Univerza v Mariboru

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Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Funkcionalna analiza
Course title:	Functional analysis

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Matematika, 2. stopnja		**1. ali 2.**	**2. ali 4.**
Mathematics, 2nd degree		**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**
60		**45**			**195**	**10**

Nosilec predmeta / Lecturer: Matej BREŠAR

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Poznavanje linearne algebre in analize.	Knowledge of linear algebra and analysis.

Vsebina:	**Content (Syllabus outline):**
Banachovi prostori: vektorski in normirani prostori, polnost, primeri; podprostori in kvocientni prostori; končno-razsežni normirani prostori, kompaktne množice; Banachove algebre, spekter. Linearni operatorji in funkcionali: omejeni in neomejeni linearni operatorji; kompaktni operatorji; izreki o enakomerni omejenosti, odprti preslikavi in zaprtem grafu; dual, Hahn-Banachov izrek, refleksivni prostori.	Banach spaces: vector spaces and normed spaces, completness, examples; subspaces and quotient spaces; finite dimensional normed spaces, compact sets; Banach algebras, spectrum. Linear operators and functionals: bounded and unbounded linear operators; compact operators; uniform boundedness principle, open mapping theorem, closed graph theorem; dual, Hahn-Banach theorem, reflexive spaces.

Hilbertovi prostori: osnovni pojmi in primeri; ortogonalnost, Rieszov izrek; ortonormirane množice; adjungirani operatorji.	Hilbert spaces: basic concepts and examples; orthogonality, Riesz theorem; orthonormal bases, adjoint operators.

Temeljni literatura in viri / Readings:

B. Brown, A. Page, Elements of functional analysis, Van Nostrand, 1970.

M. Hladnik, Naloge in primeri iz funkcionalne analize in teorije mere, DMFA, 1985.

B. P. Rynne, M. A. Youngson, Linear functional analysis, Springer, 2000.

J. Vrabec, Metrični prostori, DMFA, 1993.

Cilji in kompetence:	**Objectives and competences:**
Poglobi znanje temeljnih konceptov in rezultatov funkcionalne analize.	Deepening the knowledge of fundamental concepts and results of functional analysis.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: • Banachovih prostorov • Hilbertovih prostorov • Teorije operatorjev Prenesljive/ključne spretnosti in drugi atributi: Pridobljeno znanje je podlaga tako za teoretično kot uporabno analizo na višji ravni.	Knowledge and Understanding: • Banach spaces • Hilbert spaces • Operator theory Transferable/Key Skills and other attributes: The obtained knowledge is a basis for both theoretical and applied analysis on an advanced level.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Seminarske vaje	• Lectures • Tutorial

Načini ocenjevanja:		**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt) Pisni izpit	Delež (v %) / Weight (in %) 100%	Type (examination, oral, coursework, project): Written exam
Reference nosilca / Lecturer's references:		

1. BAHTURIN, Jurij Aleksandrovič, BREŠAR, Matej, ŠPENKO, Špela. Lie superautomorphisms on associative algebras, II. *Algebr. represent. theory*, 2012, vol. 15, no 3, str. 507-525. http://dx.doi.org/10.1007/s10468-010-9254-2. [COBISS.SI-ID 16299353]

2. BIERWIRTH, Hannes, BREŠAR, Matej, GRAŠIČ, Mateja. On maps determined by zero products. *Commun. Algebra*, 2012, vol. 40, no. 6, str. 2081-2090. http://dx.doi.org/10.1080/00927872.2011.570833. [COBISS.SI-ID 16315481]

3. BREŠAR, Matej, MAGAJNA, Bojan, ŠPENKO, Špela. Identifying derivations through the spectra of their values. *Integr. equ. oper. theory*, 2012, vol. 73, no. 3, str. 395-411. http://dx.doi.org/10.1007/s00020-012-1975-7. [COBISS.SI-ID 16339289]

4. BAHTURIN, Jurij Aleksandrovič, BREŠAR, Matej, KOCHETOV, Mikhail. Group gradings on finitary simple Lie algebras. *Int. j. algebra comput.*, 2012, vol. 22, no. 5, 1250046 (46 str.). http://dx.doi.org/10.1142/S0218196712500464. [COBISS.SI-ID 16339545]

5. ALAMINOS, J., BREŠAR, Matej, ŠEMRL, Peter, VILLENA, A. R. A note on spectrum-preserving maps. *J. math. anal. appl.*, 2012, vol. 387, iss. 2, str. 595-603. http://dx.doi.org/10.1016/j.jmaa.2011.09.024. [COBISS.SI-ID 16067673]