



Univerza v Mariboru
University of Maribor

Fakulteta za naravoslovje in
matematiko / Faculty of Natural
Sciences and Mathematics



OPIS PREDMETA / SUBJECT SPECIFICATION

Predmet:	Analitični pristopi v geometriji
Subject Title:	Analytical approaches in geometry

Študijski program Study programme	Študijska smer Study field	Letnik Year	Semester Semester
Izobraževalna matematika, enopredmetni študij, 2. stopnja		1.	2.

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. Vaje Lab. Work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45		30			105	6

Nosilec predmeta / Lecturer:

Bojan HVALA

Jeziki / Predavanja / Lecture: slovenski / Slovenian

Languages: Vaje / Tutorial: slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Pogojev ni.

Prerequisites:

None.

Vsebina:

Contents (Syllabus outline):

- Analitična geometrija v kartezičnih koordinatah. Premice, stožnice. Uporaba v konkretnih primerih v geometriji. Eulerjeve stožnice.
- Analitična geometrija v trilinearnih koordinatah. Premice, stožnice. Projektivna ravnina. Uporaba v konkretnih primerih v geometriji. Eulerjeva premica, Kiepertova hiperbola. Kubične krivulje trikotnika.
- Kompleksna števila v geometriji. Potrebni in zadostni pogoji za podobnost trikotnikov z danimi oglišči. Pogoji za to, da so tri točke oglišča enakostraničnega trikotnika. Napoleonov, Thebaultov izrek, Napoleon – Barlotti izrek. Kolinearnost in koncikličnost. Ptolomejev izrek. Cliffordovi izreki.

- Analytic geometry in Cartesian coordinates. Lines, conics. Examples of use in geometry. Euler's conics.
- Analytical geometry in trilinear coordinates. Lines, conics. Projective plane. Examples of use in geometry. Euler line, Kieper hyperbola. Cubics associated with a triangle.
- Complex numbers in geometry. Necessary and sufficient conditions for similarity of triangles with given vertices. Conditions that three given points are the vertices of an equilateral triangle. Napoleon and Thebault's theorem. Napoleon – Barlotti theorem. Colinearity and concyclicity. Ptolemy theorem. Clifford theorems.

Temeljni študijski viri / Textbooks:

- B. Spain: *Analytical conics*, Dover Publications, Mineola, New York, 2007.
- O. Botema, R. Erne, R. Hartshorne: *Topics in elementary geometry*, Springer, New York, 2008
- Liang-shin Hahn: *Complex numbers & geometry*, MAA, Washington, 1994

Cilji:

Cilj predmeta je na konkretnih primerih ravninske geometrije ponoviti in utrditi analitično geometrijo v kartezičnih koordinatah.

Predstavitev alternativnih trilinearnih koordinat ima dvojen namen:

- predstaviti sredstvo, ki je včasih bistveno udobnejše, včasih pa celo zapletenejše od znanih sredstev;
- predstaviti teorijo, ki bo za študente podobno nova, kot bo klasična analitična geometrija nova za njihove bodoče dijake.

Cilj zaključnega poglavja je seznaniti študente s kompleksnimi števili kot močnim orodjem v ravninski geometriji.

Objectives:

The aim of this course is (through the work on concrete cases of planar geometry) to repeat and consolidate the students knowledge on analytic geometry in Cartesian coordinates.

We introduce an alternative trilinear coordinates in order to present a new mean, sometimes substantially more comfortable and sometimes even more complex than the known ones. This chapter also brings a completely new method for work with circles and lines to the future teachers, which will make them understand better the situation of their future students being for the first time acquainted with the usual methods.

The objective of this course is also to acquaint students with complex numbers as a powerful tool in the planar geometry.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent utrdil znanje klasične analitične geometrije in pridobil občutek za prednosti alternativnih metod, kot sta uporaba trilinearnih koordinat in kompleksnih števil v ravninski geometriji.

Prenesljive/ključne spretnosti in drugi atributi:
Zavest o dejstvu, da investicija v izgradnjo močnejšega matematičnega orodja prinaša prednosti v fazi uporabe.

Intended learning outcomes:

Knowledge and Understanding:

On completion of this course the student will consolidate his knowledge on classical analytic geometry and get an insight in the advantages of the use of trilinear coordinates and complex numbers in the plane geometry.

Transferable/Key Skills and other attributes:
Awareness of the fact that investment in building a more powerful mathematical tools brings advantages during the application.

Metode poučevanja in učenja:

- Predavanja
- Teoretične vaje
- Individualno delo

Learning and teaching methods:

- Lectures
- Theoretical exercises
- Individual work

Načini ocenjevanja:

- Pisni izpit
- Ustni izpit

Delež (v %) /
Weight (in %)

50%, 50%

Assessment:

- Written exam
- Oral exam

Materialni pogoji za izvedbo predmeta :

- Predavalnica z računalnikom in LCD projektorjem

Material conditions for subject realization

- Lecture hall, computer, LCD projector

Obveznosti študentov:

(pisni, ustni izpit, naloge, projekti)

- Pisni izpit
- Ustni izpit

Students' commitments:

(written, oral examination, coursework, projects):

- Written exam
- Oral exam