Univerza v Mariboru

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Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Ravninska in prostorska geometrija**
Course title:	Plane and solid geomety

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Izobraževalna matematika – dvopredmetni, 1. stopnja		**2.**	**3.**
Educational mathematics – Double-major, 1st degree		**2.**	**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**	**15**		**90**	**6**

Nosilec predmeta / Lecturer: Bojan HVALA

Jeziki / Languages:	
Predavanja / Lectures:	SLOVENSKO/SLOVENE
Vaje / Tutorial:	SLOVENSKO/SLOVENE

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Jih ni.	There are none.

Vsebina:	**Content (Syllabus outline):**
Trikotnik. Cevov izrek. Znamenite točke trikotnika. Eulerjeva premica, krožnica devetih točk. Simsonova premica, Ptolomejev izrek. Krožnica. Potenca točke glede na krožnico, potenčna premica in potenčno središče. Eulerjev izrek.	Triangle. Ceva's theorem. Basic triangle centers. Euler line, Nine-point circle. Simson line, Ptolemy's theorem. Circle. Power of a point with respect to a circle, radical axis, radical center. Euler's theorem. Quadrangles. Varignon's theorem. Cyclic

Štirikotniki. Varignonov izrek. Tetivni štirikotniki. Napoleonovi trikotniki. Ploščina. Brahmaguptova in Heronova formula. Menelajev izrek in primeri uporabe. Transformacije ravnine: izometrije (translacije, rotacije, zrcaljenja), raztegi. Inverzija. Telesa. Prizma, piramida, valj, stožec, krogla. Volumen. Koti v telesih. Prostorski kot. Eulerjeva formula. Pravilna telesa.	quadrangles. Napoleon triangles. Area. Brahmagupta's formula. Heron's formula. Menelaus' theorem and applications. Transformations: isometries (translation, rotation, reflection), dilatation. Inversion. Solid. Prism, Cylinder, Cone, Sphere. Volume. Angles in solids. Solid angles. Euler polyhedral formula. Platonic solids.

Temeljni literatura in viri / Readings:

H. S. M. Coxeter, S. L. Greitzer: *Geometry Revisited.* Washington: MAA, 1967.

C. Kimberling, *Geometry in action, a discovery approach using the Geometer's sketchpad*, Key College Publishing, Emeryville, 2003.

D. Palman: *Trokut i kružnica.* Zagreb: Element, 1994.

D. Palman: *Geometrijske konstrukcije.* Zagreb: Element, 1996.

D. Palman: *Stereometrija.* Zagreb: Element, 2002.

Bogomolny, A. ``Regular Polyhedra." http://www.cut-the-knot.com/do_you_know/polyhedra.html.

Cilji in kompetence:	**Objectives and competences:**
Študent se seznani z osnovami pojmi in rezultati geometrije trikotnika, s transformacijami v ravnini in njihovo uporabo pri geometrijskih konstrukcijah ter z osnovnimi pojmi prostorske geometrije.	Knowing fundamental concepts and results from triangle geometry. Understending transformations of the plane and their applications to geometric constructions. Knowing fundamental results from solid geometry.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: • Študent obvlada pojme in rezultate iz ravninske in prostorske geometrije v razširjenem srednješolskem obsegu. • Študent vadi dokazovanje trditev iz ravninske geometrije in s tem spoznava drugačen, manj računski pristop k dokazovanju. • Študent obvlada osnovne geometrijske konstrukcije, tako z uporabo klasičnih orodij, kot z uporabo računalniških geometrijskih orodij.	Knowledge and Understanding: • Enlarging student's high school knewledge about the concepts and results from plane and solid geometry. • Practicing the geometrical, noncomputational approach to proving results in plane geomety. • Being able to accomplish basic geometric constructions applying classical tools as well as modern geometric computer tools. • Understanding the importance of transformations of the plane mapping

• Študent spoznava pomen transformacij, ki konkretne geometrijske situacije preslikajo v bolj ugodne. Prenesljive/ključne spretnosti in drugi atributi: • Problemski pristop, kjer z računalniškim eksperimentiranjem tvorimo hipoteze in jih kasneje bodisi dokažemo bodisi ovržemo s protiprimeri. • Dojemanje transformacij kot opcije za pretvorbo matematične situacije v drugo situacijo, ki je udobnejša za obravnavo.	geometric configurations into more convenient ones. Transferable/Key Skills and other attributes: • Problem solving approach, consisted of computer experimentation, proposing hypothesis and finding either the proof or the counterexample. • Understanding the concept of transformations as tools to convert a certain mathematical situation into a more convenient one.
Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Teoretične vaje • Laboratorijske vaje v računalniški učilnici • Individualno delo	• Lectures • Theoretical exercises • Excersises in computer room. • Individual work

Načini ocenjevanja: / **Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt)	Delež (v %) / Weight (in %)	Type (examination, oral, coursework, project):
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.	50% 50%	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.

Reference nosilca / Lecturer's references:

1. HVALA, Bojan. Diophantine Steiner triples. *Math. Gaz.*, March 2011, vol. 95, no. 532, str. 31-39. [COBISS.SI-ID 18256648]

2. HVALA, Bojan. Diophantine Steiner triples and Pythagorean-type triangles. *Forum geom.*, 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.). *Challenges of science, mathematics and technology teacher*

education in Slovenia, (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. *Taiwan. j. math.*, 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. *Publ. math. (Debr.)*, 1999, letn. 54, št. 1/2, str. 39-54. [COBISS.SI-ID 8598617]