 0024-3795. <https://www.sciencedirect.com/science/article/pii/S0024379522000659>, DOI: [10.1016/j.laa.2022.02.022](https://doi.org/10.1016/j.laa.2022.02.022). [COBISS.SI-ID [100272387](https://cobiss.si/100272387)]
5. BREŠAR, Matej, SHULMAN, Victor S. On, around, and beyond Frobenius' theorem on division algebras. *Linear and Multilinear Algebra*. 2022, vol. 70, iss. 7, str. 1369-1381. ISSN 0308-1087. <https://www.tandfonline.com/doi/full/10.1080/03081087.2020.1761281>, DOI: [10.1080/03081087.2020.1761281](https://doi.org/10.1080/03081087.2020.1761281). [COBISS.SI-ID [106388227](https://cobiss.si/106388227)]