



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:**

Marko Jakovac

**Jeziki /**

**Languages:**

**Predavanja /** Slovenski / Slovenian

**Lectures:**

**Vaje / Tutorial:** Slovenski / Slovenian

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

Jih ni.

**Prerequisites:**

There are none.

**Vsebina:**

**Content (Syllabus outline):**

Funkcije več realnih spremenljivk. Zveznost, parcialna odvedljivost. Višji parcialni odvodi. Taylorjeva formula. Lokalni in globalni ekstremi. Vezani ekstremi.

Ploščina, volumen, dvojni, trojni integral. Polarne, cilindrične in sferne koordinate. Integral s parametrom. Eulerjevi funkciji gama in beta.

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.

Area, volume. Double and triple integrals. Polar, cylindrical and spherical coordinates. Parameter-dependent integral. Euler's Gamma and Beta functions.

Curves and surfaces. Parametrization. Tangent. Arc length, surface area. Examples.

### Temeljni literatura in viri / Readings:

- F. in B. Brešar: *Analiza II*, Maribor: Feri, 2005
- F. in B. Brešar: *Analiza III*, Maribor: Feri, 2005
- G.F. Simmons, J.S. Robertson: *Differential equations with applications and historical notes*, New York: McGraw Hill, 1991.
- M. H. Protter, C. B. Morrey: *Intermediate calculus*. New York : Springer, 1985

### Cilji in kompetence:

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.

### Objectives and competences:

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:

- 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.

### Prenosljive/ključne spretnosti in drugi atributi:

- Ilustracija dejstva, da nam teorija, navidez oddaljene od realnosti, lahko ponudi mnoge praktično uporabne rezultate.

### Intended learning outcomes:

- Knowing basic facts about functions of several variables and being aware of the possible applications of this theory, specially in solving external problems.
- Knowing concepts of integration on measurable subsets of plane and space.
- Knowing the basic facts about curves and surfaces.

### 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.

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**Metode poučevanja in učenja:**

- Predavanja
- Teoretične vaje

**Learning and teaching methods:**

- Lectures
- Theoretical exercises

Delež (v %) /

**Načini ocenjevanja:**

Weight (in %)

**Assessment:**

<u>Izpiti:</u>	Delež (v %) / Weight (in %)	<u>Exams:</u>
Pisni izpit – problemi	50%	Written exam – problems
Ustni izpit – teorija	50%	Oral exam – theory
Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.		Each of the mentioned assessments must be assessed with a passing grade.
Opravljen pisni izpit – problemi je pogoj za pristop k ustnemu izpitu – teorija.		Passing grade of written exam – problems is required to take the oral exam – theory.
Pisni izpit – problemi se lahko nadomesti z dvema delnima testoma (sprotne obveznosti).		Written exam – problems can be replaced with two mid-term tests.

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

1. JAKOVAC, Marko, MESARIČ ŠTESL, Daša. On game chromatic vertex-critical graphs. *Bulletin of the Malaysian Mathematical Sciences Society*. Jan. 2023, vol. 46, iss. 1, str. 1-30, ilustr. ISSN 0126-6705. <https://link.springer.com/article/10.1007/s40840-022-01418-6>, DOI: 10.1007/s40840-022-01418-6. [COBISS.SI-ID 139148291]
2. DRAVEC, Tanja, JAKOVAC, Marko, KOS, Tim, MARC, Tilen. On graphs with equal total domination and Grundy total domination numbers. *Aequationes mathematicae*. Feb. 2022, vol. 96, iss. 1, 137-146. ISSN 0001-9054. <https://link.springer.com/article/10.1007/s00010-021-00776-z>, DOI: 10.1007/s00010-021-00776-z. [COBISS.SI-ID 100359427]
3. BUJTÁS, Csilla, JAKOVAC, Marko, TUZA, Zsolt. The  $k$ -path vertex cover: general bounds and chordal graphs. *Networks*. July 2022, vol. 80, iss. 1, str. 63-76. ISSN 0028-3045. <https://onlinelibrary.wiley.com/doi/10.1002/net.22079>, DOI: 10.1002/net.22079. [COBISS.SI-ID 116964355]
4. BREŠAR, Boštjan, JAKOVAC, Marko, MESARIČ ŠTESL, Daša. Indicated coloring game on Cartesian products of graphs. *Discrete applied mathematics*. [Print ed.]. Jan. 2021, vol. 289, str. 320-326. ISSN 0166-218X. <https://www.sciencedirect.com/science/article/pii/S0166218X2030500X>, DOI: 10.1016/j.dam.2020.11.007. [COBISS.SI-ID 41803267]
5. JAKOVAC, Marko, OTACHI, Yota. On the security number of the Cartesian product of graphs. *Discrete applied mathematics*. [Print ed.]. Dec. 2021, vol. 304, str. 119-128. ISSN 0166-218X.

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