Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Osnove analize**
Course title:	Basic Analysis

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Fizika, 1. stopnja		**1.**	**1.**
Physics, 1st degree		**1.**	**1.**

Vrsta predmeta / Course type	Obvezni / Mandatory
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
60		**45**			**135**	**8**

Nosilec predmeta / Lecturer:	Niko TRATNIK

Jeziki / Languages:	**Predavanja / Lectures:**	SLOVENSKO/SLOVENIAN
	Vaje / Tutorial:	SLOVENSKO/SLOVENIAN

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Priporočeno je predznanje maturitetnega kurza matematike. Vsaka izmed naštetih obveznosti v načinih ocenjevanja mora biti opravljena s pozitivno oceno. Pozitivna ocena pri pisnem izpitu je pogoj za pristop k teoretičnemu izpitu.	Matura-level knowledge of mathematics is recommended. Each of the mentioned commitments must be assessed with a passing grade. Passing grade of the written exam is required for taking the theoretical exam.
Vsebina:	**Content (Syllabus outline):**

1. Funkcije ene realne spremenljivke. Pregled elementarnih funkcij. Zveznost in limita funkcij. 2. Definicija in geometrijski pomen odvoda, odvodi elementarnih funkcij, pravila za odvajanje. Analiza poteka funkcije; monotonost, konveksnost in konkavnost; ekstremi in prevoji. Lagrangeov izrek, L'Hospitalovo pravilo. Višji odvodi. 3. Zaporedja, vrste, potenčne vrste, Taylorjeve vrste. 4. Definicija nedoločenega integrala, metode integriranja, integrali elementarnih funkcij. Definicija določenega integrala. Newton-Leibnizova formula. Uporaba določenega integrala.	1. Functions of one real variable. Elementary functions. Continuity and limits of functions. 2. Definition and geometric meaning of a derivative, derivatives of elementary functions, rules for calculating derivatives. Determining the graph of a function; monotonicity, convexity, maxima and minima, inflexion points. Mean value theorems. L'Hospital's rule. Higher order derivatives. 3. Sequences, series, power series, Taylor's series. 4. Indefinite integrals, methods of integration, integrals of elementary functions. Definition of the definite integral. The fundamental theorem of the calculus. Applications.

Temeljni literatura in viri / Readings:

1. I. Vidav, Višja matematika I. Ljubljana: DMFA, 1994.
2. E. Mendelson, 3000 solved problems in Calculus. New York: McGraw-Hill, 1988.
3. R. C. Wrede, M. R. Spiegel, Schaum's outlines advanced calculus. New York: McGraw Hill, 2010.
4. M. Dobovišek, M. Hladnik, M. Omladič, Rešene naloge iz analize I. Ljubljana: DMFA, 1992.
5. B. Hvala, Zbirka izpitnih nalog iz analize: z namigi, nasveti in rezultati. Ljubljana: DMFA, 1996.

Dodatna literatura / Additional Readings:

1. F. Ayres, E. Mendelson, Schaum's outline of calculus. New York: McGraw-Hill, 1999.
2. B. Drinovec-Drnovšek, S. Strle, Naloge iz analize 1: z odgovori, nasveti in rešitvami. Ljubljana: DMFA - založništvo, 2021.

Cilji in kompetence:	**Objectives and competences:**
Študentje obvladajo temeljne pojme in metode analize, na nivoju diferencialnega in integralnega računa funkcij ene realne spremenljivke. Te pojme in metode so sposobni uporabiti pri nadaljnjem študiju fizike.	Students learn the fundamental concepts and methods of the calculus of functions of one real variable. The students are able to use the concepts and methods latter in the study of physics.
Predvideni študijski rezultati:	**Intended learning outcomes:**

Znanje in razumevanje.	**Knowledge and understanding.**
Po uspešnem zaključku tega predmeta bodo študentje: 1. Obvladali elementarne funkcije in njihove lastnosti. 2. Razumeli pojem limita funkcije in znali računati limite. 3. Razumeli pojem odvoda funkcij in znali računati odvode. 4. Znali uporabiti odvod pri analizi poteka funkcije; obravnavi monotonosti, konveksnosti in konkavnosti; določanju ekstremov in prevojev. 5. Obvladali Lagrangeov izrek in L'Hospitalovo pravilo. 6. Obvladali delo z zaporedji, vrstami, potenčnimi vrstami, Taylorjevimi vrstami. 7. Razumeli pojem nedoločenega integrala, obvladali metode integriranja in jih znali uporabiti. 8. Razumeli pojem določenega integrala, obvladali Newton-Leibnizovo formulo in njeno uporabo. 9. Znali uporabiti določeni integral v različnih situacijah. **Prenesljive/ključne spretnosti in drugi atributi:** Matematično orodje, ki je nujno potrebno za delo pri vseh fizikalnih predmetih.	After successful conclusion of this course the students will: 1. Know elementary functions and their properties. 2. Understand the concept of the limit of a function and know how to calculate them. 3. Understand the concept of the derivative of a function and know how to calculate them. 4. Know how to use derivatives in determining the graph of a function; in study of monotonicity, convexity, maxima and minima, inflexion points. 5. Know how to use mean value theorems and L'Hospital's rule. 6. Know how to use sequences, series, power series, Taylor's series. 7. Understand the concept of the indefinite integral and know the methods of integration, and how to use them. 8. Understand the concept of the definite integrals and know the fundamental theorem of the calculus, and how to use it. 9. Know different applications of definite integral. **Transferable/Key Skills and other attributes:** Knowledge of mathematical tools that is essential for all the subjects on physics

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

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

	50% 50%	

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

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

Reference nosilca / Lecturer's references:

1. 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. DOI: 10.1016/j.dam.2023.11.006. [COBISS.SI-ID 172545795]

2. 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 0340-6253. DOI: 10.46793/match.92-1.025T. [COBISS.SI-ID 185502723]

3. 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. DOI: 10.1016/j.amc.2022.127736. [COBISS.SI-ID 139442179]

4. 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. DOI: 10.1007/s00373-023-02666-4. [COBISS.SI-ID 155893507]

5. KNOR, Martin, TRATNIK, Niko. A method for computing the edge-Hosoya polynomial with application to phenylenes. *Match : communications in mathematical and in computer chemistry.* 2023, vol. 89, no. 3, str. 605-629. ISSN 0340-6253. DOI: 10.46793/match.89-3.605K. [COBISS.SI-ID 142041603]