UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2017/18)			
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 / elective
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. dr. Roman Drnovšek, prof. dr. Peter Šemrl

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:**
Vpis v letnik študija.	Enrolment in the programme.
Vsebina:	**Content (Syllabus outline):**

Kompaktni operatorji na Banachovih prostorih. Schauderjev izrek o negibni točki. Invariantni podprostori. Izrek Lomonosova. Rieszov razcep kompaktnega operatorja. Fredholmovi operatorji. Calkinova algebra. Bistveni spekter. Parcialne izometrije in unitarni operatorji. Schmidtova reprezentacija kompaktnih operatorjev. Hilbert-Schmidtovi operatorji. Dualnost med algebrami vseh omejenih operatorjev, vseh operatorjev s sledjo in vseh kompaktnih operatorjev. Spekter normalnih operatorjev. Spektralni izrek za normalne operatorje (v obliki operatorja množenja in v integralski obliki). Fuglede-Putnamov izrek.	Compact operators on Banach spaces.The Schauder fixed point theorem. 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). The Fuglede-Putnam theorem.

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:**

Obravnava 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:	**Intended learning outcomes:**
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.	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:	**Learning and teaching methods:**
predavanja, vaje, domače naloge, konzultacije	Lectures, exercises, homeworks, consultations

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt):	10%	Type (examination, oral, coursework, project):
domače naloge	50%	homeworks
izpit iz vaj	40%	written exam
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]