Univerza v Mariboru
Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	**Analiza I**
Course title:	Analysis I

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Matematika, 1. stopnja		1.	1.
Mathematics, 1st cycle		1.	1.

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
75		60			165	10

Nosilec predmeta / Lecturer: Boštjan Brešar

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisits:
Jih ni.	There are none.

Vsebina:	Content (Syllabus outline):
Osnovni matematični pojmi. Realna števila: aksiomi, supremum, maksimum; potence, koreni; iracionalna števila; intervali; absolutna vrednost. Kompleksna števila: osnovne lastnosti; polarni zapis. Zaporedja: konvergenca, operacije z zaporedji; monotona zaporedja, število e; podzaporedja, stekališča; Cauchyjeva zaporedja; potence z realnimi eksponenti. Vrste: konvergenca; geometrijska vrsta; vrste s pozitivnimi členi, kriteriji za konvergenco;	Basic mathematical concepts. Real numbers: axioms, supremum, maximum; powers, roots; irrational numbers; intervals; absolute value. Complex numbers: basic properties; trigonometric form. Sequences: convergence, operations on sequences; monotone sequences, the number e; subsequences, accumulation points; Cauchy sequences; powers with real exponents. Series: convergence; geometric series; series of positive terms, convergence criteria; alternating

alternirajoče vrste; absolutna in pogojna konvergenca; vsota in produkt vrst.

Funkcije: osnovni pojmi; realne funkcije realne spremenljivke; elementarne funkcije; zveznost, enakomerna zveznost, zvezne funkcije na zaprtih intervalih; limite.

Odvod: geometrijski pomen, diferencial, pravila za odvajanje; odvodi elementarnih funkcij; izreki o srednji vrednosti, višji odvodi.

series; absolute and conditional convergence; addition and multiplication of series.

Functions: basic concepts; real functions of one real variable; elementary functions; continuity, uniform continuity, functions continuous on a closed interval; limits.

Differentiation: geometric interpretation, differential, differentiation formulas; derivates of elementary functions; mean value theorems, higher derivatives.

Temeljni literatura in viri / Readings:

M. Dobovišek, M. Hladnik, M.Omladič, Rešene naloge iz analize, DMFA, Ljubljana, 1980.
E. Fischer, Intermediate real analysis, Springer, 1983.
J. M. Howie, Real analysis, Springer, 2001.
B. Hvala, Zbirka izpitnih nalog iz analize, DMFA, Ljubljana, 1996.
F. Morgan, , Real analysis, AMS, 2005.
M. A. Robdera, A concise approach to mathematical analysis, Springer, 2003.
W. Rudin, Principles of mathematical analysis, McGraw Hill Book Co., 1976.
T. Tao, Analysis 1, 3rd edition, Hindustan Book Agency, New Delhi, 2014.I. Vidav, Višja matematika I, II, DZS, Ljubljana, 1974.

Cilji in kompetence:

Cilj in kompetence tega predmeta so, da študentje usvojijo osnovne pojme in metode realne analize, in jih uporabljajo pri nadaljnjem študiju matematike.

Objectives and competences:

The objectives and competences of this course are for students to acquire basic knowledge of real analysis, and to apply it in the study of mathematics.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben
- razumeti osnovne pojme realne analize.
- razložiti in uporabljati osnovne izreke realne analize (realne funkcije realne spremenljivke, zveznost in limita funkcije, odvod funkcije).
- za reševanje problemov uporabiti realno analizo.

Prenosljive/ključne spretnosti in drugi atributi:

- Spretnosti komuniciranja: ustni zagovor izpita, pisno izražanje pri pisnem izpitu.

Intended learning outcomes:

Knowledge and understanding:

On completion of this course the student will be able to
- understand basic concepts of real analysis.
- explain and use basic theorems from real analysis (real functions of real variable, continuity and limits of functions, differentiation),
- apply real analysis for problem solving.

Transferable/Key skills and other attributes:

| | Uporaba informacijske tehnologije: uporaba računala ali računalniških aplikacij pri reševanju problemov.
• Reševanje problemov: reševanje problemov s pomočjo metod iz realne analize. | | Communication skills: oral exam, manner of expression at written examination.
• Use of information technology: use of a calculator or computer applications for problem solving.
• Problem solving: problem solving using methods from real analysis |

Metode poučevanja in učenja:

• Predavanja • Teoretične vaje

Learning and teaching methods:

• Lectures • Theoretical exercises

Načini ocenjevanja:

Assessment:

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

Reference nosilca / Lecturer's references:

1. MANUEL, Paul, BREŠAR, Boštjan, KLAVŽAR, Sandi. The geodesic transversal problem on some networks. *Computational & Applied Mathematics*. Feb. 2023, vol. 42, iss. 1, art. 59 (12 str.). ISSN 2238-3603. https://link.springer.com/article/10.1007/s40314-023-02199-9, DOI: 10.1007/s40314-023-02199-9. [COBISS.SI-ID 140079107]

2. BREŠAR, Boštjan, SAMADI, Babak, YERO, Ismael G. Injective coloring of graphs revisited. *Discrete mathematics*. [Print ed.]. May 2023, vol. 346, iss. 5, art. 113348 (12 str.). ISSN 0012-365X. https://www.sciencedirect.com/science/article/pii/S0012365X23000341, DOI: 10.1016/j.disc.2023.113348. [COBISS.SI-ID 141111555]

3. ANDERSON, Sarah, BREŠAR, Boštjan, KLAVŽAR, Sandi, KUENZEL, Kirsti, RALL, Douglas F. Orientable domination in product-like graphs. *Discrete applied mathematics*. [Print ed.]. Feb. 2023, vol. 326, str. 62-69. ISSN 0166-218X. https://www.sciencedirect.com/science/article/pii/S0166218X22004267, DOI: 10.1016/j.dam.2022.11.003. [COBISS.SI-ID 135012355]

4. BREŠAR, Boštjan, DRAVEC, Tanja, KLESZCZ, Elżbieta. Uniquely colorable graphs up to automorphisms. *Applied mathematics and computation*. [Print ed.]. Aug. 2023, vol. 450, art. 128007 (10 str.). ISSN 0096-3003. https://www.sciencedirect.com/science/article/pii/S0096300323001765, DOI: 10.1016/j.amc.2023.128007. [COBISS.SI-ID 147344899]

5. BREŠAR, Boštjan, MESARIČ ŠTESL, Daša. The independence coloring game on graphs. *Quaestiones mathematicae*. [Print ed.]. 2022, vol. 45, iss. 9, str. 1413-1434, ilustr. ISSN 1607-3606. https://www.tandfonline.com/doi/abs/10.2989/16073606.2021.1947919, DOI: 10.2989/16073606.2021.1947919. [COBISS.SI-ID 70914307]