MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATION OF THE REPUBLIC OF UZBEKISTAN

CHIRCHIK STATE PEDAGOGICAL UNIVERSITY

"APPROVED BY"
Vice-rector for educational affairs
D. B. Akhmadjanov
"__" _____ 2024 year

WORKING CURRICULUM (SYLLABUS) BY DISCIPLINE MATHEMATICAL ANALYSIS

(Full-time 1-year course)

Field of knowledge:	500000 - Natural Sciences, Mathematics and Statistics
Field of education:	540000 - Mathematics and Statistics
Direction of education:	60540200 - Mathematics

Chirchik-2024

SUBJECT SYLLABUS

Academic year:	2024/2025		
Subject name:	Mathematical Analysis		
Subject Type:	Mandatory		
Subject Code:	MAN1123424		
Year:	4		
Form of training:	Full-time		
Type of education:	Bachelor		
The format of classes and hours allocated per semester:	**Total**	**1 semester**	**2 semester**
	360	180	180
Lecture	**88**	44	44
Practical	**92**	46	46
Laboratory work	-	-	-
Seminar	-	-	-
Independent work	**180**	90	90
Credit quantity:	**12**	6	6
Assessment form:	**M. E. 1,2**	In written and oral	In written and oral
	Final control	In written	in written
Responsible department for the subject:	**Algebra and Mathematical Analysis**		

Information about the teacher

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1.	http: / / www. edu. uz-Ministry of Higher Education, Science and Innovation of the Republic of Uzbekistan.
2.	www.ziyonet.uz -Educational information network of the Republic of Uzbekistan
3.	www.cspi.uz -website of Chirchik State Pedagogical University
4.	www.natlib.uz - Alisher Navoi National Library of Uzbekistan

This curriculum was approved by the Department of Algebra and Mathematical Analysis at the meeting no. _ _ of ___- _____ 2024.

This curriculum was approved by the Faculty of Mathematics and Computer Science at the meeting no. _ _ of ___- _____ 2024.

This curriculum was approved by the Council of Chirchik State Pedagogical University at the meeting no. _ _ of ___- _____ 2024.

Head of the Educational and Methodological Department — **M.J. Boltaev**

Dean of the Faculty — **D.M. Makhmudova**

Head of the Department — **G'.X. DJumabaev**

Compiled by — **M.H.Raupova**

“5"	4.5 – 5	" A "	90-100	Excellent
“4”	3.5 – 4.4949	"B+"	80 — 89.9	Good
		"B”	70 – 79,9	
“3”	3 – 3,49	“C+”	65 — 69.9	Satisfied
		"C”	60 — 64,9,9	
“2”	0 – 2,99	“F "	0-59.9	Unsatisfied

Basic and additional educational literature and information resources

	Basic literature
1.	G‘.X. Djumabayev. Matematik analiz 1. Chirchiq 2023
2.	F.S.Aktamov. Matematik analiz 1. Chirchiq 2023
3.	Azlarov T., Mansurov X. Matematik analiz, 1,2-tomlar, Toshkent, "Uzbekiston", 1994,1995.
4.	Khudoiberganov G., Vorisov A. K., Mansurov X. T., Shoimkulov B. A. Matematik analiz, 1,2-tomlar, Toshkent, "Uzbekiston", 2010.5
5	A.G. Abduraxmonov. Aniq va Aniqmas integrallar(matrematik analiz) BookTrrade 2022. CHDPU.
	Additional literature
1.	Ilin V., Sadovnichy V., Sendov B. Mathematical analysis, Moscow " Nauka", 1979.
2.	Khudoiberganov G., Vorisov A., Mansurov X. Complex analysis of maruz. Toshkent "Universiteti" 1998-y.
3.	M. S. Saloiddinov, F. N. Nasritdinov Oddiy diffrensial tenglamalar Toshkent 1994-
4.	y.P. Oppokov, N. Turgunov, and I. A. Gafarov. Оддий диффренсиал тенгламалардан мисол ва масалалар. Toshkent 2009
5.	Kudryavsev L. Course of mathematical analysis TT, 1, 1973.
6.	Fichtengols G. Course of differential and integral calculus, TT, I, II, Moscow "fizmat-lit", 2001.
7.	Demidovich B. Collection of problems and exercises on mathematical analysis, Moscow, "Nauka", 1990.
8.	A. F. Filippov Collection of problems on differential equations. Scientific Publishing Center 2000-th
	Internet sites

