



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

| UČNI NAČRT PREDMETA / COURSE SYLLABUS                                                                                                                                                    |                    |                               |                                                                                                                                                                                                      |                           |                               |                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------|----------------------|
| Predmet:                                                                                                                                                                                 |                    | Analiza II                    |                                                                                                                                                                                                      |                           |                               |                      |
| Course title:                                                                                                                                                                            |                    | Analysis II                   |                                                                                                                                                                                                      |                           |                               |                      |
|                                                                                                                                                                                          |                    |                               |                                                                                                                                                                                                      |                           |                               |                      |
| Študijski program in stopnja<br>Study programme and level                                                                                                                                |                    | Študijska smer<br>Study field |                                                                                                                                                                                                      | Letnik<br>Academic year   |                               | Semester<br>Semester |
| Matematika                                                                                                                                                                               |                    |                               |                                                                                                                                                                                                      | 1.                        |                               | 2.                   |
| Mathematics                                                                                                                                                                              |                    |                               |                                                                                                                                                                                                      | 1.                        |                               | 2.                   |
|                                                                                                                                                                                          |                    |                               |                                                                                                                                                                                                      |                           |                               |                      |
| Vrsta predmeta / Course type                                                                                                                                                             |                    |                               |                                                                                                                                                                                                      |                           |                               |                      |
|                                                                                                                                                                                          |                    |                               |                                                                                                                                                                                                      |                           |                               |                      |
| Univerzitetna koda predmeta / University course code:                                                                                                                                    |                    |                               |                                                                                                                                                                                                      |                           |                               |                      |
|                                                                                                                                                                                          |                    |                               |                                                                                                                                                                                                      |                           |                               |                      |
| Predavanja<br>Lectures                                                                                                                                                                   | Seminar<br>Seminar | Sem. vaje<br>Tutorial         | Lab. vaje<br>Laboratory work                                                                                                                                                                         | Teren. vaje<br>Field work | Samost. delo<br>Individ. work | ECTS                 |
| 60                                                                                                                                                                                       |                    | 60                            |                                                                                                                                                                                                      |                           | 150                           | 9                    |
|                                                                                                                                                                                          |                    |                               |                                                                                                                                                                                                      |                           |                               |                      |
| Nosilec predmeta / Lecturer:                                                                                                                                                             |                    | Matevž Črepnjak               |                                                                                                                                                                                                      |                           |                               |                      |
|                                                                                                                                                                                          |                    |                               |                                                                                                                                                                                                      |                           |                               |                      |
| Jeziki /<br>Languages:                                                                                                                                                                   |                    | Predavanja /<br>Lectures:     | SLOVENSKO/SLOVENE                                                                                                                                                                                    |                           |                               |                      |
|                                                                                                                                                                                          |                    | Vaje / Tutorial:              | SLOVENSKO/SLOVENE                                                                                                                                                                                    |                           |                               |                      |
| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:                                                                                                                    |                    |                               | Prerequisites:                                                                                                                                                                                       |                           |                               |                      |
| Vsaka izmed naštetih obveznosti v načinih ocenjevanja mora biti opravljena s pozitivno oceno.<br>Pozitivna ocena pri pisnem izpitu je pogoj za pristop k ustnemu izpitu.                 |                    |                               | Each of the mentioned commitments must be assessed with a passing grade.<br><br>Passing grade of the written exam is required for taking the oral exam.                                              |                           |                               |                      |
| Vsebina:                                                                                                                                                                                 |                    |                               | Content (Syllabus outline):                                                                                                                                                                          |                           |                               |                      |
| Odvod: konveksnost, lokalni ekstremi, L'Hospitalovo pravilo in Taylorjeva formula.                                                                                                       |                    |                               | Derivation: convexity, local extrema, L'Hospital rule and Taylor's formula.                                                                                                                          |                           |                               |                      |
| Integral: primitivna funkcija in nedoločeni integral, Riemannove in Darbouxjeve vsote; Newton-Leibnizova formula; uporaba integrala; posplošeni integrali. Riemann-Stieltjesov integral. |                    |                               | Integral: primitive function and indefinite integral; definite integral, Riemann and Darboux sums; Newton-Leibniz formula; applications of integrals; improper integrals. Riemann-Stieltjes integral |                           |                               |                      |



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| Funkcijska zaporedja in vrste: konvergenca po točkah, enakomerna konvergenca; realne in kompleksne potenčne vrste; Taylorjeve vrste. | Sequences and series of functions: pointwise convergence, uniform convergence; real and complex power series; Taylor series. |
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### Temeljni literatura in viri / Readings:

W. Rudin, Principles of mathematical analysis, McGraw Hill Book Co., 1976.  
W. Rudin, Real and complex analysis. 3rd ed., McGraw-Hill, 1987.  
M. Dobovišek, M. Hladnik, M. Omladič, Rešene naloge iz analize I. 9. natis, let. 6, DMFA, Ljubljana, 1992.  
B. Hvala, Zbirka izpitnih nalog iz analize, DMFA, Ljubljana, 1996.  
I. Vidav, Višja matematika I, II, DZS, Ljubljana, 1974.

### Dodatna literatura /Additional Readings:

E. Fischer, Intermediate real analysis, Springer, 1983.  
J. M. Howie, Real analysis, Springer, 2001.  
F. Morgan, Real analysis, AMS, 2005.  
M. A. Robdera, A concise approach to mathematical analysis, Springer, 2003.  
M. Stoll, Introduction to real analysis, 2nd edition, Pearson, 2001.

### Cilji in kompetence:

Razumevanje nekaterih zahtevnejših pojmov analize.

Študentje obvladajo temeljne pojme in metode realne analize na nivoju diferencialnega in integralnega računa funkcij ene realne spremenljivke. Te pojme in metode so sposobni uporabiti pri nadaljnjem študiju matematike.

