

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATION
OF THE REPUBLIC OF UZBEKISTAN
CHIRCHIK STATE PEDAGOGICAL UNIVERSITY



SYLLABUS FOR THE THEORY OF FUNCTIONS OF A
COMPLEX VARIABLE

Fields of knowledge: 100000 - Education
Fields of education: 110000 - Education
Educational direction: 60110600 - Mathematics and informatics

CHIRCHIK- 2024

✓

The curriculum (syllabus) of the subject was approved by the Council of Chirchik State Pedagogical University dated " ____ " ____ 2024 of the meeting of No. ____.

Authors:

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The curriculum (syllabus) of the subject was approved and recommended to the council of the faculty "Mathematics and informatics" at the meeting of the department "Algebra and mathematical analysis" by protocol No. ____ of " ____ " ____ 2024 year

The dean of the faculty


D.M. Makhmudova

The curriculum (syllabus) of the subject was discussed and recommended for use by the faculty council of the Faculty of Mathematics and Informatics of Chirchik State Pedagogical University by protocol No. ____ of " ____ " ____ 2024 year.

The head of the department


G'.X.Djumabayev

Basic literature	
1.	T.T. Tuychiev, "Independent Work in the Theory of Complex Variable Functions." Mumtoz So'z, 2018.
2.	A. Ghoziev, "Mathematical Analysis Parts 1 and 2." Samarkand, 2020.
3.	Sadullayev A., Khudoiberanov G., Mansurov Kh., Vorisov A., Tuychiev T. Collection of Examples and Problems from the Course of Mathematical Analysis (Complex Analysis) Part 3. "Uzbekistan," 2000.
Additional literature	
1.	Shabat B.V. Introduction to Complex Analysis. Vol. I, Moscow: Nauka, 1985.
2.	Khudaiberanov G., Vorisov A.K., Mansurov K.T. Complex Analysis. Vol. University, 1998.
3.	Sirajiddinov S.H., Salohiddinov M.S., Maksudov Sh. Theory of Complex Variable Functions. Tashkent: "O'qituvchi", 1979.
4.	Privalov I.I. Introduction to the Theory of Functions of a Complex Variable. Moscow: "Nauka", 1977.

Internet addresses

<http://www.edu.uz> - Ministry of Higher Education, Science, and Innovations of the Republic of Uzbekistan.

<http://www.gov.uz> - Uzbekistan Republic Government Portal.

www.ziyounet.uz - Information Education Network of the Republic of Uzbekistan

www.cspu.uz - CSPU website

www.natlif.uz - (A. Navoi National Library of Uzbekistan)

To ensure students thoroughly master a subject, it is important to utilize advanced and modern teaching methods and apply new informational-pedagogical technologies. In mastering the subject, textbooks, study and methodological guides, handouts, and electronic materials are used. Advanced pedagogical technologies are selected in accordance with the topics of lectures and practical lessons. Teaching the subject involves the use of pedagogical technologies such as "Networks," "Brainstorming," "Boomerang," "Balance," "Cluster," "Venn Diagrams," and "Model-Based Education." Each topic's uniqueness is taken into account. Furthermore, audio, video, and computer equipment is utilized.

Criteria for Assessing and Monitoring Students' Knowledge in the Subject

Monitoring and evaluation of student knowledge is carried out through student activity, mid-term control, final control and assessment of independent learning.

- **Mid-term supervision** is an important stage of assessment by the teacher of the student's knowledge and practical skills acquired in the first part of the module, and is an indicator of future mastery of this subject. Assessment of students' knowledge in mid-term control is carried out through oral question-and-answer and written work. If the student does not pass the mid-term examination, he will be given the opportunity to retake it 2 more times. **20 percent of the total assessment.**

- **Assessment of independent learning** is carried out through students' completion of assigned practical projects in a group and individually. Each student is given one team project and two individual projects. The student studies the given issue and conducts research, understanding the goals and objectives of the given project. Analyzes the obtained results, prepares presentations with conclusions and defends them. The number, subject, content of the projects, methods of implementation and deadlines are fully disclosed in the working science program. **50 percent of the total evaluation.**

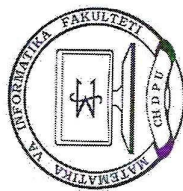
- **Final control** is a summative stage of evaluation of the student's knowledge and practical skills by the professor-teacher. Final control is conducted in the form of written work. **30 percent of the total evaluation.**

Assessment, intermediate and final control tasks (tasks) are developed by the course professors, pre-moderated and approved by the head of the department.

The content of the assignments for conducting the types of control should allow an objective, transparent and accurate assessment of the student's learning.

A student must not engage in any activity that may lead to academic misconduct (misconduct). For example, plagiarism, collusion, falsification of results, irregularities in the examination process, i.e. use of notes and handouts, telephone and other means of communication, communication with others inside or outside the examination room are prohibited. Students who are guilty of this will be excluded from the control or examination process, and their grade will be zero.

