

UČNI NAČRT PREDMETA / COURSE SYLLABUS						
<b>Predmet:</b>		Neasociativna algebra				
<b>Course title:</b>		Nonassociative algebra				
<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	
Magistrski študijski program Matematika		ni smeri		1 ali 2	prvi ali drugi	
Master's study programme Mathematics		none		1 or 2	first or second	
<b>Vrsta predmeta / Course type</b>				izbirni		
<b>Univerzitetna koda predmeta / University course code:</b>				M2222		
<b>Predavanja</b> Lectures	<b>Seminar</b> Seminar	<b>Vaje</b> Tutorial	<b>Klinične vaje</b> work	<b>Druge oblike študija</b>	<b>Samost. delo</b> Individ. work	<b>ECTS</b>
45		30			105	6
<b>Nosilec predmeta / Lecturer:</b>		prof. Tomaž Košir				
<b>Jeziki / Languages:</b>		<b>Predavanja / Lectures:</b> slovenski/Slovene, angleški/English				
		<b>Vaje / Tutorial:</b> slovenski/Slovene, angleški/English				
<b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>				<b>Prerequisites:</b>		
<b>Vsebina:</b>				<b>Content (Syllabus outline):</b>		

<p>Pomembnejši tipi neasociativnih algeber (alternativne algebre, jordsanske algebre).</p> <p>Definicija Liejeve algebre. Ideali in homomorfizmi. Rešljive in nilpotentne Liejeve algebre.</p> <p>Liejev in Cartanov izrek. Killingova forma. Povsem razcepne upodobitve. Upodobitve algebre <math>sl(2, F)</math>. Razcep na korenske podprostore.</p> <p>Korenski sistemi. Enostavni koreni in Weylova grupa. Klasifikacija (končnorazsežnih) enostavnih Liejevih algeber.</p> <p>Univerzalna ovojna algebra. Poicaré-Birkhoff-Wittov izrek.</p> <p>Upodobitve enostavnih Liejevih algeber.</p>	<p>Important types of nonassociative algebras (alternating algebras, Jordan algebras).</p> <p>The definition of Lie algebra. Ideals and homomorphisms. Solvable and nilpotent Lie algebras.</p> <p>Lie's and Cartan's Theorems. The Killing form. Completely irreducible representations. Representations of <math>sl(2, F)</math>. Root subspace decomposition.</p> <p>Root systems. Simple roots and the Weyl group. Classification of (finite-dimensional) simple Lie algebras.</p> <p>Universal enveloping algebra. Theorem Poicaré-Birkhoff-Witt.</p> <p>Representation theory of simple Lie algebras.</p>
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#### Temeljni literatura in viri / Readings:

K. A. Zhevlakov, A. M. Slinko, I. P. Shestakov, A. I. Shirshov, Rings that are nearly associative, Academic Press, 1982.

J. E. Humphreys: Introduction to Lie Algebras and Representation Theory, Springer, New York-Berlin, 1997.

J. P. Serre: Complex Semisimple Lie Algebras, Springer, Berlin, 2001.

W. A. de Graaf: Lie Algebras : Theory and Algorithms, North Holland, Amsterdam, 2000.

#### Cilji in kompetence:

Študent spozna osnovne pojme in izreke neasociativne algebre.

#### Objectives and competences:

Student meets the fundamental notions and theorems of the nonassociative algebra.

#### Predvideni študijski rezultati:

#### Intended learning outcomes:

Znanje in razumevanje: Poznavanje osnovnih pojmov in izrekov neasociativne algebre in njihovo prepoznavanje v drugih vejah matematike.  
 Uporaba: V drugih vejah matematike.

Refleksija: Razumevanje teorije na podlagi primerov in uporabe.

Prenosljive spretnosti – niso vezane le na en predmet: Formulacija in reševanje problemov z abstraktnimi metodami.

Knowledge and understanding: Understanding of basic concepts and theorems of noncommutative algebra, and their role in some other areas.  
 Application: In other mathematical areas.

Reflection: Understanding the theory on the basis of examples and applications.

Transferable skills: Formulation and solution of problems using abstract methods.

**Metode poučevanja in učenja:**

predavanja, vaje, domače naloge, konzultacije

**Learning and teaching methods:**

Lectures, exercises, homeworks, consultations

Delež (v %) /  
 Weight (in %)

**Načini ocenjevanja:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt):  
 izpit iz vaj (2 kolokvija ali pisni izpit)  
 ustni izpit

Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)

50%  
 50%

**Assessment:**

Type (examination, oral, coursework, project):  
 2 midterm exams instead of written exam, written exam  
 oral exam

Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

**Reference nosilca / Lecturer's references:**

Tomaž Košir:  
 – GRUNENFELDER, Luzius, GURALNICK, Robert M., KOŠIR, Tomaž, RADJAVI, Heydar. Permutability of characters on algebras. Pacific journal of mathematics, ISSN 0030-8730, 1997, let. 178, št. 1, str.

63-70 [COBISS.SI-ID 7437145]

– GRUNENFELDER, Luzius, KOŠIR, Tomaž, OMLADIČ, Matjaž, RADJAVI, Heydar. Maximal Jordan algebras of matrices with bounded number of eigenvalues. *Israel journal of mathematics*, ISSN 0021-2172, 2002, vol. 128, str. 53-75 [COBISS.SI-ID 11625305]

– BERNIK, Janez, DRNOVŠEK, Roman, KOKOL-BUKOVŠEK, Damjana, KOŠIR, Tomaž, OMLADIČ, Matjaž, RADJAVI, Heydar. On semitransitive jordan algebras of matrices. *Journal of algebra and its applications*, ISSN 0219-4988, 2011, vol. 10, iss. 2, str. 319-333 [COBISS.SI-ID 15908697]