



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Izbrana poglavja iz analize
Course title:	Selected Topics in Analysis

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Matematika, 3. stopnja		1. ali 2.	1. ali 3. ali 4.
Mathematics, 3 rd cycle		1 st or 2 nd	1 st or 3 rd ali 4 th

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30					150	6

Nosilec predmeta / Lecturer:

Jeziki / Languages:	Predavanja / Lectures:	Slovenski jezik; Slovene
	Vaje / Tutorial:	

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Znanje osnovnih pojmov in rezultatov iz analize (zveznost, diferencirabilnost in integrabilnost; zaporedja in vrste).

Prerequisites:

Basic knowledge of fundamental notions and results of analysis (continuity, differentiability and integrability).

Vsebina:

Izbrana so posebna poglavja iz realne analize, teorije mere in integriranja, kompleksne analize, teorije potenciala, več kompleksnih spremenljivk, posebnih funkcij, zaporedij, vrst, sumabilnosti, Fourierjeve analize, analize na mnogoterostih ali katerega drugega modernega področja iz analize. Izbira poglavij je odvisna od interesa in raziskovalne usmerjenosti študentov. Spodaj navedena literatura praviloma služi le kot osnova in je nadgrajena z bolj specializiranimi teksti.

Content (Syllabus outline):

Special topics in real analysis, measure and integration theory, complex analysis, potential theory, several complex variables, special functions, sequences, series, summability, Fourier analysis, analysis on manifolds, or some other area of contemporary analysis are chosen. The choice depends on students' interests and their research orientation. The literature below in principle serves only as a basis, and is combined with more specialized texts.

Temeljni literatura in viri / Readings:

- W. Rudin, Principles of mathematical analysis, McGraw-Hill, 1986
- W. Rudin, Real and complex analysis, McGraw-Hill, 1987
- B. Ferčec, M. Mencinger. *Algebraične metode v dinamičnih sistemih*. 1. izd. Maribor: Univerzitetna založba Univerze: Fakulteta za gradbeništvo, prometno inženirstvo in arhitekturo, 2018.

Dodatna literatura / Additional Readings:

- R.C. Buck, E.F. Buck: Advanced calculus, McGraw-Hill, 1965
- M. Spivak: Calculus on manifolds, W.A. Benjamin, 1968
- W.H. Fleming: Functions of several variables, Springer, 1977
- M. Protter, C. Morrey, A first course in real analysis, Springer, 1991
- L.V. Ahlfors, Complex analysis, McGraw-Hill, 1979
- Z. Nehari, Conformal mapping, McGraw-Hill, 1952
- M.P. Do Carmo, Differential forms and applications, Springer, 1994
- M.P. Do Carmo, Riemannian geometry, Birkhäuser, 1992
- S. Lang, Differential and Riemannian manifolds, Springer, 1995
- D.J. Struik, Lectures on classical differential geometry, Addison-Wesley, 1961
- S.G. Krantz, Function theory of several complex variables, John Wiley, 1982

Cilji in kompetence:

- študentu predstaviti moderno področje iz analize, kar lahko služi kot uvod v raziskovalno delo;
- Doseči poglobljeno razumevanje teoretskih in metodoloških konceptov s področja analize
- Razviti sposobnost za samostojno reševanje najzahtevnejših problemov iz analize.
- Zmožnost razvijanja kritične refleksije na področju analize

Objectives and competences:

- to present a modern area from analysis, which can serve as an introduction to student's research work;
- To achieve a deeper understanding of theoretical and methodological concepts of analysis
- To develop the ability for solving the most challenging problems in analysis.
- Ability to develop critical reflection in analysis

Predvideni študijski rezultati:

Po uspešno opravljenem predmetu študent/ka:

Znanje in razumevanje:

- Analizira izbrana poglavja iz moderne analize ter poveže ključne pojme in izreke v smiselno celoto.
- Formulira in razloži definicije, predpostavke in trditve ter utemelji vlogo ključnih pogojev.
- Dokazuje izbrane osrednje izreke ter uporablja ustrezne dokazne tehnike.
- Rešuje zahtevnejše naloge/probleme in izbere primerne metode ter argumentira postopek

Intended learning outcomes:

After successfully completing the course, the student:

Knowledge and understanding:

- Analyzes selected topics in modern analysis and connects key concepts and theorems into a coherent whole.
- Formulates and explains definitions, assumptions, and statements, and justifies the role of key conditions.
- Proves selected core theorems and applies appropriate proof techniques.

