UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Analiza 2b
Course title:	Analysis 2b

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Univerzitetni študijski program Matematika	ni smeri	2	drugi
First cycle academic study programme Mathematics	none	2	second

Vrsta predmeta / Course type	obvezni
Univerzitetna koda predmeta / University course code:	M0262

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**	**Klinične vaje** **work**	**Druge oblike študija**	**Samost. delo** **Individ. work**	**ECTS**
60		**45**			**135**	**8**

Nosilec predmeta / Lecturer:	prof. Barbara Drinovec Drnovšek, prof. Franc Forstnerič, prof. Miran Černe

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski/Slovene
	Vaje / Tutorial:	slovenski/Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Opravljen predmet Analiza 1.	Completed course Analysis 1.
Vsebina:	**Content (Syllabus outline):**

Krivulje in ploskve v prostoru. Podmnogoterosti. Lokalna parametrizacija. Ločna dolžina. Prva fundamentalna forma ploskve. Površina. Skalarna in vektorska polja. Gradient, rotor, divergenca in Laplaceov operator. Krivuljni in ploskovni integrali. Gaussov izrek. Stokesov izrek in Greenova formula. Uporaba. Holomorfne in harmonične funkcije. Cauchy-Riemannove enačbe. Integrali kompleksnih funkcij. Greenova formula. Cauchyjeva formula. Razvoj v vrsto. Izrek o enoličnosti. Cauchyjeve ocene. Liouvillov izrek. Osnovni izrek algebre. Izrek o odprtosti holomorfne funkcije. Princip maksimuma. Razvoj v Laurentovo vrsto. Klasifikacija izoliranih singularnih točk. Meromorfne funkcije. Red ničle ali pola. Izrek o ostankih in uporaba. Princip argumenta. Rouchéjev izrek. Holomorfne funkcije kot preslikave. Konformne preslikave, elementarni primeri. Schwarzeva lema. Holomorfni avtomorfizmi kroga in ravnine. Riemannov upodobitveni izrek (brez dokaza). Laplaceova transformacija. Osnovne lastnosti. Inverzna formula.	Curves and surfaces in space. Submanifolds. Local parameterization. Arc length. First fundamental form of the surface. Surface area. Scalar and vector fields. Gradient, curl, divergence and Laplacian operator. Curve and surface integrals. Gauss theorem. Stokes theorem and Green's formula. Application. Holomorphic and harmonic functions. Cauchy-Riemann equations. Integrals of complex functions. Green's formula. Cauchy formula. Development in a power series. Uniqueness theorem. Cauchy estimates. Liouville theorem. Fundamental theorem of algebra. Open mapping theorem. Maximum principle. Laurent series expansion. Classification of isolated singular points. Meromorphic functions. Order of zero or pole. Residue theorem and applications. Argument principle. Rouché theorem. Holomorphic functions as maps. Conformal maps, elementary examples. Schwarz lemma. Holomorphic automorphisms of the disk and the plane. Riemann mapping theorem (without proof). Laplace transform. Elementary properties. Inverse formula.

Temeljni literatura in viri / Readings:

Vidav: Višja Matematika II, DZS, Ljubljana, 1981.

T. M. Apostol: Calculus II : Multi-Variable Calculus and Linear Algebra with Applications, 2nd edition, John Wiley &; Sons, New York, 1975.

J. E. Marsden, A. J. Tromba: Vector Calculus, 5th edition, Freeman, New York, 2004.

L. Ahlfors: Complex Analysis, 3rd edition, McGraw-Hill, New York, 1979.

J. B. Conway: Functions of One Complex Variable I, 2nd edition, Springer, New York-Berlin, 1995.

Suhadolc: Integralske transformacije/Integralske enačbe, DMFA-založništvo, Ljubljana, 1994.

A. Suhadolc: Metrični prostor, Hilbertov prostor, Fourierova analiza, Laplaceova transformacija, DMFA-založništvo, 1998

Cilji in kompetence:	Objectives and competences:
Študent se seznani s krivuljnimi in ploskovnimi integrali, osnovami vektorske analize in osnovami teorije funkcij ene kompleksne spremenljivke.	Student becomes familiar with line and surface integrals, fundamentals of vector analysis, and the elementary theory of functions of one complex variable.

