



UČNI NAČRT PREDMETA / SUBJECT SPECIFICATION

Predmet:	Računska algebra
Subject Title:	Computational algebra

Študijski program Study programme	Študijska smer Study field	Letnik Year	Semester Semester
Matematika		1	1 ali 2
Mathematics		1	1 or 2

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Labor work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30					120	5

Nosilec predmeta / Lecturer:

Igor Klep

Jeziki /
Languages:

Predavanja / Lecture: Slovenski / Slovene
Vaje / Tutorial: Slovenski / Slovene

Pogoji za opravljanje študijskih obveznosti:

Poznanje osnovnih pojmov iz algebre.

Prerequisites:

Knowledge of basic concepts from algebra.

Vsebina:

- polinomi, polinomski sistemi in Gröbnerjeve baze
- Hilbertov Nullstellensatz, delovanja grup in Hilbertov izrek o končnosti
- končno prezentirane grupe, permutacijske grupe, polciklične grupe in računanje homoloških grup
- načelo Tarskega, eliminacija kvantifikatorjev in cilindrično algebraična dekompozicija

Spodaj navedena literatura praviloma služi le kot osnova in bo nadgrajena z bolj specializiranimi teksti.

Content (Syllabus outline):

- polynomials, polynomial systems and Gröbner bases
- Hilbert's Nullstellensatz, groups actions, and Hilbert's finiteness theorem
- finally presented groups, permutation groups, polycyclic groups and computing homology groups
- Tarski principle, quantifier elimination and cylindrical algebraic decomposition

The literature below in principle serves only as a basis, and will be combined with more specialized texts.

Temeljna literatura in viri / Textbooks:

D. Eisenbud: Commutative Algebra with a view toward algebraic geometry, Springer GTM, 1995.

G.-M. Greuel, G. Pfister: A Singular introduction to commutative algebra, Springer, 2002.

C.C. Sims: Computation with finitely presented groups, Cambridge, 1994.

D.F. Holt, B. Eick, E.A. O'Brien: Handbook of computational group theory, Chapman & Hall, 2005.

The GAP Group, GAP -- Groups, Algorithms, and Programming
<http://www.gap-system.org>

S. Basu, R. Pollack, M.-F. Roy: Algorithms in real algebraic geometry, Springer, 2006.

Cilji:

- študenta seznaniti z osnovnimi področji računske algebre
- pripraviti podlago za poglobljeni študij posebnih področij iz algebre;
- razvijati sposobnosti študenta za samostojno reševanje problemov in razumevanje zahtevnejših matematičnih konceptov.

Objectives:

- to get students acquainted with fundamental topics of computational algebra;
- to give students a basis for the advanced study of some special topics in algebra;
- to develop student's skills for solving problems and understanding deeper mathematical concepts.

Predvideni študijski rezultati:

Znanje in razumevanje:

- poznavanje in razumevanje osnovnih rezultatov računske algebre;
- poznavanje algoritmičnih prijemov iz algebre in njihova implementacija..

Prenesljive/ključne spretnosti in drugi atributi:

- podlaga za raziskovalno delo na področju algebre;
- prenos in implementacija znanja iz algebre različna strokovna in znanstvena področja, kjer se uporabljajo algebralne metode.

Intended learning outcomes:

Knowledge and understanding:

- knowledge and understanding of basic results of computational algebra;
- knowledge and understanding of basic algorithmic approaches to algebra and their implementations.

Transferable/Key Skills and other attributes:

- a basis for research in area of algebra;
- implementation and knowledge transfer of statistical methods into different areas dealing with algebraic methods.

Metode poučevanja in učenja:

- predavanja;
- domače naloge;
- priprava seminarja;
- konzultacije;
- samostojni študij.

Teaching and learning methods:

- lectures;
- homework;
- seminar work;
- consultations;
- self-study.

Načini ocenjevanja:

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

- seminarsko predavanje;
- domače naloge;
- ustni ali pisni izpit.

Delež (v %) /
Weight (in %)

30 %
30 %
40 %

Assessment methods:

Type (examination, oral, coursework, project):

- seminar talk;
- homework;
- oral or written examination.