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
Enovit magistrski študijski program druge stopnje Predmetni učitelj	**/**	3.	5.
Five-year master's degree program Subject Teacher	**/**		

Vrsta predmeta / Course type	Obvezni / Compulsory
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45		30			105	6

Nosilec predmeta / Lecturer:	Niko Tratnik

Jeziki / Languages:	**Predavanja / Lectures:**	Slovenski / Slovenian
	Vaje / Tutorial:	Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisits:
Vsaka izmed naštetih obveznosti v načinih ocenjevanja mora biti opravljena s pozitivno oceno.	Each of the mentioned commitments must be assessed with a passing grade. Passing grade of the written exam is required

Pozitivna ocena pri pisnem izpitu je pogoj za pristop k teoretičnemu izpitu.	for taking the theoretical exam.

Vsebina:	**Content (Syllabus outline):**
Funkcije več realnih spremenljivk. Zveznost, parcialna odvedljivost. Višji parcialni odvodi. Taylorjeva formula. Lokalni in globalni ekstremi. Vezani ekstremi. Integral s parametrom; izreki o zveznosti in odvedljivosti. Posplošeni integral. Weierstrassov izrek o enakomerni konvergenci posplošenih integralov. Eulerjevi funkciji gama in beta. Ploščina, volumen, dvojni, trojni integral. Polarne, cilindrične in sferne koordinate. Krivulje in ploskve. Parametrizacija. Tangenta, tangentna ravnina. Dolžina krivulje, ploščina ploskve. Primeri.	Functions of several real variables. Partial derivatives, higher derivatives. Taylor's formula. Local and absolute extrema. Lagrange multipliers. Parameter-dependent integral; theorems for continuity and diferenciability. Improper integral. Weierstrass theorem for the uniform convergence of improper integrals. Euler's Gamma and Beta functions. Area, volume. Double and triple integrals. Polar, cylindrical and spherical coordinates. Curves and surfaces. Parametrization. Tangent. Arc length, surface area. Examples.

Temeljni literatura in viri / Readings:

M. H. Protter, C. B. Morrey, *Intermediate calculus*. New York: Springer, 1985.
S. Lang, *Calculus of several variables*. New York: Springer-Verlag, 1987.
B. Hvala, *Zbirka izpitnih nalog iz analize: z namigi, nasveti in rezultati.* Ljubljana: DMFA, 1996.
M. Dobovišek, *Rešene naloge iz analize II.* Ljubljana: DMFA, 2001.

Dodatna literatura / Additional Readings:

F. Brešar, B. Brešar, *Analiza II.* Maribor: FERI, 2005.
F. Brešar, B. Brešar, *Analiza III.* Maribor: FERI, 2005.
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Cilji in kompetence:	**Objectives and competences:**
Študent se seznani s tistimi poglavji matematične analize funkcij več spremenljivk, ki so najbolj aktualna pri opisu situacij in reševanju problemov z različnih področij matematike, naravoslovje in širše.	Student get insight in those chapters of the theory of functions of more variables that provide the most illustrative examples of applications of the theory to the description and solving problems in different areas of mathematics, sciences and wider.

Predvideni študijski rezultati:	**Intended learning outcomes:**

• Študent spozna osnovna dejstva o funkcijah več spremenljivk in njihovi uporabi, predvsem pri ekstremalnih problemih. • Seznani se z integracijo funkcij po merljivih množicah v prostoru. • Izve najosnovnejše o krivuljah in ploskvah.	• Knowing basic facts about functions of several variables and being aware of the possible applications of this theory, specially in solving extemal problems. • Knowing concepts of integration on mesurable subsets of plane and space. • Knowing the basic facts about curves and surfaces.
Prenesljive/ključne spretnosti in drugi atributi: • Ilustracija dejstva, da nam teorija, navidez oddaljene od realnosti, lahko ponudi mnoge praktično uporabne rezultate.	Transferable/Key Skills and other attributes: • An illustration of the fact, that a more abstract theory can give us many nice results with useful practical applications.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Teoretične vaje	• Lectures • Theoretical exercises

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Pisni izpit	50%	Written exam
Teoretični izpit	50%	Theoretical exam

Opombe:

Pisni izpit se lahko nadomesti s kolokviji v enakem deležu 50%.

Comments:

Written exam can be replaced by midterm exams in the weight of 50%.

Reference nosilca / Lecturer's references:

1. BREZOVNIK, Simon, CHE, Zhongyuan, TRATNIK, Niko, ŽIGERT PLETERŠEK, Petra. Resonance graphs of plane bipartite graphs as daisy cubes. *Discrete applied mathematics.* May 2025, vol. 366, str. 75-85, graf. prikazi. ISSN 0166-218X. https://www.sciencedirect.com/science/article/pii/S0166218X25000228, DOI: 10.1016/j.dam.2025.01.017 [COBISS.SI-ID 224635651]

2. BREZOVNIK, Simon, CHE, Zhongyuan, TRATNIK, Niko, ŽIGERT PLETERŠEK, Petra. Outerplane bipartite graphs with isomorphic resonance graphs. *Discrete applied mathematics.* Jan. 2024, vol. 343, str. 340-349. ISSN 0166-218X. https://www.sciencedirect.com/science/article/pii/S0166218X23004195, DOI: 10.1016/j.dam.2023.11.006 [COBISS.SI-ID 172545795]

3. TRATNIK, Niko. Zhang-Zhang polynomials of phenylenes and benzenoid graphs. *MATCH Communications in Mathematical and in Computer Chemistry.* 2024, vol. 92, no. 1, str. 25-53. ISSN 3009-4399. https://match.pmf.kg.ac.rs/issues/m92n1/m92n1_25-53.html, DOI: 10.46793/match.92-1.025T [COBISS.SI-ID 185502723]

4. BREZOVNIK, Simon, DEHMER, Matthias, TRATNIK, Niko, ŽIGERT PLETERŠEK, Petra. Szeged and Mostar root-indices of graphs. *Applied mathematics and computation.* Apr. 2023, vol. 442, [article no.] 127736, 11 str. ISSN 0096-3003. https://www.sciencedirect.com/science/article/pii/S0096300322008049, DOI: 10.1016/j.amc.2022.127736. [COBISS.SI-ID 139442179]

5. TRATNIK, Niko, YE, Dong. Resonance graphs on perfect matchings of graphs on surfaces. *Graphs and combinatorics.* 2023, vol. 39, iss. 4, [article no.] 68, 15 str. ISSN 0911-0119. https://link.springer.com/article/10.1007/s00373-023-02666-4, DOI: 10.1007/s00373-023-02666-4. [COBISS.SI-ID 155893507]