Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS								
Predmet:	**Algebra I**							
Course title:	Algebra I							
Študijski program in stopnja Study programme and level		**Študijska smer Study field**			**Letnik Academic year**		**Semester Semester**	
Matematika					**2.**		**3.**	
Mathematics					**2.**		**3.**	
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:				**Prerequisites:**				
Linearna algebra				Linear algebra				
Vsebina:				**Content (Syllabus outline):**				

Uvodni pojmi: binarne operacije, polgrupe, monoidi, cela števila. Uvod v teorijo grup: definicija in primeri grup, podgrupe, odseki in Lagrangeov izrek, ciklične grupe, generatorji grup. Uvod v teorijo kolobarjev: definicije in primeri kolobarjev, polj in algeber, podkolobarji (podpolja, podalgebre), karakteristika kolobarja, generatorji kolobarjev. Homomorfizmi grup, homomorfizmi kolobarjev. Kvocientne strukture: podgrupe edinke in kvocientne grupe, ideali in kvocientni kolobarji, izreki o izomorfizmu. Moduli: definicija in primeri modulov, prosti moduli, tenzorski produkti.	Introductory notions: binary operations, semigroups, monoids, integers. Introduction to group theory: definition and examples of groups, subgroups, cosets and Lagrange's theorem, cyclic groups, group generators. Introduction to ring theory: definitions and examples of rings, fields and algebras, subrings (subfields, subalgebras), characteristic of a ring, ring generators. Group homomorhisms, ring homomorphisms. Quotient structures: normal subgroups and quotient groups, ideals and quotient rings, isomorphism theorems. Modules: definition and examples of modules, free modules, tensor products.
Temeljna literatura in viri / Readings:	
M. Brešar, Uvod v algebro, DMFA, 2018. M. Brešar, Undergraduate algebra. A unified approach, Springer, 2019. D. S. Dummit, R. M. Foote, Abstract Algebra, Prentice-Hall International, Inc., 1991. J. Gallian: Contemporary Abstract Algebra, Brooks/Cole, 2013. I. Vidav, Algebra, DMFA, 1980.	
Cilji in kompetence:	**Objectives and competences:**
Spoznati temeljne algebraične pojme in abstraktni način razmišljanja.	Learning fundamental algebraic concepts and abstract thinking.
Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študent pozna in zmore pojasniti osnovne algebrske strukture, njihove podstrukture, homomorfizme in kvocientne struktur. Prenesljive/ključne spretnosti in drugi atributi: • Pridobljena znanja so podlaga za študij skoraj vseh matematičnih področij.	Knowledge and Understanding: • The knowledge of and ability to explain basic algebraic structures and their substructures, homomorphisms, and quotient structures. Transferable/Key Skills and other attributes: • The obtained knowledge is a prerequisite for a study of almost any area of mathematics.

Metode poučevanja in učenja:		**Learning and teaching methods:**
• Predavanja • Seminarske vaje		• Lectures • Tutorial
Načini ocenjevanja:		**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt): Pisni izpit – problemi Ustni izpit – teorija Pisni izpit se lahko nadomesti z vsaj dvema delnima testoma (sprotne obveznosti). Oba izpita, pisni in ustni, morata biti opravljena s pozitivno oceno. Opravljen pisni izpit je pogoj za pristop k ustnemu izpitu.	Delež (v %) / Weight (in %) 50% 50%	Type (examination, oral, coursework, project): Written exam – problems Oral exam – theoretical part Written exam can be replaced by two or more partial tests (mid-term testing). 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.
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.