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

"Approved by"
Acting vice-rector for
educational affairs
_____ D.B.Akhmadjanov
2024 year "___"_____

SYLLABUS
OF MATHEMATICAL ANALYSIS
(Form of education: full-time 2-course)

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

Chirchik – 2024

Syllabus of subject

Academic year:	2024/2025		
Subject name:	Mathematical analysis		
Subject type:	Compulsory		
Subject code:	MATA1128		
Year:	4		
Form of education:	Full-time		
Type of education:	Bachelor degree		
Course format and semester hours:	**Total**	**3rd semester**	**4th semester**
	240	120	120
Lecture	**60**	30	30
Practical lesson	**60**	30	30
Laboratory lesson	**120**	60	60
Seminar	**120**	60	60
Self-study	**8**	4	4
Amount of credit: Evaluation form:	**Summative**	Exam	Exam
	Final control	Exam	Exam
Responsible department for subject:	**Algebra and Mathematical Analysis**		

Information about the teacher of subject

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Organization:	Chirchik State Pedagogical University, Department of "Algebra and Mathematical Analysis"
Reviewers:	D.M. Maxmudova - Dean of the Faculty of Mathematics and Informatics at Chirchiq State Pedagogical University, Doctor of Pedagogical Sciences, Professor. J.Q. Adashev - Senior Scientific Researcher at the V. Ramanoviskiy Institute of Mathematics, Doctor of Physical and Mathematical Sciences, Professor.

Head of the educational and methodological department : M.J.Boltayev

The dean of the faculty : D.M.Maxmudova

The head of the department : G'.X.Djumabayev

Creator M.H.Raupova

1. The purpose of subject (PS)	
PS1	The main purpose of the mathematical analysis course is to familiarize students with the set of necessary information of mathematics (concepts, assertions and their proof, methods of solving practical problems, etc.). At the same time, it helps students to think logically, draw correct conclusions, increase mathematical culture, and at the same time introduce students to the foundations of modern mathematics, consciously research issues related to professional activity, explain the essence of the possibilities of mathematical analysis in finding solutions to problems, and use them.

2. Basic knowledge required to master science	
1	Matematika
2	Algebra
3	Geometriya

3. Learning Outcomes (LO)	
	In terms of a knowledge perspective:
LO1	Demonstrate a thorough understanding of the concepts and principles of mathematical analysis;
LO2	Deep analysis of the essence of mathematical analysis methods;
LO3	In order to solve problems in his professional activity, he acquires knowledge, qualifications and skills in the fields of mathematical analysis, algebra and number theory, geometry, differential equations, probability theory, and participates in scientific research.
LO4	Mathematical Analysis course problems (examples and problems) are presented and students are given the opportunity to practice applying the mathematical methods and techniques necessary to solve them.
	In terms of skills:
LO5	It is carried out through students' collective and individual implementation of given practical examples or problems.
LO6	The student studies the given problem and conducts research, understanding the goals and objectives and essence of the given examples or problems.
LO7	Analyzes the obtained results, prepares presentations with solutions and defends them.

4. Subject content		
Form of education: Lecture (L)		**Hours**
3rd semester		
L1	Multivariable functions.	2
L2	The limit of a multivariable function.	2
L3	Continuous multivariable functions. Uniform continuity of a continuous multivariable function.	2
L4	Differentiation of multivariable functions. Applications of the differential of a multivariable function to approximate calculations.	2
L5	Higher-order derivatives and differentials of a multivariable function.	2
L6	Differentiation of implicit functions.	2
L7	Extrema of a multivariable function.	2
L8	Double integrals.	2
	Midterm Exam	
L9	Applications of double integrals.	2
L10	Triple integrals.	2
L11	Applications of triple integrals.	2
L12	Line integrals taken with respect to arc length.	2
L13	Applications of line integrals taken with respect to arc length.	2
L14	Line integrals taken with respect to coordinates.	2
L15	Surface integrals.	2
TOTAL		**30**
Training format: Practical (P)		
3rd semester		
P1	Multivariable functions.	2
P2	The limit of a multivariable function.	2
P3	Continuous multivariable functions. Uniform continuity of a continuous multivariable function.	2
P4	Differentiation of multivariable functions. Applications of the differential of a multivariable function to approximate calculations.	2
P5	Higher-order derivatives and differentials of a multivariable function.	2
P6	Differentiation of implicit functions.	2
P7	Extrema of a multivariable function.	2
P8	Double integrals.	2
P9	Applications of double integrals.	2
P10	Triple integrals.	2
P11	Applications of triple integrals.	2
P12	Line integrals taken with respect to arc length.	2

				presentation of materials;
F	**Below 3,0**	Below 59	not satisfactory	did not master the materials; cannot answer questions; does not participate in training

