Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Kompleksna analiza
Course title:	Complex Analysis

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Matematika, 2. stopnja	Modul S2	**1. ali 2.**	**1. ali 3.**
Mathematics, 2nd degree	Module S2	**1. or 2.**	**1. or 3.**

Vrsta predmeta / Course type

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**			**135**	**7**

Nosilec predmeta / Lecturer: Marko JAKOVAC

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Poznavanje analize in kompleksnih števil.	Knowledge of analysis and complex numbers.

Vsebina:	**Content (Syllabus outline):**
Funkcije kompleksne spremenljivke. Elementarne funkcije v kompleksnem: linearne funkcije, ulomljene linearne funkcije. Potenčne vrste v kompleksnem. Elementarne funkcije, definirane s potenčnimi vrstami. Logaritem in ciklometrične funkcije. Holomorfne funkcije. Cauchy – Riemannov izrek. Konformnost holomorfnih funkcij. Integral funkcije kompleksne spremenljivke. Cauchyjev izrek in Cauchyjeve formule.	Functions of complex variable. Elementary functions: linear function, Möbius functions. Power series. Elementary functions defined by power series. Logarithm and cyclometric functions. Holomorphic functions. Cauchy – Riemann theorem. Conformality of holomorphic mappings. Complex line integrals. Cauchy integral theorem and Cauchy formula. Liouville theorem. Power

Liouvilleov izrek. Taylorjeva vrsta. Laurentova vrsta. Klasifikacija izoliranih singularnih točk. Mali Piccardov izrek. Izrek o residuih. Uporaba pri računanju realnih integralov. Laplaceova in Fourierova transformacija. Uporaba.	series representation. Laurent series. Classification of isolated singularity. Behaviour of holomorphic function near isolated singularity. Little Piccard Theorem. Residui theorem. Applications to the calculations of definite integrals and sums. Laplace and Fourier transforms. Applications.

Temeljni literatura in viri / Readings:

- S. G. Krantz: *Handbook of Complex Variables*, Birkhäuser, Boston, 1999.
- J.B.Conway: *Functions of One Complex Variable I,* 2nd edition, Springer, New York, 1995.
- L. Ahlfors: *Complex Analysis*, 3rd edition, McGraw-Hill, New york, 1979.

Cilji in kompetence:	**Objectives and competences:**
Študent poglobi znanje iz osnov teorije funkcij kompleksne spremenljivke ter poglobi znanje iz uporabnih aspektov te teorije, predvsem v povezavi s preslikovanji območij, pri računanju določenih integralov, seštevanju vrst ter reševanju diferencialnih enačb.	Deepening the knowledge of concepts from the theory of functions of one complex variable. To deepen the knowledge of possible applications of this theory, specialy in connection with transformations of the regions, calculating definite integrals and sums and solving differential equations.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: • Študent razume pojem holomorfne funkcije pozna osnovne s tem povezane rezultate, posebej tiste, ki se nanašajo na integracijo in na integralsko reprezentacijo ter reprezentacijo s potenčno vrsto. • Študent razume koncept preslikovanja območij z uporabo ulomljenih linearnih in drugih preprostejših elementarnih funkcij v kompleksnem. • Študent razume pojem izolirane singularne funkcije in pozna uporabno vrednost izreka o residuumih. • Študent razume koncepta Laplaceove in Fourierove transformacije in pozna njune možnosti uporabe. Prenesljive/ključne spretnosti in drugi atributi: • Ilustracija dejstva, da nam teorija, navidez oddaljene od realnosti, lahko ponudi mnoge praktično uporabne rezultate. • Dojemanje transformacij kot opcije za pretvorbo matematične situacije v drugo	Knowledge and Understanding: • To understand the concept of holomorphic function and to know the basic results, specialy those about line integrals and about the integral and the power series representation of holomorphic functions. • To understend the concept of transforming plane regions using Möbius transformations and other basic elementary functions. • To understand the concept of isolated singularity and to be aware of the importance of the residui theorem. • To understand the concepts of Laplace and Fourier tranformations and to be aware of their possible applications. 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. • Understanding the concept of transformations as tools to convert a certain

situacijo, ki je udobnejša za obravnavo.	mathematical situation into a more convenient one.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Seminarske vaje	• Lectures • Tutorial

Načini ocenjevanja:		**Assessment:**
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 dvema delnima testoma (sprotne obveznosti).	Delež (v %) / Weight (in %) 50% 50%	Exams: 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 two mid-term tests.

Reference nosilca / Lecturer's references:

1. BREŠAR, Boštjan, JAKOVAC, Marko, KATRENIČ, Ján, SEMANIŠIN, Gabriel, TARANENKO, Andrej. On the vertex k-path cover. *Discrete Applied Mathematics*, ISSN 0166-218X. [Print ed.], 2013, vol. 161, iss. 13/14, str. 1943-1949. http://dx.doi.org/10.1016/j.dam.2013.02.024. [COBISS.SI-ID 19859464]

2. JAKOVAC, Marko, TARANENKO, Andrej. On the k-path vertex cover of some graph products. *Discrete Mathematics*, ISSN 0012-365X. [Print ed.], 2013, vol. 313, iss. 1, str. 94-100. http://dx.doi.org/10.1016/j.disc.2012.09.010, doi: 10.1016/j.disc.2012.09.010. [COBISS.SI-ID 19464968]

3. JAKOVAC, Marko, PETERIN, Iztok. On the b-chromatic number of some graph products. *Studia scientiarum mathematicarum Hungarica*, ISSN 0081-6906, 2012, vol. 49, no. 2, str. 156-169. http://dx.doi.org/10.1556/SScMath.49.2012.2.1194. [COBISS.SI-ID 16321113]

4. CABELLO, Sergio, JAKOVAC, Marko. On the b-chromatic number of regular graphs. *Discrete*

Applied Mathematics, ISSN 0166-218X. [Print ed.], 2011, vol. 159, iss. 13, str. 1303-1310. http://dx.doi.org/10.1016/j.dam.2011.04.028, doi: 10.1016/j.dam.2011.04.028. [COBISS.SI-ID 15914329]

5. JAKOVAC, Marko, KLAVŽAR, Sandi. The b-chromatic number of cubic graphs. *Graphs and combinatorics*, ISSN 0911-0119, 2010, vol. 26, no. 1, str. 107-118. http://dx.doi.org/10.1007/s00373-010-0898-9. [COBISS.SI-ID 15522905]