

UČNI NAČRT PREDMETA / COURSE SYLLABUS							
Predmet:		Teorija operatorjev					
Course title:		Operator theory					
Študijski program in stopnja Study programme and level		Študijska smer Study field			Letnik Academic year		Semester Semester
Magistrski študijski program Finančna matematika		ni smeri			1 ali 2		prvi ali drugi
Master's study programme Financial Mathematics		none			1 or 2		first or second
Vrsta predmeta / Course type					izbirni		
Univerzitetna koda predmeta / University course code:					M2123		
Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS	
45		30			105	6	
Nosilec predmeta / Lecturer:		prof. Peter Šemrl, prof. Roman Drnovšek					
Jeziki / Languages:		Predavanja / Lectures: slovenski/Slovene, angleški/English					
		Vaje / Tutorial: slovenski/Slovene, angleški/English					
Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:				Prerequisites:			
Vsebina:				Content (Syllabus outline):			

<p>Kompaktni operatorji na Banachovih prostorih.</p> <p>Schauderjev izrek o negibni točki.</p> <p>Invariantni podprostori. Izrek Lomonosova. Rieszov razcep kompaktnega operatorja.</p> <p>Fredholmovi operatorji. Calkinova algebra. Bistveni spekter.</p> <p>Parcialne izometrije in unitarni operatorji.</p> <p>Schmidtova reprezentacija kompaktnih operatorjev.</p> <p>Hilbert-Schmidtovi operatorji. Dualnost med algebrami vseh omejenih operatorjev, vseh operatorjev s sledjo in vseh kompaktnih operatorjev.</p> <p>Spekter normalnih operatorjev.</p> <p>Spektralni izrek za normalne operatorje (v obliki operatorja množenja in v integralški obliki).</p> <p>Fuglede-Putnamov izrek.</p>	<p>Compact operators on Banach spaces. The Schauder fixed point theorem.</p> <p>Invariant subspaces. Lomonosov's theorem. The Riesz decomposition of a compact operator. Fredholm operators. The Calkin algebra. The essential spectrum. Partial isometries and unitary operators. The Schmidt representation of a compact operator. Hilbert-Schmidt operators. Duality between the algebra of all bounded operators, the algebra of all trace-class operators and the algebra of all compact operators. The spectrum of normal operators. The spectral theorem for normal operators (in the multiplication operator form and in the integral form).</p> <p>The Fuglede-Putnam theorem.</p>
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Temeljni literatura in viri / Readings:

- R. Bhatia: Notes on Functional Analysis, Texts and Readings in Mathematics 50, Hindustan Book Agency, New Delhi, 2009.
- J. B. Conway: A Course in Functional Analysis, 2nd edition, Springer, New York, 1990.
- I. Gohberg, S. Goldberg, M. A. Kaashoek: Classes of Linear Operators I, Birkhäuser, Basel, 1990.
- G. K. Pedersen: Analysis Now, Springer, New York, 1996.
- I. Vidav: Linearni operatorji v Banachovih prostorih, DMFA-založništvo, Ljubljana, 1982.

Cilji in kompetence:

Objectives and competences:

Obravnavava nekaterih razredov omejenih linearnih operatorjev na Hilbertovih in Banachovih prostorih.

Treatment of some classes of bounded linear operators on Hilbert and Banach spaces.

Predvideni študijski rezultati:

Znanje in razumevanje: Poznavanje osnovnih razredov linearnih operatorjev, sposobnost aplikacije pridobljenega znanja.

Uporaba: Uporaba teorije operatorjev sega tudi v naravoslovje in druga področja znanosti kot na primer ekonomijo.

Refleksija: Razumevanje teorije, utrjeno s primeri uporabe.

Prenosljive spretnosti – niso vezane le na en predmet: Identifikacija in reševanje problemov. Spretnost uporabe domače in tuje literature.

Intended learning outcomes:

Knowledge and understanding: Knowledge of some classes of linear operators, the ability to apply the acquired knowledge.

Application: Operator theory is used in natural sciences and other areas of science such as economics.

Reflection: Understanding of the theory, strengthened by examples.

Transferable skills: Identifying and solving problems. Ability to use a wide range of references.

Metode poučevanja in učenja:

predavanja, vaje, domače naloge, konzultacije

Learning and teaching methods:

Lectures, exercises, homeworks, consultations

Načini ocenjevanja:

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

domače naloge

izpit iz vaj

Delež (v %) /

Weight (in %)

Assessment:

Type (examination, oral, coursework, project):

homeworks

written exam

10%

50%

40%

ustni izpit		oral exam
Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)		Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

Reference nosilca / Lecturer's references:

Roman Drnovšek:

– DRNOVŠEK, Roman. Common invariant subspaces for collections of operators. Integral equations and operator theory, ISSN 0378-620X, 2001, vol. 39, no. 3, str. 253-266 [COBISS.SI-ID 10597721]

– DRNOVŠEK, Roman. A generalization of Levinger's theorem to positive kernel operators. Glasgow mathematical journal, ISSN 0017-0895, 2003, vol. 45, part 3, str. 545-555 [COBISS.SI-ID 12825945]

– DRNOVŠEK, Roman. Invariant subspaces for operator semigroups with commutators of rank at most one. Journal of functional analysis, ISSN 0022-1236, 2009, vol. 256, iss. 12, str. 4187-4196 [COBISS.SI-ID 15167321]

Peter Šemrl:

– ŠEMRL, Peter. Similarity preserving linear maps. Journal of operator theory, ISSN 0379-4024, 2008, vol. 60, no. 1, str. 71-83 [COBISS.SI-ID 15079257]

– ŠEMRL, Peter. Local automorphisms of standard operator algebras. Journal of mathematical analysis and applications, ISSN 0022-247X. [Print ed.], 2010, vol. 371, iss. 2, str. 403-406 [COBISS.SI-ID 15672665]

– ŠEMRL, Peter. Symmetries on bounded observables: a unified approach based on adjacency preserving maps. Integral equations and operator theory, ISSN 0378-620X, 2012, vol. 72, iss. 1, str. 7-66 [COBISS.SI-ID 16568665]