	1. The Purpose of Science (PS)
PS1	The main purpose of the mathematical analysis course is to introduce students to the necessary set of mathematical data (concepts, statements and their proofs, methods for solving practical problems, etc.). At the same time, it serves to train students in logical thinking, draw correct conclusions, improve their mathematical culture, and at the same time introduce students to it learn the basics of modern mathematics, be able to consciously explore professional issues, explain the essence of the possibilities of mathematical analysis and apply them when searching for solutions to problems.

	2. Basic knowledge required to master science
1	Mathematics
2	Algebra
3	Geometry

	3. Learning Outcomes (LO)
	In terms of knowledge:
LO1	Demonstrate a deep understanding of the concepts and principles of mathematical analysis;
LO2	A deep analysis of the essence методов of mathematical analysis methods;
LO3	In professional activities, acquires knowledge, skills and abilities in the fields of mathematical analysis, algebra and number theory,geometry, differential equations, probability theory, suitable for solving problems, participates in scientific research jobs.
LO4	Presents the problems (examples and problems) of the mathematical analysis course, and students are given the opportunity to practice applying the mathematical methods and techniques necessary to solve them.
	In terms of skills:
LO5	This is done by students completing practical examples or tasks that are given collectively and individually.
LO6	The student studies the question posed, conducts research, understanding the goals and objectives, the essence of the given example or task.
LO7	Protects by analyzing the results obtained and preparing presentations with solutions.
LO8	Analyzes the results obtained, prepares presentations with solutions, and defends them.
	4. Content of science
	Form of study: Lecture (L) **Hours**

1st half of the year		
L1	Subject of mathematical analysis. Sets and mappings.	2
L2	The set of real numbers.	2
L3	Convergent sequences and their properties.	2
L4	Convergent sequences and arithmetic operations on them.	2
L5	The convergence principle.	2
L6	A single-variable function and its properties.	2
L7	Definitions of the function limit.	2
L8	Properties of a function that has a limit.	2
L9	Continuous function and its properties.	2
L10	Properties of functions that are continuous on a segment.	2
	Midterm exam	
L11	Basic elementary functions and their continuity.	2
L12	Derivative of a function of one variable.	2
L13	Rules for calculating the derivative.	2
L14	Differential of the function.	2
L15	Higher-order derivative and differentials.	2
L16	Basic theorems of differential calculus.	2
L17	Applications of the derivative.	2
L18	Full function check using the derivative.	2
	Midterm exam	
L19	Definition of an integral and simple methods for finding it.	2
L20	Integration of rational functions.	2
L21	Integration of trigonometric functions.	
L22	Integration of simple irrational and transcendental functions.	2
Total		**44**
Form of classes: Lecture (M)		**Hours**
2nd half of the year		
L1	Definition of a definite integral.	2
L2	Necessary and sufficient conditions for the existence of a certain integral.	2
L3	Class of integrable functions.	2
L4	Properties of a definite integral.	2
L5	Methods for calculating a definite integral.	2
L6	Indefinite integrals with infinite limits.	2
L7	An indefinite integral of an unbounded function.	2
L8	An indefinite integral of an unbounded function.	2
L9	Application of a definite integral for calculating geometric quantities.	2
L10	Application of a definite integral in mechanics and physics.	2
	Midterm Exam	
L11	Sequences of convergent numbers and their properties.	2
L12	Positive convergent sequences	2

7. Requirements for obtaining credits:

It is necessary to fully master the theoretical and methodological concepts related to science, be able to correctly reflect the results of analysis, independently observe the processes and concepts being studied, perform tasks and tasks in the form of current and intermediate control, perform written tasks based on options for final control.

8. Criteria for evaluating and controlling knowledge of students on the subject

Student educational outcomes are assessed using a 100-point grading system. The conversion of scores based on students' learning outcomes is carried out according to the YeCTS (European Credit Transfer System).

