

Taras Shevchenko National University of Kyiv

Physics Department

Course description

**Complex Analysis**

**Level: Language: Duration: Occurrence:**

Bachelor Ukrainian 1 semester 3rd semester

**Credits: Total Hours: Contact Hours: Self-study Hours:**

3 90 45 45

**Description of Course Work and Examinations**

Module-rating system, results are evaluated on a 100-point scale. The course contains 2 midterms 30 pts/90 min each, an exam on higher complexity problems 10 pts/180 min, and a final exam 30 pts/180 min.

**Prerequisites**

Mathematical Analysis (1st – 2nd semesters)

**Syllabus**

***Basic Definitions:*** complex number (CN), complex plane, absolute value and argument of a CN, trigonometric and exponential forms.

***Basic Operations:*** algebraic operations on CNs, CN sequences and limits, limit points, point at infinity, compactification of the complex field, Riemann sphere.

***Functions of CNs:*** function of a complex variable, single- and multivalued functions, branches, branch cuts, continuous functions, analytic functions.

***Differentiation and Integration in the Complex Plane:*** differentiability of a function of a CN, Cauchy-Riemann equations, harmonic functions and harmonic conjugates, Cauchy’s differentiation formula, Cauchy’s integral theorem, Taylor series, Laurent series on a ring, classification of singularities, asymptotic behavior near singularities, residues, Cauchy’s residue theorem, calculation of problematic integrals of real-valued functions, infinite series residue theorem.

***Operational Analysis:*** Fourier and Laplace transforms, theorems of existence, inverse transforms, transforms of common functions, solution of linear ODEs with initial conditions using the Laplace transform.

**Literature**

1. L.I. Volkovyskyi, G.L. Lunz, I.G. Aramanovich. *Collection of tasks on the theory of functions of a complex variable*. 2002 Moscow, 312 p, ISBN 5-9221-0264-8.

**Instructors**

Associate Professor Oleh V. Barabash.