| UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2017/18) | | | |
|---|---|---|---|
| **Predmet:** | Uvod v harmonično analizo | | |
| **Course title:** | Introduction to harmonic analysis | | |

| **Študijski program in stopnja**<br>**Study programme and level** | **Študijska smer**<br>**Study field** | **Letnik**<br>**Academic year** | **Semester**<br>**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 |

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| **Vrsta predmeta / Course type** | izbirni / elective |
| **Univerzitetna koda predmeta / University course code:** | M2122 |

| **Predavanja**<br>**Lectures** | **Seminar**<br>**Seminar** | **Vaje**<br>**Tutorial** | **Klinične vaje**<br>**work** | **Druge oblike študija** | **Samost. delo**<br>**Individ. work** | **ECTS** |
|---|---|---|---|---|---|---|
| **45** | | **30** | | | **105** | **6** |

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| **Nosilec predmeta / Lecturer:** | doc. dr. 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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| Vpis v letnik študija. | Enrolment in the programme. |
| **Vsebina:** | **Content (Syllabus outline):** |

| | |
|---|---|
| Fourierove vrste, sumacijske metode, Riesz-Thorinov interpolacijski izrek,<br><br>harmonične funkcije, Poissonovi integrali, Hardyjevi prostori, harmonična konjugiranka, Hilbertova transformacija,<br><br>Schwartzov razred, Fourierova transformacija, distribucije in umirjene distribucije,<br><br>šibki Lp prostori in Marcinkiewiczev interpolacijski izrek, Paley-Wienerjev izrek ter princip nedoločenosti,<br><br>Hardy-Littlewoodova maksimalna funkcija,<br><br>Calderón-Zygmundovi singularni integralski operatorji,<br><br>linearni parcialni diferencialni operatorji s konstantnimi koeficienti, fundamentalna rešitev, prostori Soboljeva. | Fourier series, summation methods, Riesz-Thorin interpolation theorem,<br>Harmonic functions, Poisson integrals, Hardy spaces, harmonic conjugate, Hilbert transform,<br><br>Schwartz class, Fourier transform, distributions and tempered distributions,<br><br>weak Lp spaces and the Marcinkiewicz interpolation theorem, the Paley-Wiener theorem and the uncertainty principle,<br><br>Hardy-Littlewood maximal function,<br><br>Calderón-Zygmund singular integral operators,<br><br>linear partial differential operators with constant coefficients, fundamental solution, Sobolev spaces. |

**Temeljni literatura in viri / Readings:**

L. Grafakos: Classical Fourier Analysis, Second Edition, Graduate Texts in Mathematics 249, Springer, 2008.

E. M. Stein, G. L. Weiss: Introduction to Fourier Analysis on Euclidean Spaces, Princeton University Press, 1971.

A. Torchinsky: Real-Variable Methods in Harmonic Analysis, Academic Press, 1986.

Y. Katznelson: An introduction to harmonic analysis, Dover, New York,1976.

L. Hörmander: The Analysis of Linear Partial Differential Operators I: Distribution Theory and Fourier Analysis, Berlin Heidelberg New York 1990.

| **Cilji in kompetence:** | **Objectives and competences:** |
|---|---|
| Spoznavanje temeljnih pojmov in orodij harmonične analize na evklidskih prostorih, umeščanje v kontekst parcialnih diferencialnih enačb. | Acquiring knowledge of fundamental notions and tools of euclidean harmonic analysis, placing them into the context of partial differential equations. |

| **Predvideni študijski rezultati:** | **Intended learning outcomes:** |
|---|---|
| Znanje in razumevanje: Obvladovanje osnovnih konceptov harmonične analize na evklidskih prostorih.<br><br>Uporaba: Parcialne diferencialne enačbe, matematična fizika, naravoslovje, medicina.<br><br>Refleksija: Gre za eno temeljnih področij sodobne matematične analize.<br><br>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. | Knowledge and understanding: Mastering basic concepts of euclidean harmonic analysis.<br><br>Application: PDE, mathematical physics, natural sciences, medicine.<br><br>Reflection: The course subject is one of the cornerstones of modern mathematical analysis.<br><br>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:** | **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):<br><br>domače naloge<br><br>ustni zagovor<br><br>Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL) | <br><br><br>50%<br><br>50% | Type (examination, oral, coursework, project):<br><br>homework assignments<br><br>oral exam<br><br>Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL) |

**Reference nosilca / Lecturer's references:**

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]

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. 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]