Depending on the characteristics of the subject (course), changes and additions may be made to the evaluation and control criteria.



CURRICULUM (SYLLABUS)

Mathematics and Informatics
Faculty

60110600 - Mathematics and
Informatics Education Program

General information			
Subject name: Theory of Functions of a Complex Variable			
Subject code: Math 5354	Amount of credit: 4	✓	Semester: 5 ✓
Department name: Algebra and mathematical analysis			
Teacher: Raupova Mokhinur Haydar qizi			
Email: r.mokhinur@gmail.com			
Subject Type: Elective ✓			
Form of education:			
Evaluation form:			
Science language:			
Full-time ✓			
Exam ✓			
Uzbek ✓			

Summary of science

Subject and Content of the Course: To train young people to be highly qualified, it is necessary to educate highly qualified specialists. The main content of the course on lectures and solving examples from the theory of functions of a complex variable is to enhance the scientific and methodological preparation of future mathematics teachers, fostering independent and creative thinking, ensuring competitiveness, and forming the methodological knowledge, skills, and competencies needed for pedagogical activity. It addresses the use of mathematical problems and exercises that aid in achieving these goals.

The objective of teaching this course is to acquaint students with the essential information in mathematics (concepts, propositions and their proofs, methods for solving practical problems, etc.). At the same time, it aims to develop students' logical thinking, enable them to draw correct conclusions, enhance their mathematical culture, and introduce them to the foundations of modern mathematics. This includes consciously investigating issues related to professional activity, explaining the essence of mathematical analysis capabilities in problem-solving, and teaching them how to apply these in practice.

The mission of the course is:

- To help students master the culture of thinking by comprehending mathematical concepts, rules, and methods consciously; to understand, generalize, and analyze information; to set objectives and choose ways to achieve them;
- To formulate their thoughts logically, clearly, and rationally, both in oral

and written communication.
- Achieving competencies in applying the fundamental methods of the theory of functions of a complex variable, including both theoretical and experimental research methods, to professional activities, and through this, realizing the significance of mathematical analysis in studying engineering, physics, technology, economics, and other fields, in solving their problems, particularly in the analysis of mathematical models of various processes.

Learning outcomes:
Students who completed the course:
- Students study the theoretical foundations, key concepts, principles, and laws of the theory of functions with complex variables, and develop skills to apply them in practice;
- They conduct an in-depth analysis of the essence of the methods within the theory of functions with complex variables;
- They apply appropriate tools of functional analysis to solve problems in professional activities;
Competencies to be acquired as a result of the course:
- In future professional activities, will possess knowledge, skills, and competencies in elementary mathematics, mathematical analysis, and probability theory (KK-1);
- Participates in conducting scientific research (KK-3).

Science content	
Form of education: Lecture (L)	
L1	Operations on complex numbers.
L2	Domains in the complex plane, sequences of complex numbers, and their limits.
L3	Concept of a function with a complex variable. Limit and continuity of functions with a complex variable.
L4	Differentiability of functions with a complex variable. Cauchy-Riemann conditions.
L5	Elementary functions and conformal mappings performed with their help.
L6	Laplace transform and its properties.
L7	Differentiability of functions with a complex variable.
L8	Integral of a function with a complex variable. Cauchy's integral theorem. Cauchy's integral formula.
L9	Taylor series. Classification of special points.
L10	Functional series, power series.
L11	Laurent series

L12	Residues and their computation.
L13	Jordan's lemma
L14	Some applications of residue theory
L15	The regular branch of the logarithm.
Form of education: practical lesson (P)	
P1	Operations on complex numbers.
P2	Domains in the complex plane, sequences of complex numbers, and their limits.
P3	Concept of a function with a complex variable. Limit and continuity of functions with a complex variable.
P4	Differentiability of functions with a complex variable. Cauchy-Riemann conditions.
P5	Elementary functions and conformal mappings performed with their help.
P6	Laplace transform and its properties.
P7	Differentiability of functions with a complex variable.
P8	Integral of a function with a complex variable. Cauchy's integral theorem. Cauchy's integral formula.
P9	Taylor series. Classification of special points.
P10	Functional series, power series.
P11	Laurent series
P12	Residues and their computation.
P13	Jordan's lemma
P14	Some applications of residue theory
P15	The regular branch of the logarithm.

Teaching and learning methods

The module is organized through lectures, practical classroom sessions, and independent study activities by students. In the lectures, theoretical information necessary to analyze topics in the theory of functions of a complex variable is provided. In practical classroom sessions, issues (examples and problems) of the course in the theory of functions of a complex variable are presented, and students are given the opportunity to practice applying the necessary mathematical methods and techniques to solve these issues. During independent study activities, students are expected to study the topics in depth and analyze them using literature, scientific journals, and sources.

Type of training	A dedicated hour
Lecture	30 ✓
Practical training	30 ✓
Self-education	60 ✓
Total student hours of study and teaching	120 ✓