### Objectives and competences:

Understanding some advanced concepts of analysis.

Students learn the fundamental concepts and methods of the real analysis and calculus of functions of one real variable. The students are able to use the concepts and methods later in the study of mathematics.

### Predvideni študijski rezultati:

Znanje in razumevanje:

- Odvoda.
- Integrala.
- Funkcijskih zaporedij in vrst.
- Fourierjevih vrst.

Po uspešnem zaključku tega predmeta bodo študentje:

1. Razumeli pojem odvoda funkcij in znali računati odvode.

### Intended learning outcomes:

Knowledge and Understanding:

- Derivation.
- Integration.
- Sequences and series of functions.
- Fourier series.

After successful conclusion of this course the students will:

1. Understand the concept of the derivative of a function and know how to calculate them.



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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <p>2. Znali uporabiti odvod pri analizi poteka funkcije; obravnavi monotonosti, konveksnosti in konkavnosti; določanju ekstremov in prevojev.</p> <p>3. Obvladali Lagrangeov izrek in L'Hospitalovo pravilo.</p> <p>4. Obvladali delo z zaporedji, vrstami, potenčnimi vrstami, Taylorjevimi vrstami, Fourierjevimi vrstami.</p> <p>5. Razumeli pojem nedoločenega integrala, obvladali metode integriranja in jih znali uporabiti.</p> <p>6. Razumeli pojem določenega integrala, obvladali Newton-Leibnizovo formulo in njeno uporabo.</p> <p>7. Znali uporabiti določeni integral v različnih situacijah.</p> <p>Prenesljive/ključne spretnosti in drugi atributi:</p> <ul style="list-style-type: none"><li>• Pridobljena znanja so podlaga za večino predmetov v nadaljevanju študija.</li></ul> |                                | <p>2. Know how to use derivatives in determining the graph of a function; in study of monotonicity, convexity, maxima and minima, inflexion points.</p> <p>3. Know how to use mean value theorems and L'Hospital's rule.</p> <p>4. Know how to use sequences, series, power series, Taylor's series, Fourier series.</p> <p>5. Understand the concept of the indefinite integral and know the methods of integration, and how to use them.</p> <p>6. Understand the concept of the definite integrals and know the fundamental theorem of the calculus, and how to use it.</p> <p>7. Know different applications of definite integral.</p> <p>Transferable/Key Skills and other attributes:</p> <ul style="list-style-type: none"><li>• The obtained knowledge is a basis for most of the later subjects.</li></ul> |  |
| <b>Metode poučevanja in učenja:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                | <b>Learning and teaching methods:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| <ul style="list-style-type: none"><li>• Predavanja</li><li>• Teoretične vaje</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                | <ul style="list-style-type: none"><li>• Lectures</li><li>• Theoretical exercises</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |
| <b>Načini ocenjevanja:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                | <b>Assessment:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |
| Pisni izpit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Delež (v %) /<br>Weight (in %) | Written exam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
| Ustni izpit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 50%                            | Oral exam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 50%                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |

**Opombe:**

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

**Comments:**

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

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



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1. ČREPNIJAK, Matevž, SOVIČ, Tina. Characterizing inverse sequences for which their inverse limits are homeomorphic. *Acta mathematica Hungarica*. 2024, vol. 172, iss.1, str. 42-61. ISSN 0236-5294. DOI: [10.1007/s10474-024-01394-2](https://doi.org/10.1007/s10474-024-01394-2). [COBISS.SI-ID [188657411](#)]
2. BANIČ, Iztok, ČREPNIJAK, Matevž, KAC, Teja. Markov set-valued functions on compact metric spaces. *Glasnik matematički*. Serija 3. 2024, vol. 59, no. 1, str. 193-212. ISSN 0017-095X. [https://web.math.pmf.unizg.hr/glasnik/59.1/59\(1\)-09.pdf](https://web.math.pmf.unizg.hr/glasnik/59.1/59(1)-09.pdf), DOI: 10.3336/gm.59.1.09.
3. ČREPNIJAK, Matevž, KAC, Teja. Uncountable family of 0-rigid continua that are homeomorphic to their inverse limits. *Qualitative theory of dynamical systems*. 2023, vol. 22, iss. 2, [article no.] 80, 13 str. ISSN 1575-5460. [Digitalna knjižnica Univerze v Mariboru – DKUM](#), DOI: [10.1007/s12346-023-00777-0](https://doi.org/10.1007/s12346-023-00777-0), DOI: [20.500.12556/DKUM-87542](https://doi.org/20.500.12556/DKUM-87542). [COBISS.SI-ID [150129923](#)]
4. ČREPNIJAK, Matevž, KAC, Teja. Inverse limits with Markov-type functions. *Bulletin of the Malaysian Mathematical Sciences Society*. Sep. 2022, vol. 45, iss. 5, str. 2151-2164. ISSN 0126-6705. DOI: [10.1007/s40840-022-01302-3](https://doi.org/10.1007/s40840-022-01302-3). [COBISS.SI-ID [110088707](#)]
5. ŽIGERT PLETERŠEK, Petra, ČREPNIJAK, Matevž. *Matematika A : za študente FKKT UM*. 1. izd. Maribor: Univerzitetna založba, 2022. 1 spletni vir (1 datoteka PDF (318 str.)), graf. prikazi. ISBN 978-961-286-554-2. <https://press.um.si/index.php/ump/catalog/book/627>, [Digitalna knjižnica Univerze v Mariboru – DKUM](#), [Digitalna knjižnica Slovenije - dLib.si](#), DOI: [10.18690/um.fkkt.1.2022](https://doi.org/10.18690/um.fkkt.1.2022). [COBISS.SI-ID [96194563](#)]