Basic and additional educational literature and information sources

Basic literature	
1.	G'oziyev A. Mathematical Analysis. Parts 1, 2. Samarkand- 2020
2.	Azlarov T., Mansurov H. Mathematical Analysis, Volumes 1, 2, Tashkent, "Uzbekistan", 1994, 1995.
3.	Khudoyberganov G., Vorisov A.K., Mansurov Kh.T., Shoimkulov B.A. Mathematical Analysis, Volumes 1, 2, Tashkent, "Uzbekistan", 2010.
Additional literature	
1.	Collection of examples and problems from the course by A. Sadullaev "Mathematical Analysis". Part 2-3. Tashkent "Uzbekistan" 1995 (2000).
2.	Demidovich B. Collection of problems and exercises in mathematical analysis, Moscow, "Nauka", 1990.
Internet sites	
1.	http://www.edu.uz– Ministry of Higher Education, Science, and Innovations of the Republic of Uzbekistan.
2.	http://www.gov.uz– Uzbekistan Republic Government Portal.
3.	www.ziyonet.uz – Information Education Network of the Republic of Uzbekistan
4.	www.cspi.uz - CSPU website
5.	www.natlib.uz - (A. Navoi National Library of Uzbekistan)

This Syllabus was approved by the "Algebra and mathematical analysis" department in the meeting No. __ dated ___- _____ 2024.

This Syllabus was approved by the "Mathematics and informatics" faculty in the meeting No. __ dated ___- _____ 2024.

This Syllabus was approved by the Council of Chirchik State Pedagogical University in the meeting No. __ dated ___- _____ 2024.

ΣMI= ΣCC+ ΣIC + FCA The module (subject) is considered mastered when a score higher than ΣMI≥ 60 score.				
Criteria for assessing the educational results of students:				
Level	**5 score system (point)**	**Appropriation in percent**	**In traditional**	**Assessment criteria**
For the education department		**For professors and teachers**		
A+	**4,51 – 5**	91 - 100	Excellent	The student quickly learns the material independently: he does not make mistakes; actively participates in training; answers questions completely and clearly.
A	**4,26 – 4,5**	86 – 90		the student learns the materials independently: does not make mistakes; answers questions completely and clearly.
B+	**4,01–4,25**	81 – 85	Good	the student has mastered the material well, can express it logically; actively participates in training; answers questions completely and accurately, but makes minor mistakes.
B	**3,51 – 4,0**	71 – 80		the student has mastered the material well, answers the questions fully and accurately, but makes minor mistakes.
C+	**3,26 – 3,5**	66 – 70	Satisfactory	knows basic material but struggles to express clearly; answers to questions lack accuracy and completeness; makes some mistakes in the presentation of materials; feels difficulty in the process of communication.
C	**3,0 – 3,25**	60 – 65		knows basic material but struggles to express clearly; answers to questions lack accuracy and completeness; makes some mistakes in the

P13	Applications of line integrals taken with respect to arc length.	2
P14	Line integrals taken with respect to coordinates.	2
P15	Surface integrals.	2
	TOTAL	**30**
Form of education: Lecture (L)		
4th semester		
L1	Understanding of differential equations. Problems leading to differential equations.	**2**
L2	Equations reducible to separable and separated variable differential equations.	**2**
L3	Homogeneous and reducible differential equations.	**2**
L4	Linear differential equations. Bernoulli and Riccati equations.	**2**
L5	Exact differential equations. Integrating factor.	**2**
L6	First-order equations not solved with respect to the derivative.	**2**
L7	Integration of equations by introducing a parameter. Lagrange and Clairaut equations.	**2**
L8	Existence and uniqueness of the solution to the Cauchy problem for a first-order ordinary differential equation not solved with respect to the derivative. Particular solution.	**2**
	Midterm Exam	
L9	Existence and uniqueness theorem for n-th order ordinary differential equations. Differential equations with decreasing order. Nonlinear integrable equations.	**2**
L10	n-th order linear differential equations. Wronskian determinant. Ostrogradsky-Liouville formula.	**2**
L11	n-th order non-homogeneous linear differential equations. J. Lagrange method. n-th order linear homogeneous differential equations with constant coefficients and their properties.	**2**
L12	Equations reducible to linear equations with constant coefficients.	**2**
L13	Associated equations. Euler's equation.	**2**
L14	System of differential equations. Normal system of differential equations. General concepts. Methods for solving systems of linear differential equations with constant coefficients.	**2**
L15	Fundamentals of stability theory.	**2**
	TOTAL	**30**
Training format: Practical (P)		
4th semester		
P1	Understanding of differential equations. Problems leading to differential equations.	2
P2	Equations reducible to separable and separated variable differential equations.	2
P3	Homogeneous and reducible differential equations.	2

