

| UČNI NAČRT PREDMETA / COURSE SYLLABUS | | | | | | | |
|--|---------------------------|--------------------------------------|------------------------------|-------------------------------------|---|-----------------------------|--|
| Predmet: | | Uvod v harmonično analizo | | | | | |
| Course title: | | Introduction to harmonic analysis | | | | | |
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| 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 | | | |
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| Univerzitetna koda predmeta / University course code: | | | | M2122 | | | |
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| 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 | | | |
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| 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: | | | |
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| Vsebina: | | | | Content (Syllabus outline): | | | |

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| <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 integralni 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:

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| <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> |
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Cilji in kompetence:

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

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| <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]