



Univerza v Mariboru

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, 3. stopnja		1. ali 2.	1. ali 2. ali 4.
Mathematics, 3 rd Degree		1 st or 2 nd	1 st or 2 nd or 4 th

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
60					240	10

Nosilec predmeta / Lecturer:

Jeziki / Languages:	Predavanja / Lectures:	Slovenski in angleški jezik; Slovene and English
	Vaje / Tutorial:	Slovenski in angleški jezik; Slovene and English

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

Osnovno znanje klasične analize, linearne algebre in metričnih prostorov.

Prerequisites:

Basic knowledge of classical analysis, linear algebra and metric spaces.

Vsebina:

Content (Syllabus outline):

Linearni topološki prostori: lokalno konveksni prostori, Banachovi prostori, Hilbertovi prostori.

Teorija operatorjev: splošna teorija, posebni razredi operatorjev.

Topološke algebre: Banachove algebre, operatorske algebre.

Nekatere izmed teh tem so obdelane podrobneje, druge pa le na osnovni ravni. Pri izboru se upoštevajo interesi in raziskovalne usmeritve študentov.

Linear topological spaces: locally convex spaces, Banach spaces, Hilbert spaces.

Operator theory: general theory, special classes of operators.

Topological algebras: Banach algebras, operator algebras.

Some of these topics are treated in greater detail, and some of them only at a basic level. The selection depends on students' interests

Temeljni literatura in viri / Readings:

- J. B. Conway, A course in operator theory, AMS, 2000.
- J. B. Conway, A course in functional analysis, Springer-Verlag, 1997.
- H. G. Dales, Banach algebras and automatic continuity, Oxford Science Publications, 2000.
- N. Dunford, J. T. Schwartz, Linear operators, I, II, III, John Wiley & Sons, 1988.
- R. V. Kadison, J. R. Ringrose, Fundamentals of the theory of operator algebras, I, II, AMS, 1997.
- P. D. Lax, Functional analysis, John Wiley & Sons, 2002.
- R. E. Megginson, An introduction to Banach space theory, Springer-Verlag, 1998.
- H. H. Schaefer, M. P. Wolff, Topological vector spaces, Springer-Verlag, 1999.

Cilji in kompetence:

- Doseči poglobljeno razumevanje teoretskih in metodoloških konceptov s področja funkcionalne analize
- Razviti sposobnost samostojnega razvijanja novega znanja s področja funkcionalne analize
- Razviti sposobnost za samostojno reševanje najzahtevnejših problemov iz funkcionalne analize
- Razviti sposobnost izboljševanja znanih in odkrivanja novih rezultatov s področja funkcionalne analize
- Zmožnost razvijanja kritične refleksije na področju funkcionalne analize
- Razviti zmožnost vodenja najzahtevnejših znanstvenoraziskovalnih projektov s širšega področja funkcionalne analize.

Objectives and competences:

- To achieve a deeper understanding of theoretical and methodological concepts of functional analysis
- To develop the ability to independently develop new knowledge in the field of functional analysis
- To develop the ability for solving the most challenging problems in functional analysis
- To develop the ability of improving known results as well as obtaining new results in functional analysis
- Ability to develop critical reflection in functional analysis
- To develop the ability to lead the most challenging scientific research projects in the wider field of functional analysis

Predvideni študijski rezultati:

Znanje in razumevanje:

- poznavanje osnovnih področij funkcionalne analize;
- razumevanje osnovnih pojmov funkcionalne analize.

Prenesljive/ključne spretnosti in drugi atributi:

- podlaga za raziskovalno delo na področju funkcionalne analize;
- pridobljeno znanje za uporabo funkcionalne analize na drugih matematičnih področjih.

Intended learning outcomes:

Knowledge and understanding:

- a basis for research in functional analysis;
- knowledge needed for applying functional analysis to other mathematical areas.

Transferable/Key Skills and other attributes:

- a basis for research in functional analysis;
- knowledge needed for applying functional analysis to other mathematical areas.

Metode poučevanja in učenja:

- predavanja;
- priprava seminarja;
- konzultacije;
- samostojni študij.

Learning and teaching methods:

- lectures;
- seminar work;
- consultations;
- self-study.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)	Delež (v %) / Weight (in %)	Type (examination, oral, coursework, project):
• seminar;	20 %	• seminar;
• domače naloge;	30 %	• homework;
• ustni izpit.	50 %	• oral examination.

Reference nosilca / Lecturer's references:

J. Alaminos, M. Brešar, P. Šemrl, A. R. Villena, A note on spectrum-preserving maps, J. Math. Anal. Appl. 387 (2012), 595-603.

M. Brešar, Š. Špenko, Determining elements in Banach algebras through spectral properties, J. Math. Anal. Appl. 393 (2012), 144-150.

M. Brešar, B. Magajna, Š. Špenko, Identifying derivations through the spectra of their values, Integr. Eq. Oper. Th. 73 (2012), 395--411.

J. Alaminos, M. Brešar, J. Extremera, Š. Špenko, A. R. Villena, Determining elements in C*-algebras through spectral properties, J. Math. Anal. Appl. 405 (2013), 214--219.

J. Alaminos, M. Brešar, J. Extremera, Š. Špenko, A. R. Villena, Derivations preserving quasinilpotent elements, Bull. London Math. Soc. 46 (2014), 379-384.