The points for assessing educational outcomes are determined in the following manner:

Midterm exam	**The final exam**
For answers during the midterm assessment – midterm assessment score (MAS); For completing independent study assignments – independent work assessment (ISA); The performance of the student in practical, seminar, laboratory classes, and independent study assignments, as well as their activity in these exercises, is evaluated by the natural science teacher. When assessing the student based on the type of midterm assessment, the grades received in the academic classes are taken into account. For answers during the midterm exam – midterm assessment score (MES); For completing independent study assignments – independent work assessment (ISA); The performance of the student in practical, seminar, laboratory classes, and independent study assignments, as well as their activity in these exercises, is evaluated by the natural science teacher. When assessing the student based on the type of interim assessment, the grades received in the academic classes are taken into account.	Assessment for the final control for participation in the final exam (AFE)
The maximum point midterm exam score is 5 points: ΣME = MAS + ISA	***Maximum score of the final exam (MSFE)*** ***5 points***

A student with a score of ΣPE ≥ 3 is allowed to pass the final exam.

Module Assimilation Rate (MAR):

Σ MAR = MAS

The module is considered mastered when Σ MAR ≥ 3 is obtained.

Criteria for Assessing Educational Outcomes of Students:

IL8	Concavity of the function graph.	2
IL9	Asymptotes Asymptotes of the function graph.	2
IL10	Initial function.	2
IL11	Concepts of indefinite integral.	2
IL12	Integration of trigonometric functions.	2
IL13	Integration of some irrational functions.	2
IL14	Definitions of a definite integral (Riemann integral).	2
IL15	Newton-Leibniz formula.	4
IL16	The existence of a definite integral.	2
IL17	Class of integrable functions.	4
IL18	Number series.	4
IL19	Series of real and complex numbers.	4
IL20	Properties of convergent series.	4
IL21	Series with positive and arbitrary terms and their convergence signs.	4
IL22	Properties of absolutely and conditionally convergent series.	4
IL23	Riemann's theorem.	4
IL24	Functional series.	4
IL25	Signs of uniform convergence of functional sequences (series).	4
IL26	Convergence of functional series by the D'Alembert criterion.	4
IL27	Functional properties of functional sequences (series).	4
IL28	Area of convergence of real and complex degree series.	4
IL29	Cauchy-Addamar formula.	4
IL30	Functional properties of power series.	4
Total		**90**

6. Educational technologies and methods:

Lectures - interactive case studies; seminars (reasoning, quick questions and answers); working in groups; conducting presentations; individual projects; projects for collaboration and defense.

Practical classes include solving problems related to the topic, making practical observations, making measurements, and working with astronomical tables.

Independent work - it is recommended to carry out in the following types:

- preparation of reports;
- preparation of presentations;
- problem solving;
- individual and group educational project;
- work with information and analytical materials;
- working with resources.
- drawing and illustrative models (smart map, frame, logical graph, etc.) k.) create;
- creation of multimedia presentations;
- preparation of methodological developments of lessons;
- preparation of extracurricular developments;

L13	Arbitrary convergent sequences.	2
L14	Functional sequences.	2
L15	Properties of planar convergent function sequences.	2
L16	Function rows.	4
	Midterm Exam	
L17	Properties of convergent functional series.	4
L18	Power series.	2
L19	Taylor series.	2
L20	Fourier series.	2
Total		**44**
Form of classes: Practical (A)		
1st half of the year		
P1	Subject of mathematical analysis. Sets and mappings.	2
P2	is a set of real numbers.	2
P3	Convergent sequences and their properties.	2
P4	Convergent sequences and arithmetic operations on them.	2
P5	Convergence principle.	2
P6	A single variable function and its properties.	2
P7	Defining the function limit.	2
P8	Properties of a function that has a limit.	2
P9	Continuous function and its properties.	2
P10	Properties of functions that are continuous on a segment.	2
P11	Basic elementary functions and their continuity.	2
P12	Derivative of a function of one variable.	2
P13	Rules for calculating the derivative.	2
P14	Differential of the function.	2
P15	High order derivative and differentials.	2
P16	Basic theorems of differential calculus.	2
P17	Applications of the derivative.	2
P18	Full function check using the derivative.	2
P19	Indefinite integral and simple methods for finding it.	2
P20	Integration of rational functions.	2
P21	Integration of trigonometric functions.	2
P22	Integration of simple irrational and transcendental functions.	4
Total		**46**
Form of classes: Practical (A)		
2nd half of the year		
P1	Definition of a definite integral.	2
P2	Necessary and sufficient conditions for the existence of a definite integral.	2
P3	Classes of integrable functions.	2
P4	Properties of a definite integral.	2
P5	Methods for calculating a definite integral.	2

