

| UČNI NAČRT PREDMETA / COURSE SYLLABUS  |                           |  |                              |                                    |   |             |
|--|---------------------------|--|------------------------------|------------------------------------|---|-------------|
| <b>Predmet:</b>  |                           | Izbrana poglavja iz analize  |                              |                                    |   |             |
| <b>Course title:</b>   |                           | Topics in analysis   |                              |                                    |   |             |
| <b>Študijski program in stopnja</b><br>Study programme and level             |                           | <b>Študijska smer</b><br>Study field   |                              | <b>Letnik</b><br>Academic year     | <b>Semester</b><br>Semester             |             |
| Magistrski študijski program<br>Matematika                                   |                           | ni smeri   |                              | 1 ali 2                            | prvi ali drugi                          |             |
| Master's study programme<br>Mathematics                                      |                           | none   |                              | 1 or 2                             | first or second                         |             |
| <b>Vrsta predmeta / Course type</b>  |                           |  |                              | izbirni                            |   |             |
| <b>Univerzitetna koda predmeta / University course code:</b>                 |                           |  |                              | M2125                              |   |             |
| <b>Predavanja</b><br>Lectures  | <b>Seminar</b><br>Seminar | <b>Vaje</b><br>Tutorial  | <b>Klinične vaje</b><br>work | <b>Druge oblike študija</b>        | <b>Samost. delo</b><br>Individ.<br>work | <b>ECTS</b> |
| 30   | 15                        | 30   |                              |                                    | 105                                     | 6           |
| <b>Nosilec predmeta / Lecturer:</b>  |                           | doc. Oliver Dragičević, prof. Barbara Drinovec Drnovšek, prof. Franc Forstnerič, prof. Miran Černe, prof. Oleksiy (Aleksey) Kostenko |                              |                                    |   |             |
| <b>Jeziki / Languages:</b>   |                           | <b>Predavanja / Lectures:</b> slovenski/Slovene, angleški/English  |                              |                                    |   |             |
|  |                           | <b>Vaje / Tutorial:</b> slovenski/Slovene, angleški/English  |                              |                                    |   |             |
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> |                           |  |                              | <b>Prerequisites:</b>              |   |             |
|  |                           |  |                              |                                    |   |             |
| <b>Vsebina:</b>  |                           |  |                              | <b>Content (Syllabus outline):</b> |   |             |
|  |                           |  |                              |                                    |   |             |

|  |   |
|--|---|
| <p>Predavatelj/ica izbere nekatere pomembne teme iz analize, kot npr.: osnove kompleksne analize več kompleksnih spremenljivk, teorija minimalnih ploskev, spektralna teorija in druge sodobne teme iz analize, ki jih izbere izvajalec.</p> | <p>The lecturer selects some important topics in analysis, such as: several complex variables, minimal surface theory, spectral theory and other topics chosen by the lecturer.</p> |
|--|---|

**Temeljni literatura in viri / Readings:**

T. H. Colding, W. P. Minicozzi, A course in minimal surfaces. Graduate Studies in Mathematics, 121. American Mathematical Society, Providence, RI, 2011

U. Dierkes, S. Hildebrandt, F. Sauvigny, Minimal surfaces. Grundlehren der Mathematischen Wissenschaften [Fundamental Principles of Mathematical Sciences], 339. Springer, Heidelberg, 2010.

J. Lebl, Tasty Bits of Several Complex Variables, A whirlwind tour of the subject, <https://www.jirka.org/scv/scv.pdf> 2018.

B. Simon: A Comprehensive Course in Analysis, Part 4: Operator Theory, AMS, 2015

**Cilji in kompetence:**

Študent spozna nekatera pomembna področja analize, kot so kompleksna analiza več kompleksnih spremenljivk, teorija minimalnih ploskev, spektralna teorija.

V okviru seminarских/projektnih aktivnosti študentje z individualnim delom in predstavitevijo ter delom v skupinah pridobijo izobraževalno komunikacijske in socialne kompetence za prenos znanj in za vodenje (strokovnega skupinskega dela).

**Objectives and competences:**

Students encounter some of the important areas of analysis, such as: several complex variables, minimal surface theory, spectral theory and other topics chosen by the lecturer.

With individual presentations and team work interactions within seminar/project activities students acquire communication and social competences for successful team work and knowledge transfer.

**Predvideni študijski rezultati:**

Znanje in razumevanje: Študentje se seznanijo s tematiko, metodami in glavnimi rezultati različnih področij analize.

**Intended learning outcomes:**

Knowledge and understanding: Students get acquainted with the subject matter, the methods, and the main results of various areas of analysis.

Uporaba: Študent bo znal pridobljeno znanje uporabiti v različnih matematičnih in drugih kontekstih.

Refleksija: Študentje spoznajo in razumejo medsebojno prepletanje in oplajanje različnih področij analize.

Prenosljive spretnosti – niso vezane le na en predmet: Študentje spoznajo nekatere metode, uporabne pri konstrukciji in analizi matematičnih modelov .

Application: Students will be able to use their knowledge in different mathematical and other contexts.