- Primerja in ovrednoti različne teoretske pristope z vidika prednosti, omejitev in pogojev uporabnosti.
- Kritično interpretira znanstvena besedila, identificira odprta vprašanja in predlaga smeri nadaljnjega dela.
- Sintezira znanje za potrebe doktorskega raziskovanja: formulira mini-raziskovalni problem in načrtuje korake reševanja.
- Pripravi in predstavi seminarsko nalogo: jasno komunicira rezultate z ustrezno notacijo in navajanjem virov.

Prenesljive/ključne spretnosti in drugi atributi:

- Kritično bere in presoja znanstvena besedila ter identificira ključne predpostavke, rezultate in odprta vprašanja.
- Samostojno načrtuje in izvaja zahtevno problemsko/raziskovalno delo: opredeli problem, izbere metode in utemelji postopek.
- Jasno komunicira matematične rezultate (pisno in ustno): strukturirano argumentira, uporablja ustrezno notacijo ter korektno navaja vire.

- Solves advanced problems and selects suitable methods, justifying the reasoning and procedure.
- Compares and evaluates different theoretical approaches in terms of strengths, limitations, and conditions of applicability.
- Critically interprets scientific texts, identifies open questions, and proposes directions for further work.
- Synthesizes knowledge for doctoral research: formulates a mini-research problem and plans the steps toward its solution.
- Prepares and presents a seminar paper: communicates results clearly using appropriate notation and proper referencing of sources.

Transferable/Key Skills and other attributes:

- Critically reads and evaluates advanced scientific texts, identifying key assumptions, results, and open questions.
- Independently plans and carries out demanding problem-solving/research work: formulates the problem, selects appropriate methods, and justifies the approach.
- Communicates mathematical results clearly (in writing and orally): structures arguments, uses appropriate notation, and cites sources correctly.

Metode poučevanja in učenja:

- Razlaga,
- predavanje,
- razgovor,
- delo z besedilom,
- reševanje problemov.

Learning and teaching methods:

- Explanation,
- lecture,
- discussion,
- text-based work,
- problem solving.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Seminarska naloga	50 %	Seminar paper
Teoretični izpit	50 %	Theoretical exam

Reference nosilca / Lecturer's references:

1. FERČEC, Brigita, ŽULJ, Maja, MENCINGER, Matej. On the integrability of persistent quadratic three-dimensional systems. *Mathematics*. April 2024, vol. 12, no. 9, [article no.] 1338, 12 str. ISSN 2227-7390. <https://dk.um.si/IzpisGradiva.php?id=88769>, DOI: [10.3390/math12091338](https://doi.org/10.3390/math12091338). [COBISS.SI-ID [196478979](https://cobiss.si/id/196478979)],

[[Odpri dostop](#), [JCR](#),]

kategorija: 1A1

2. FERČEC, Brigita, ŽULJ, Maja, GINÉ, Jaume. Blow-up method for linearizability of resonant differential systems. *International journal of bifurcation and chaos in applied sciences and engineering*. 2023, vol. 33, no. 08, str. 1-17. ISSN 1793-6551. <https://www.worldscientific.com/doi/10.1142/S0218127423501006>, DOI: [10.1142/S0218127423501006](https://doi.org/10.1142/S0218127423501006). [COBISS.SI-ID [159115267](#)], [[JCR](#)],

kategorija: 1A2

3. FERČEC, Brigita, GINÉ, Jaume. The blow-up method applied to monodromic singularities. *Electronic journal of qualitative theory of differential equations*. 2024, no. 4, 18 str. ISSN 1417-3875. <https://www.math.u-szeged.hu/ejqtde/p10602.pdf>, DOI: [10.14232/ejqtde.2024.1.4](https://doi.org/10.14232/ejqtde.2024.1.4). [COBISS.SI-ID [181232643](#)], [[JCR](#)],

kategorija: 1A1

4. FERČEC, Brigita, GINÉ, Jaume. Formal Weierstrass integrability for a Liénard differential system. *Journal of mathematical analysis and applications*. [Print ed.]. 2021, issue 1, art. 125016, 14 str. ISSN 0022-247X. DOI: [10.1016/j.jmaa.2021.125016](https://doi.org/10.1016/j.jmaa.2021.125016). [COBISS.SI-ID [49998851](#)], [[JCR](#)]

kategorija: 1A1

5. ŽULJ, Maja, FERČEC, Brigita, MENCINGER, Matej. On integrability and linearizability of persistent $p: -q$ resonant systems. *Journal of mathematical analysis and applications*. [Print ed.]. Nov. 2022, vol. 515, iss. 1 (126369), 19 str. ISSN 0022-247X. DOI: [10.1016/j.jmaa.2022.126369](https://doi.org/10.1016/j.jmaa.2022.126369). [COBISS.SI-ID [112287747](#)], [[JCR](#)]

kategorija: 1A1