



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Poglavlja iz algebre
Course title: Topics in Algebra

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Matematika, 2. stopnja	Modul S2	1. ali 2.	1. ali 3.
Mathematics, 2 nd cycle	Module S2	1. or 2.	1. or 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
60		45			165	9

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:

Poznavanje osnov teorije grup in teorije kolobarjev.

Vsebina:

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

Moduli: osnovni pojmi in primeri, posebni razredi modulov (prosti, projektivni, enostavni itd.), moduli nad glavnimi kolobarji.

Tenzorski produkti vektorskih prostorov, modulov in algeber.

Prerequisites:

Knowledge of basic group theory and basic ring theory.

Content (Syllabus outline):

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

Modules: basic concepts and examples, special classes of modules (free, projective, simple, etc.), modules over principal ideal domains.

Tensor products of vector spaces, modules and algebras.

Končno-razsežne algebre: Frobeniusov izrek, končni obsegi, Wedderburnova strukturna teorija.

Finite-dimensional algebras: Frobenius' Theorem, finite division rings, Wedderburn's Structure Theory.

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.
 D. Dummit, R. Foote, Abstract Algebra, Prentice-Hall, 1991.
 T. W. Hungerford, Algebra, Springer-Verlag, 1980.

Cilji in kompetence:

Poglobiti 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.
 Prenosljive/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

Načini ocenjevanja:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

Pisni izpit
 Ustni izpit

Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.

Delež (v %) /
 Weight (in %)

50%
 50%

Type (examination, oral, coursework, project):

Written exam
 Oral exam

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

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

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

Reference nosilca / Lecturer's references:

1. BREŠAR, Matej. *Undergraduate algebra : a unified approach*, (Springer undergraduate mathematics series). Cham: Springer, cop. 2019. XXIV, 2116 str. ISBN 978-3-030-14052-6. ISBN 978-3-030-14053-3.
2. ALAMINOS, J., BREŠAR, Matej, EXTREMERA, J., VILLENA, A. R. Zero Lie product determined Banach algebras, II. *Journal of mathematical analysis and applications*, ISSN 0022-247X. [Print ed.], June 2019, vol. 474, iss. 2, str. 1498-1511.
3. BREŠAR, Matej, ŠEMRL, Peter. Continuous commuting functions on matrix algebras. *Linear Algebra and its Applications*, ISSN 0024-3795. [Print ed.], May 2019, vol. 568, str. 29-38.
4. BREŠAR, Matej, HANSELKA, Christoph, KLEP, Igor, VOLČIČ, Jurij. Skolem-Noether algebras. *Journal of algebra*, ISSN 0021-8693, March 2018, vol. 498, str. 294-314..
5. BREŠAR, Matej, ZHAO, Kaiming. Biderivations and commuting linear maps on Lie algebras. *Journal of Lie theory*, ISSN 0949-5932, 2018, vol. 28, no. 3, str. 885-900.