Reflection: Students comprehend the interplay and mutual enrichment of various areas of analysis.

Transferable skills: Students learn methods which are useful in construction and analysis of mathematical models.

**Metode poučevanja in učenja:**

predavanja, vaje, domače naloge, konzultacije

**Learning and teaching methods:**

Lectures, exercises, homeworks, consultations

Delež (v %) /

Weight (in %)

**Načini ocenjevanja:**

**Assessment:**

|   |                       |   |
|---|-----------------------|---|
| <p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>domače naloge, seminarska naloga, izpit</p> <p>Ocene: 5 (negativno), 6-10 (pozitivno) (po Statutu UL)</p> | <p>50%</p> <p>50%</p> | <p>Type (examination, oral, coursework, project):</p> <p>homework, seminar paper, exam</p> <p>Grading: 5 (fail), 6-10 (pass) (according to the Statute of UL)</p> |
|---|-----------------------|---|

---

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

Miran Černe:

– ČERNE, Miran, FLORES, Manuel. On Beurling's boundary differential relation. Israel journal of mathematics, ISSN 0021-2172, 2014, vol. 199, iss. 2, str. 831-840 [COBISS.SI-ID 17144153]

– ČERNE, Miran. Beurling's boundary differential relations on multiply connected domains. Journal of mathematical analysis and applications, ISSN 0022-247X. [Print ed.], 2015, vol. 428, iss. 1, str. 544-562 [COBISS.SI-ID 17270873]

– ČERNE, Miran. Nonlinear Riemann-Hilbert problems for quasilinear  $\bar{\partial}$ -equations on the unit disc. Complex variables and elliptic equations, ISSN 1747-6933, 2018, vol. 63, iss. 2, str. 278-291. [COBISS.SI-ID 18052185]

Barbara Drinovec Drnovšek:

– DRINOVEC-DRNOVŠEK, Barbara, KUZMAN, Uroš. Lelong functional on almost complex manifolds. Complex variables and elliptic equations, ISSN 1747-6933, 2015, vol. 60, iss. 2, str. 168-180 [COBISS.SI-ID 16979289]

–DRINOVEC-DRNOVŠEK, Barbara, FORSTNERIČ, Franc. Minimal hulls of compact sets in  $R^3$ . Transactions of the American Mathematical Society, ISSN 0002-9947, 2016, vol. 368, no. 10, str. 7477-7506. [COBISS.SI-ID 17543769]

– ALARCÓN, Antonio, DRINOVEC-DRNOVŠEK, Barbara, FORSTNERIČ, Franc, LÓPEZ, Francisco J. Minimal surfaces in minimally convex domains. Transactions of the American Mathematical Society, ISSN 0002-9947, Feb. 2019, vol. 371, no. 3, str. 1735-1770. [COBISS.SI-ID 18379865]

Franc Forstnerič:

– ALARCÓN, Antonio, FORSTNERIČ, Franc. Darboux charts around holomorphic Legendrian curves and applications. International mathematics research notices, ISSN 1073-7928, Feb. 2019, vol. 2019, iss.3, str. 893-922 [COBISS.SI-ID 18086233]

– FORSTNERIČ, Franc. A properly embedded holomorphic disc in the ball with finite area and dense boundary. Mathematische Annalen, ISSN 0025-5831, Feb. 2019, vol. 373, iss. 1-2, str. 719-742. [COBISS.SI-ID 18364505]

– ALARCÓN, Antonio, FORSTNERIČ, Franc. Every conformal minimal surface in  $R^3$  is isotopic to the real part of a holomorphic null curve. Journal für die Reine und Angewandte Mathematik, ISSN 0075-4102, 2018, vol. 2018, iss. 740, str. 77-109. [COBISS.SI-ID 17540953]

Oliver Dragičević:

- CARBONARO, Andrea, DRAGIČEVIĆ, Oliver. Functional calculus for generators of symmetric contraction semigroups. Duke mathematical journal, ISSN 0012-7094, 2017, vol. 166, no. 5, str. 937-974 [COBISS.SI-ID 17897305]

- 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].

Aleksey Kostenko:

- KOORNWINDER, Tom H., KOSTENKO, Aleksej Sergejevič, TESCHL, Gerald. Jacobi polynomials, Bernstein-type inequalities and dispersion estimates for the discrete Laguerre operator. Advances

in mathematics, ISSN 0001-8708, July 2018, vol. 333, str. 796-821 [COBISS.SI-ID 18416473]

- ECKHARDT, Jonathan, KOSTENKO, Aleksej Sergejevič, TESCHL, Gerald. Spectral asymptotics for canonical systems. *Journal für die Reine und Angewandte Mathematik*, ISSN 0075-4102, 2018, vol. 2018, iss. 736, str. 285-315 [COBISS.SI-ID 18344537]

- KOSTENKO, Aleksej Sergejevič, NICOLUSSI, Noema. On the Hamiltonian-Krein index for a non-self-adjoint spectral problem. *Proceedings of the American Mathematical Society*, ISSN 0002-9939, Sep. 2018, vol. 146, no. 9, 11 str. 3907-3921. [COBISS.SI-ID 18460249]