

Syllabus

- I. Course Name:** Topics in Complex Analysis
- II. Course description and objective** The main objectives of the discipline are to teach students the theoretical basics and methods of the theory of functions of many complex variables and to apply these methods to other mathematical disciplines.
- III. Optionally**
- IV. Bachelor Program, 7th Term, 48 Hours, 4 Credits**
- V. Course content**

Chapter 1. Power series and holomorphic functions

Theme 1. Multiple power series

1. Multiple circular domains
2. Multiple power series
3. Domains of convergence for multiple power series.
4. The connection between coefficients of power series and radii of convergence

Theme 2. Holomorphic functions of many variables

1. Definition of holomorphic functions of many variables
2. The integral Cauchy formula
3. Connection with power series
4. Cauchy-Riemann's conditions

Theme 3. Properties of holomorphic functions of many variables

1. The maximum principle
2. Uniqueness Theorem
3. Holomorphic functions in multiple-circular domains
4. Jensen's formula

Chapter 2. Hartogs' series and holomorphic convexity

Theme 4. Subharmonic and plurisubharmonic functions.

1. Semi-continuous functions
2. Subharmonic functions.
3. Plurisubharmonic functions.
4. Hartogs' lemma for subharmonic and plurisubharmonic functions.

Theme 5 Hartogs' series and domains, radius of convergence, corollaries

1. Hartogs' domains
2. Radius of convergence of Hartogs' series
3. The Hartogs theorem for radius of convergence
4. Osgood's Lemma
5. The Hartogs theorem for separate holomorphic functions

Theme 6. Pseudo-convexity, holomorphic convexity, holomorphic shells

1. Holomorphic extension of domains and pseudo-convexity
2. Holomorphic convexity and holomorphic shell
3. Holomorphic convexity of an arbitrary convex domain
4. Theorems of Cartan-Tullen's type.

Chapter 3. d-dash problem

Theme 7. d-dash problem for differential forms with compact support and in polydisks

1. Auxiliary results from the one-dimensional complex analysis
2. d-dash problem for functions with compact support

3. d-dash problem for forms with compact support
4. d-dash problem in polydisk
5. The theorem about the “sticking of holes”

Theme 8. Meromorphic functions and Cousin’s problems

1. Meromorphic functions of many variables
2. First Cousin's problem.
3. Second Cousin's problem.

Theme 9. The Weierstrass preparation theorem

1. Weierstrass’ distinguished polynomial
2. The Weierstrass preparation theorem
3. Corollaries

VI. Pre-taken courses

Complex Analysis

VII. Form of the final test: test (two-level evaluation scale) / examination (four-level evaluation scale)

VIII. Teaching materials and reference books

Basic Literature

1. L.I. Ronkin. Elements of the theory of analytic functions of many variables. Kiev, Naukova Dumka, 1977 (Russian)
2. B.V. Shabat Introduction to complex analysis , v.2. Providence, R.I. : American Mathematical Society, 1992
3. E. Herve. Functions of many complex variables. Oxford University Press, 1963.

4. L.Hermander. Introduction to the theory of functions of several complex variables. D Van Nostrand Company, Prinston, 1966.

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