

UČNI NAČRT PREDMETA / COURSE SYLLABUS						
Predmet:		Uvod v harmonično analizo				
Course title:		Introduction to harmonic analysis				
Študijski program in stopnja Study programme and level		Študijska smer Study field		Letnik Academic year	Semester Semester	
Magistrski študijski program Matematika		ni smeri		1 ali 2	prvi ali drugi	
Master's study programme Mathematics		none		1 or 2	first or second	
Vrsta predmeta / Course type				izbirni		
Univerzitetna koda predmeta / University course code:				M2122		
Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45		30			105	6
Nosilec predmeta / Lecturer:		doc. Oliver Dragičević				
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>Fourierove vrste, sumacijske metode, Riesz-Thorinov interpolacijski izrek,</p> <p>harmonične funkcije, Poissonovi integrali, Hardyjevi prostori, harmonična konjugiranka, Hilbertova transformacija,</p> <p>Schwartzov razred, Fourierova transformacija, distribucije in umirjene distribucije,</p> <p>šibki L_p prostori in Marcinkiewiczev interpolacijski izrek, Paley-Wienerjev izrek ter princip nedoločenosti,</p> <p>Hardy-Littlewoodova maksimalna funkcija,</p> <p>Calderón-Zygmundovi singularni integralski operatorji,</p> <p>linearni parcialni diferencialni operatorji s konstantnimi koeficienti, fundamentalna rešitev, prostori Soboljeva.</p>	<p>Fourier series, summation methods, Riesz-Thorin interpolation theorem,</p> <p>Harmonic functions, Poisson integrals, Hardy spaces, harmonic conjugate, Hilbert transform,</p> <p>Schwartz class, Fourier transform, distributions and tempered distributions,</p> <p>weak L_p spaces and the Marcinkiewicz interpolation theorem, the Paley-Wiener theorem and the uncertainty principle,</p> <p>Hardy-Littlewood maximal function,</p> <p>Calderón-Zygmund singular integral operators,</p> <p>linear partial differential operators with constant coefficients, fundamental solution, Sobolev spaces.</p>
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Temeljni literatura in viri / Readings:

<p>L. Grafakos: Classical Fourier Analysis, Second Edition, Graduate Texts in Mathematics 249, Springer, 2008.</p> <p>E. M. Stein, G. L. Weiss: Introduction to Fourier Analysis on Euclidean Spaces, Princeton University Press, 1971.</p> <p>A. Torchinsky: Real-Variable Methods in Harmonic Analysis, Academic Press, 1986.</p> <p>Y. Katznelson: An introduction to harmonic analysis, Dover, New York, 1976.</p> <p>L. Hörmander: The Analysis of Linear Partial Differential Operators I: Distribution Theory and Fourier Analysis, Berlin Heidelberg New York 1990.</p>

Cilji in kompetence:

<p>Spoznavanje temeljnih pojmov in orodij harmonične analize na evklidskih prostorih, umeščanje v kontekst parcialnih diferencialnih enačb.</p>

Objectives and competences:

<p>Acquiring knowledge of fundamental notions and tools of euclidean harmonic analysis, placing them into the context of partial differential equations.</p>
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Predvideni študijski rezultati:

Znanje in razumevanje: Obvladovanje osnovnih konceptov harmonične analize na evklidskih prostorih.

Uporaba: Parcialne diferencialne enačbe, matematična fizika, naravoslovje, medicina.

Refleksija: Gre za eno temeljnih področij sodobne matematične analize.

Prenosljive spretnosti – niso vezane le na en predmet: Prepoznavanje problemov, ki sodijo v področje harmonične analize oziroma formulacija in reševanje nalog s pomočjo metod klasične Fourierove analize.

Intended learning outcomes:

Knowledge and understanding: Mastering basic concepts of euclidean harmonic analysis.
Application: PDE, mathematical physics, natural sciences, medicine.

Reflection: The course subject is one of the cornerstones of modern mathematical analysis.

Transferable skills: Recognition of problems in the realm of harmonic analysis, formulation and solving problems with methods of classical Fourier analysis.

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

ustni zagovor

Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)

Delež (v %) /

Weight (in %)

50%

50%

Assessment:

Type (examination, oral, coursework, project):

homework assignments

oral exam

Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

Reference nosilca / Lecturer's references:

Oliver Dragičević:

- DRAGIČEVIĆ, Oliver. Weighted estimates for powers of the Ahlfors-Beurling operator. Proceedings of the American Mathematical Society, ISSN 0002-9939, 2011, vol. 139, no. 6, str. 2113-2120 [COBISS.SI-ID 15876697]

- DRAGIČEVIĆ, Oliver, VOLBERG, Alexander. Bilinear embedding for real elliptic differential operators in divergence form with potentials. Journal of functional analysis, ISSN 0022-1236, 2011, vol. 261, iss. 10, str. 2816-2828 [COBISS.SI-ID 16051545]

- DRAGIČEVIĆ, Oliver, VOLBERG, Alexander. Linear dimension-free estimates in the embedding theorem for Schrödinger operators. Journal of the London Mathematical Society, ISSN 0024-6107, 2012, vol. 85, p. 1, str. 191-222 [COBISS.SI-ID 16214873]