Predvideni študijski rezultati:	Intended learning outcomes:
Znanje in razumevanje: Razumevanje vektorske in kompleksne analize ter sorodnih tem. Uporaba razvitih metod v geometriji in naravoslovju. Uporaba: Analiza 2b sodi med temeljne predmete pri študiju matematike vseh usmeritev in je pogoj za vpis predmetov Analiza 3, Kompleksna analiza, Teorija mere, Funkcionalna analiza, Verjetnost in statistika, Analiza na mnogoterostih. Refleksija: Razumevanje teorije na podlagi primerov in uporabe. Prenosljive spretnosti – niso vezane le na en predmet: Postavitev problema, izbira primerne metode, reševanje problema, analiza doseženega rezultata na primerih. Formulacija problemov v matematičnem jeziku. Spretnost uporabe domače in tuje literature.	Knowledge and understanding: Undestanding of vector analysis, complex analysis and related topics. Application of methods in geometry and natural science. Application: Analysis 2 is one of the fundamental courses in mathematical studies. It is a prerequisite for the courses Analysis 3, Complex analysis, Measure theory, Functional analysis, Probability and statistics, Analysis on manifolds. Reflection: Understanding of the theory from the applications. Transferable skills: The ability to design the problem, select an appropriate method, solve the problem, and analyse the results on test cases. The ability to formulate a problem in mathematical language. Skills in using the domestic and foreign literature.

Metode poučevanja in učenja:	Learning and teaching methods:
Predavanja, vaje, domače naloge, konzultacije	Lectures, exercises, homework, consultations

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Način (pisni izpit, ustno izpraševanje, naloge, projekt): 2 kolokvija namesto izpita iz vaj, izpit iz vaj, izpit iz teorije ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)	 50% 50%	Type (examination, oral, coursework, project): 2 midterm exams instead of written exam, written exam oral exam grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

Reference nosilca / Lecturer's references:

Miran Černe:

– ČERNE, Miran. Maximal plurisubharmonic functions and the polynomial hull of a completely circled fibration. Arkiv för matematik, ISSN 0004-2080, 2002, vol. 40, no. 1, str. 27-45 [COBISS.SI-ID 11623513]

– ČERNE, Miran, FORSTNERIČ, Franc. Embedding some bordered Riemann surfaces in the affine plane. Mathematical research letters, ISSN 1073-2780, 2002, vol. 9, no. 5-6, str. 683-696 [COBISS.SI-ID 12391257]

– ČERNE, Miran. Nonlinear Riemann-Hilbert problem for bordered Riemann surfaces. American journal of mathematics, ISSN 0002-9327, 2004, vol. 126, no. 1, str. 65-87 [COBISS.SI-ID 12895577]

Barbara Drinovec Drnovšek:

– DRINOVEC-DRNOVŠEK, Barbara. Discs in Stein manifolds containing given discrete sets. Mathematische Zeitschrift, ISSN 0025-5874, 2002, vol. 239, no. 4, str. 683-702 [COBISS.SI-ID 11567449]

– DRINOVEC-DRNOVŠEK, Barbara. Proper holomorphic discs avoiding closed convex sets. Mathematische Zeitschrift, ISSN 0025-5874, 2002, vol. 241, no. 3, str. 593-596 [COBISS.SI-ID 12076377]

– DRINOVEC-DRNOVŠEK, Barbara. Proper discs in Stein manifolds avoiding complete pluripolar sets. Mathematical research letters, ISSN 1073-2780, 2004, vol. 11, no. 5-6, str. 575-581 [COBISS.SI-ID 13311065]

Franc Forstnerič:

– FORSTNERIČ, Franc, ROSAY, Jean-Pierre. Approximation of biholomorphic mappings by automorphisms of C [sup] n. Inventiones Mathematicae, ISSN 0020-9910, 1993, let. 112, št. 2, str. 323-349 [COBISS.SI-ID 9452121]

– ČERNE, Miran, FORSTNERIČ, Franc. Embedding some bordered Riemann surfaces in the affine plane. Mathematical research letters, ISSN 1073-2780, 2002, vol. 9, no. 5-6, str. 683-696 [COBISS.SI-ID 12391257]

– FORSTNERIČ, Franc. Noncritical holomorphic functions on Stein manifolds. Acta mathematica, ISSN 0001-5962, 2003, vol. 191, no. 2, str. 143-189 [COBISS.SI-ID 13138009]

– FORSTNERIČ, Franc. Runge approximation on convex sets implies the Oka property. Annals of mathematics, ISSN 0003-486X, 2006, vol. 163, no. 2, str. 689-707 [COBISS.SI-ID 13908825]