P6	Improper integrals with infinite limits.	2
P7	Improper integral of an unbounded function.	2
P8	Improper integral of an unbounded function.	2
P9	Applying a definite integral to calculate geometric quantities.	2
P10	Application of a definite integral in mechanics and physics.	2
P11	Convergent number series and their properties.	2
P12	Positive series.	2
P13	Arbitrary rows.	2
P14	Functional sequences.	2
P15	Properties of uniformly convergent functional sequences.	2
P16	Function series.	4
P17	Properties of uniformly convergent functional series.	4
P18	Power series.	4
P19	Taylor series.	2
P20	Fourier series.	4
Total		**46**

5. Independent learning (IL)		
1st half of the year		
IL1	The concept of sets and examples of tasks.	2
IL2	The concept of a subset. Study examples and problems related to subsets.	2
IL3	Definitions and concepts of sets. Study examples and problems related to sets.	2
IL4	Approximation of real numbers using decimals. Real numbers and their comparison.	2
IL5	Set of real numbers. The exact boundary of a bounded set and its theorem.	2
IL6	The concept of a function. Scope of the function definition and value range.	2
IL7	Coordinate system. Graph of the function.	2
IL8	Defining a function and studying examples and problems related to the scope of definition and values.	2
IL9	Concepts and theorems about even and odd functions. Study of examples and problems related to even and odd functions.	2
IL10	Concepts and definitions of periodic and non-periodic functions.	2
IL11	Limited and Unlimited features.	2
IL12	The concept of an inverse function for a given function, concepts about the boundaries of bounded and unbounded functions.	2
IL13	Properties of functions $y=ax^{\alpha}$ and $y=\log_a x$, graphs of functions. Functions y=sinx, y=cosx, y=tgx, y=ctgx and their properties, graphs.	2
IL14	Defining the limit of a numeric sequence. Examples.	2
IL15	Show whether the limit of a given numerical sequence is as defined.	4
IL16	Necessary condition for convergence of the sequence. Limit theorems.	2
IL17	Infinitesimal and infinitely large sequences.	4
IL18	Arbitrary numeric sequences. Partial sequences and partial limits.	4
IL19	Upper and lower limits. Studying the concepts of limits and giving examples.	4
IL20	The principle of nested segments. Concepts of convergence of bounded functions.	4
IL21	Study examples and problems related to restricted functions.	4
IL22	Show that a given number is the limit of a given function by definition.	4
IL23	Concepts and definitions of the function limit. Study the examples and problems associated with them.	4
IL24	Limit at infinity. One-way limits.	4
IL25	Infinitely small and infinitely large. Concepts and definitions of uncertainties. Concepts of limits. Study of examples and problems related to uncertainties.	4
IL26	Types of discontinuities, the concept of a jump. Performing arithmetic operations on continuous functions. Concepts and definitions of continuous functions.	4
IL27	Definitions and concepts of the Weierstrass theorem. Definitions of uniform continuity and information about them. Study examples and problems related to Cantor's theorem and provide concepts.	4
IL28	Study of functions with discontinuities, points of discontinuity, types of discontinuities, the correspondence of a single element of a set to any law or rule for one or more elements.	4
IL29	Continuity of the function at a point, in this case a sufficiently small neighborhood of the point is studied. Checking the existence and continuity of the inverse function, studying finding the inverse function.	4
IL30	The concept of sets and examples of problems.	4
Total:		**90**
2nd half of the year		
IL1	Function derivative.	2
IL2	is the differential of the function.	2
IL3	The differential of a function is the ratio of the increment of the function to the increment of the argument corresponding to the nth derivative of the function.	2
IL4	The differential of a function is the ratio of the increment of the function to the increment of the argument corresponding to the nth derivative of the function.	2
IL5	Checking the monotonicity of a function using the derivative.	2
IL6	Extrema of the function, finding them using the derivative.	2
IL7	Convexity of the function graph.	2