Nptel mathematics complex analysis pdf

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Complex Functions: Limits, Continuity and Differentiation : Introduction to complex functions - Limits and continuity - Differentiation and the Cauchy-Riemann equations, analytic functions, elementary functions and their mapping properties, harmonic functions - Complex logarithm multi-function, analytic branches of the logarithm multi-function, complex exponent multi-functions and their analytic branches, complex hyperbolic functions - Problem Session Complex Integration Theory : Introducing curves, paths and contours, contour integrals and their properties, fundamental theorem of calculus - Cauchys theorem as a version of Greens theorem, Cauchy-Goursat theorem for a rectangle, The anti-derivative theorem, Cauchy-Goursat theorem for a disc, the deformation theorem - Cauchy's integral formula, Cauchy's estimate, Liouville's theorem, the fundamental theorem of algebra, higher derivatives of analytic functions, Morera's theorem - Problem Session Further Properties of Analytic Functions : Power series, their analyticity, Taylors theorem - Zeroes of analytic functions, Rouches theorem - Open mapping theorem, maximum modulus theorem. Mobius Transformations : Properties of Mobius transformations - Problem Session Isolated Singularities and Residue Theorem : Isolated singularities, removable singularities - Poles, classification of isolated singularities - Casoratti-Weierstrass theorem, Laurents theorem - Residue theorem, the argument principle - Problem Session Something went wrong. Wait a moment and try again. 'Complex Analysis' Video Lectures by Prof. P. A. S. Sree Krishna from IIT Guwahati Advanced Complex Analysis Part 1. Instructor: Dr. T.E. Venkata Balaji, Department of Mathematics, IIT Madras. This is the first part of a series of lectures on advanced topics in Complex Analysis. By advanced, we mean topics that are not (or just barely) touched upon in a first course on Complex Analysis. The theme of the course is to study zeros of analytic (or holomorphic) functions and related theorems. These include the theorems of Hurwitz and Rouche, the open mapping theorem, the inverse and implicit function theorems, applications of those theorems, behaviour at a critical point, analytic branches, constructing Riemann surfaces for functional inverses, analytic continuation and monodromy, hyperbolic geometry and the Riemann mapping theorem. (from nptel.ac.in) Fundamental Theorems Connected with Zeroes of Analytic Functions Unit 1: Theorems of Rouche and Hurwitz Lecture 01 - Fundamental Theorems Connected with Zeroes of Analytic Functions Lecture 02 - The Argument (Counting) Principle, Rouche's Theorem and the Fundamental Theorem of Algebra Lecture 03 - Morera's Theorem and Normal Limits of Analytic Functions Lecture 04 - Hurwitz's Theorem and Normal Limits of Univalent Functions Unit 2: Open Mapping Theorem Lecture 05 - Local Constancy of Multiplicities of Assumed Values Lecture 06 - The Opening Mapping Theorem Unit 3: Inverse Function Theorem Lecture 07 - Introduction to the Inverse Function Theorem Lecture 08 - Completion of the Proof of the Inverse Function Theorem: The Integral Inversion Formula for the Inverse Function Lecture 09 - Univalent Analytic Functions have Never-Zero Derivatives and are Analytic Isomorphisms Unit 4: Implicit Function Theorem Lecture 10 - Introduction to the Implicit Function Theorem Lecture 11 - Proof of the Implicit Function Theorem: Topological Preliminaries Lecture 12 - Proof of the Implicit Function Theorem: The Integral Formula for Analyticity of the Explicit Function Unit 5: Riemann Surfaces for Multi-valued Functions Lecture 13 - Doing Complex Analysis on a Real Surface: The Idea of a Riemann Surface Lecture 14 - F(z,w)=0 is Naturally a Riemann Surface Lecture 15 - Constructing the Riemann Surface for the Complex Logarithm Lecture 16 - Constructing the Riemann Surface for the m-th Root Function Lecture 17 - The Riemann Surface for the Functional Inverse of an Analytic Mapping at a Critical Point Lecture 18 - The Algebraic Nature of the Functional Inverse of an Analytic Mapping at a Critical Point Unit 6: Analytic Continuation Lecture 19 - The Idea of a Direct Analytic Continuation or an Analytic Extension Lecture 20 - General or Indirect Analytic Continuation and the Lipschitz Nature of the Radius of Convergence Lecture 21a - Analytic Continuation along Paths via Power Series Part A Lecture 21b - Analytic Continuation along Paths via Power Series Part B Lecture 22 - Continuity of Coefficients Occurring in Families of Power Series defining Analytic Continuations along Paths Unit 7: Monodromy Lecture 23 - Analytic Continuability along Paths: Dependence on the Initial Function and on the Path - First Version of the Monodromy Theorem Lecture 24 - Maximal Domains of Direct and Indirect Analytic Continuation - Second Version of the Monodromy Theorem Lecture 25 - Deducing the Second Version of the Monodromy Theorem from the First (Homotopy) Version Lecture 27 - Existence and Uniqueness of Analytic Continuations on Nearby Paths Lecture 28 - Proof of the First (Homotopy) Version of the Monodromy Theorem Lecture 30 - Proof of the Algebraic Nature of Analytic Branches of the Functional Inverse of an Analytic Function at a Critical Point Unit 8: Harmonic Functions, Maximum Principles, Schwarz Lemma and Uniqueness of Riemann Mappings Lecture 31 - The Mean Value Property, Harmonic Functions and the Maximum Principle Lecture 32 - Proofs of Maximum Principles and Introduction to Schwarz Lemma Lecture 33 - Proof of Schwarz Lemma and Uniqueness of Riemann Mappings Lecture 34 - Reducing Existence of Riemann Mappings to Hyperbolic Geometry of Sub-domains of the Unit Disc Unit 9: Pick Lemma and Hyperbolic Geometry on the Unit Disc Lecture 35a - Differential and Infinitesimal Schwarz's Lemma, Pick's Lemma, Hyperbolic Arc Lengths, Metric and Geodesics on the Unit Disc Lecture 35b - Differential and Infinitesimal Schwarz's Lemma, Pick's Lemma, Hyperbolic Arc Lengths, Metric and Geodesics on the Unit Disc (cont.) Lecture 36 - Hyperbolic Geodesics for the Hyperbolic Metric on the Unit Disc Lecture 37 - Schwarz-Pick Lemma for the Hyperbolic Metric on the Unit Disc Unit 10: Theorems of Arzela-Ascoli and Montel Lecture 38 - Arzela-Ascoli Theorem: Under Uniform Boundedness, Equicontinuity and Uniform Sequential Compactness are Equivalent Lecture 39 - Completion of the Proof of the Arzela-Ascoli Theorem and Introduction to Montel's Theorem Lecture 40 - The Proof of Montel's Theorem Unit 11: Existence of a Riemann Mapping Lecture 41 - The Candidate for a Riemann Mapping Lecture 42a - Completion of Proof of the Riemann Mapping Theorem Lecture 42b - Completion of Proof of the Riemann Mapping Theorem (cont.) References Advanced Complex Analysis Part 1 Instructor: Dr. T.E. Venkata Balaji, Department of Mathematics, IIT Madras. The theme of the course is to study zeros of analytic (or holomorphic) functions and related theorems.

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