



Univerza v Mariboru



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Fakulteta za naravoslovje in
matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Analitični pristopi v geometriji
Course title:	Analytical approaches in geometry

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Matematika, 2. stopnja		1. ali 2.	1. ali 3.
Mathematics, 2 nd degree		1. or 2.	1. or 3.

Vrsta predmeta / Course type

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
45		30			135	7

Nosilec predmeta / Lecturer: Bojan HVALA

Jeziki /

Languages:

Predavanja /

Lectures:

Vaje / Tutorial:

SLOVENSKO/SLOVENE

SLOVENSKO/SLOVENE

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

Prerequisites:

Vsebina:

Content (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

- 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

z danimi oglišči. Pogoji za to, da so tri točke oglišča enakostraničnega trikotnika. Napoleonov, Thebaultov izrek, Napoleon – Barlottijev izrek. Kolinearnost in koncikličnost. Ptolomejev izrek. Cliffordovi izreki.

equilateral triangle. Napoleon and Thebaultov theorem. Napoleon – Barlotti theorem. Colinearity and concyclity. Ptolemey theorem. Clifford theorems.

Temeljni literatura in viri / Readings:

- 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 in kompetence:

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 and competences:

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 analitic 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:

Learning and teaching methods:

• Predavanja • Teoretične vaje • Individualno delo	• Lectures • Theoretical excersises • Individual work		
Načini ocenjevanja:	Assessment:		
Način (pisni izpit, ustno izpraševanje, naloge, projekt) Pisni test – praktični del Izpit (ustni) – teoretični del Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno. Pozitivna ocena pri pisnem testu je pogoj za pristop k izpitu.	<table><tr><td>Delež (v %) / Weight (in %) 50% 50%</td><td>Type (examination, oral, coursework, project): Written test – practical part Exam (oral) – theoretical part Each of the mentioned commitments must be assessed with a passing grade. Passing grade of the written test is required for taking the exam.</td></tr></table>	Delež (v %) / Weight (in %) 50% 50%	Type (examination, oral, coursework, project): Written test – practical part Exam (oral) – theoretical part Each of the mentioned commitments must be assessed with a passing grade. Passing grade of the written test is required for taking the exam.
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Reference nosilca / Lecturer's references:			
1. HVALA, Bojan. Diophantine Steiner triples. <i>Math. Gaz.</i>, March 2011, vol. 95, no. 532, str. 31-39. [COBISS.SI-ID 18256648] 2. HVALA, Bojan. Diophantine Steiner triples and Pythagorean-type triangles. <i>Forum geom.</i>, 2010, vol. 10, str. 93-97. http://forumgeom.fau.edu/FG2010volume10/FG201010.pdf. [COBISS.SI-ID 15669337] 3. HVALA, Bojan. Modernizing mathematics education in Slovenia : a teacher friendly approach. V: LAMANAUSKAS, Vincentas (ur.). <i>Challenges of science, mathematics and technology teacher education in Slovenia</i>, (Problems of education in the 21st century, vol. 14). Siauliai: Scientific Methodological Center Scientia Educologica, 2009, str. 34-43. [COBISS.SI-ID 17351944] 4. HVALA, Bojan. Generalized Lie derivations in prime rings. <i>Taiwan. j. math.</i>, dec. 2007, vol. 11, iss. 5, str. 1425-1430. [COBISS.SI-ID 15969288] 5. BREŠAR, Matej, HVALA, Bojan. On additive maps of prime rings. II. <i>Publ. math. (Debr.)</i>, 1999, letn. 54, št. 1/2, str. 39-54. [COBISS.SI-ID 8598617]			