



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS						
<b>Predmet:</b>	<b>Algebra I</b>					
<b>Course title:</b>	Algebra I					
<b>Študijski program in stopnja</b> Study programme and level	<b>Študijska smer</b> Study field			<b>Letnik</b> Academic year	<b>Semester</b> Semester	
Matematika				<b>3.</b>	<b>5.</b>	
Mathematics				<b>3.</b>	<b>5.</b>	
<b>Vrsta predmeta / Course type</b>				obvezni / compulsory		
<b>Univerzitetna koda predmeta / University course code:</b>						
<b>Predavanja</b> Lectures	<b>Seminar</b> Seminar	<b>Sem. vaje</b> Tutorial	<b>Lab. vaje</b> Laboratory work	<b>Teren. vaje</b> Field work	<b>Samost. delo</b> Individ. work	<b>ECTS</b>
<b>60</b>		<b>45</b>			<b>135</b>	<b>8</b>
<b>Nosilec predmeta / Lecturer:</b>		Matej Brešar				
<b>Jeziki / Languages:</b>	<b>Predavanja / Lectures:</b>	SLOVENSKO/SLOVENE				
	<b>Vaje / Tutorial:</b>	SLOVENSKO/SLOVENE				
<b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>				<b>Prerequisites:</b>		
Linearna algebra				Linear algebra		
<b>Vsebina:</b>				<b>Content (Syllabus outline):</b>		

<p>Pregled algebrskih struktur: polgrupe, grupe, kolobarji, polja, vektorski prostori, algebre. Podstrukture. Generatorji. Direktni produkti in vsote.</p> <p>Primeri grup in kolobarjev: cela števila, grupa in kolobar ostankov, kvaternioni, kolobarji matrik in linearne grupe, kolobarji funkcij, kolobarji polinomov, simetrične grupe, diedrske grupe.</p> <p>Homomorfizmi: osnovni pojmi in primeri. Cayleyev izrek. Polje ulomkov.</p> <p>Kvocienčne strukture: podgrupe edinke in kvocienčne grupe, ideali in kvocientni kolobarji, izreki o izomorfizmu.</p> <p>Končne grupe: Lagrangeov izrek, Cauchyev izrek, delovanja grup, izreki Sylowa, enostavne grupe, končne Abelove grupe.</p>	<p>An overview of algebraic structures: semigroups, groups, rings, fields, vector spaces, algebras. Substructures. Generators. Direct products and sums.</p> <p>Examples of groups and rings: the integers, the integers modulo <math>n</math>, the quaternions, matrix rings and linear groups, rings of functions, polynomial rings, symmetric groups, dihedral groups.</p> <p>Homomorphisms: basic notions and examples. Cayley's theorem. Field of fractions.</p> <p>Quotient structures: normal subgroups and quotient groups, ideals and quotient rings, isomorphism theorems.</p> <p>Finite groups: Lagrange's theorem, Cauchy's theorem, group actions, Sylow theorems, simple groups, finite Abelian groups.</p>
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**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.

<b>Cilji in kompetence:</b>	<b>Objectives and competences:</b>
Spoznati temeljne algebraične pojme in abstraktni način razmišljanja.	Learning fundamental algebraic concepts and abstract thinking.
<b>Predvideni študijski rezultati:</b>	<b>Intended learning outcomes:</b>
<p>Znanje in razumevanje:</p> <ul style="list-style-type: none"> <li>Razumevanje osnovnih algebrskih struktur, njihovih podstruktur, homomorfizmov in kvocientnih struktur.</li> <li>Poznavanje osnov teorije končnih grup.</li> </ul> <p>Prenesljive/ključne spretnosti in drugi atributi:</p> <ul style="list-style-type: none"> <li>Pridobljena znanja so podlaga za študij skoraj vseh matematičnih področij.</li> </ul>	<p>Knowledge and Understanding:</p> <ul style="list-style-type: none"> <li>The knowledge of basic algebraic structures and their substructures, homomorphisms, and quotient structures.</li> <li>Understanding the basics of the theory of finite groups.</li> </ul> <p>Transferable/Key Skills and other attributes:</p> <ul style="list-style-type: none"> <li>The obtained knowledge is a prerequisite for a study of almost any area of mathematics.</li> </ul>

<b>Metode poučevanja in učenja:</b>		<b>Learning and teaching methods:</b>	
<ul style="list-style-type: none"> <li>• Predavanja</li> <li>• Seminarske vaje</li> </ul>		<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Tutorial</li> </ul>	
<b>Načini ocenjevanja:</b>		<b>Assessment:</b>	
Način (pisni izpit, ustno izpraševanje, naloge, projekt):	Delež (v %) / Weight (in %)	Type (examination, oral, coursework, project):	
Pisni izpit – problemi	50%	Written exam – problems	
Ustni izpit – teorija	50%	Oral exam – theoretical part	
Pisni izpit se lahko nadomesti z dvema delnima testoma (sprotni obveznosti).		Written exam can be replaced by two partial tests (mid-term testing).	
Oba izpita, pisni in ustni, morata biti opravljena s pozitivno oceno.		Each of the two exams, oral and written, must be assessed with a passing grade.	
Opravljen pisni izpit je pogoj za pristop k ustnemu izpitu.		Passing the written exam is a prerequisite for taking the oral exam.	
<b>Reference nosilca / Lecturer's references:</b>			
<p>1. BREŠAR, Matej. <i>Undergraduate algebra : a unified approach</i>, (Springer undergraduate mathematics series). Cham: Springer, cop. 2019. XXIV, 316 str.</p> <p>2. BREŠAR, Matej, GOGIĆ, Ilja. Centrally stable algebras. <i>Journal of algebra</i>. Nov. 2019, vol. 537, str. 79-97.</p> <p>3. J. ALAMINOS, J., BREŠAR, Matej, EXTREMERA, J., VILLENA, A. R. Zero Lie product determined Banach algebras, II. <i>Journal of mathematical analysis and applications</i>. [Print ed.]. June 2019, vol. 474, iss. 2, str. 1498-1511.</p> <p>4. BREŠAR, Matej, GUO, Xiangqian, LIU, Genqiang, LÜ, Rencai, ZHAO, Kaiming. Zero product determined Lie algebras. <i>European journal of mathematics</i>. [Print ed.]. Jun. 2019, vol. 5, iss. 2, str. 424-453.</p> <p>5. BREŠAR, Matej, ŠEMRL, Peter. Continuous commuting functions on matrix algebras. <i>Linear Algebra and its Applications</i>. [Print ed.]. May 2019, vol. 568, str. 29-38.</p>			