



Univerza v Mariboru



Univerza v Mariboru

Fakulteta za naravoslovje in
matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Fraktali
Course title:	Fractals

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Izobraževalna matematika, dvopredmetni študij, 2. stopnja	Modul D2	1. ali 2.	2. ali 4.
Educational mathematics, double major 2 nd degree	Module D2	1. or 2.	2. or 4.

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
30		15			45	3

Nosilec predmeta / Lecturer:

Dušan PAGON

Jeziki /

Languages:

Predavanja /

Lectures:

Vaje / Tutorial:

SLOVENSKO/SLOVENE

SLOVENSKO/SLOVENE

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

Jih ni.

Prerequisites:

There are none.

Vsebina:

- Metričen prostor, različne vrste podprostorov, prostor fraktalov.
- Afine transformacije, skrčitve, sistemi iterirajočih funkcij.
- Teoretično in eksperimentalno določanje dimenzije fraktala, Hausdorff-Bezikovičeva dimenzija.

Content (Syllabus outline):

- A metric space, different types of subspaces, the space of fractals.
- Affine transformations, contraction mappings, systems of iterating functions.
- The theoretical and experimental determination of the fractal dimension, Hausdorff-Besicovitch dimension.

Temeljni literatura in viri / Readings:

Barnsley, M. F.: Fractals Everywhere. Academic Press, Boston (1988); Second edition (1993)
 Barnsley, M. F.: Superfractals. Cambridge University Press, Cambridge (2006)
 Devaney, R. L.: Chaos, Fractals and Dynamics - Computer Experiments in Dynamics, Addison-Wesley (1990)
 Edgar, G: Classics on Fractals. Westview Press, Boulder (1992)
 Falconer, K. J.: The Geometry of Fractal Sets. Cambridge University Press, Cambridge (1985)

Cilji in kompetence:

Študenti se seznani s strukturo podprostora fraktalov v metričnem prostoru in z osnovnimi načini generiranja fraktalov (družine iterirajočih preslikav). Spoznajo tudi definicijo dimenzije fraktala.

Objectives and competences:

Students get familiar with the structure of the subset of fractals in a metric space and with the main ways of generating fractals (iterated functions systems). They also learn the definition of the fractal dimension.

Predvideni študijski rezultati:

Znanje in razumevanje:

- aktivno obvladanje strukture metričnega prostora in prepoznavanje fraktalnih podmnožic
- teoretično in eksperimentalno določanje dimenzije fraktalov

Prenesljive/ključne spretnosti in drugi atributi:

- sposobnost generiranja fraktalov
- izračun dimenzije fraktalne množice

Intended learning outcomes:

Knowledge and Understanding:

- active knowledge of metric space structure and the ability to recognize its fractal subsets
- theoretical and experimental ways for finding the dimension of a fractal

Transferable/Key Skills and other attributes:

- the ability to generate fractals
- the calculation of fractal dimension

Metode poučevanja in učenja:

- Predavanja
- Seminarske vaje
- Individualno delo

Learning and teaching methods:

- Lectures
- Tutorial
- Individual work

Načini ocenjevanja:

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

- seminarska naloga
- ustni izpit

Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.

Delež (v %) /
Weight (in %)
20%
80%

Type (examination, oral, coursework, project):

- coursework
- oral exam

Each of the mentioned commitments must be assessed with a passing grade.

Reference nosilca / Lecturer's references:

1. PAGON, Dušan, REPOVŠ, Dušan, ZAICEV, Mikhail. On the codimension growth of simple color Lie superalgebras. *J. Lie theory*, 2012, vol. 22, no. 2, str. 465-479.

<http://www.heldermann.de/JLT/JLT22/JLT222/jlt22017.htm>. [COBISS.SI-ID

16070233]

2. PAGON, Dušan. Simplified square equation in the quaternion algebra. *International journal of pure and applied mathematics*, 2010, vol. 61, no. 2, str. 231-240. [COBISS.SI-ID 17718024]
3. GUTIK, Oleg, PAGON, Dušan, REPOVŠ, Dušan. On chains in H-closed topological pospaces. *Order (Dordr.)*, 2010, vol. 27, no. 1, str. 69-81. <http://dx.doi.org/10.1007/s11083-010-9140-x>. [COBISS.SI-ID 15502169]
4. GUTIK, Oleg, PAGON, Dušan, REPOVŠ, Dušan. The continuity of the inversion and the structure of maximal subgroups in countably compact topological semigroups. *Acta math. Hung.*, 2009, vol. 124, no. 3, str. 201-214. <http://dx.doi.org/10.1007/s10474-009-8144-8>, doi: 10.1007/s10474-009-8144-8. [COBISS.SI-ID 15212121]
5. PAGON, Dušan. The dynamics of selfsimilar sets generated by multibranching trees. *International journal of computational and numerical analysis and applications*, 2004, vol. 6, no. 1, str. 65-76. [COBISS.SI-ID 14037081]