P4	Linear differential equations. Bernoulli and Riccati equations.	2
P5	Exact differential equations. Integrating factor.	2
P6	First-order equations not solved with respect to the derivative.	2
P7	Integration of equations by introducing a parameter. Lagrange and Clairaut equations.	2
P8	Existence and uniqueness of the solution to the Cauchy problem for a first-order ordinary differential equation not solved with respect to the derivative. Particular solution.	2
P9	Existence and uniqueness theorem for n-th order ordinary differential equations. Differential equations with decreasing order. Nonlinear integrable equations.	2
P10	n-th order linear differential equations. Wronskian determinant. Ostrogradsky-Liouville formula.	2
P11	n-th order non-homogeneous linear differential equations. J. Lagrange method. n-th order linear homogeneous differential equations with constant coefficients and their properties.	2
P12	Equations reducible to linear equations with constant coefficients.	2
P13	Associated equations. Euler's equation.	2
P14	System of differential equations. Normal system of differential equations. General concepts. Methods for solving systems of linear differential equations with constant coefficients.	2
P15	Fundamentals of stability theory.	2
TOTAL		**30**

Independent Learning (IL)		
3rd semester		
IL1	Teylor and Maclaurin series.	4
IL2	Expansion of elementary functions into power series.	4
IL3	The mean value of a function.	4
IL4	Theorems and applications regarding the mean value.	4
IL5	Improper integrals of the first kind and their convergence.	4
IL6	Convergence of improper integrals with infinite limits.	4
IL7	Convergence of improper integrals of arbitrary functions.	4
IL8	Cauchy's criterion for integrals.	4
IL9	Dirichlet's test. Abel's test.	4
IL10	Concepts of improper integrals of the second kind.	4
IL11	Concepts of improper integrals of the second kind.	4
IL12	Improper integrals of the second kind and their convergence.	4
IL13	Absolute and conditional convergence of improper integrals.	4
IL14	Convergence criteria for improper integrals.	4
IL15	R^n space and its important sets. Sequences in R^n space and their limits.	4
	TOTAL:	**60**

	4th Semester	
IL1	Multivariable function and its limit.	4
IL2	Continuity of a multivariable function.	4
IL3	Continuity of a multivariable function.	4
IL4	Properties of continuous functions.	4
IL5	Properties of continuous functions.	4
IL6	Uniform continuity of a multivariable function.	4
IL7	Uniform continuity of a multivariable function.	4
IL8	Cantor's theorem.	4
IL9	Cantor's theorem.	4
IL10	Derivative of a multivariable function.	4
IL11	Derivative of a multivariable function.	4
IL12	Differential of a multivariable function.	4
IL13	Differential of a multivariable function.	4
IL14	Directional derivative.	4
IL15	Directional derivative.	4
TOTAL		**60**

VIII. Requirements for obtaining a credit::

Full mastery of theoretical and practical concepts of science, ability to correctly reflect the results of analysis, independent observation of the studied processes, creation and current, intermediate control forms of tasks and assignments given in writing or orally execution, passing tests on final control.

IX. Criteria for evaluation and control of student knowledge in science

The educational results of students are evaluated in a 100-point rating system. The conversion of points for the educational results by students is carried out on the basis of the ECTS (European Credit Transfer System) system.

Points for evaluation of educational results are determined in the following order:

Auditorium lessons for the completion of assigned tasks - current assessment (CA); Assessment of self-study on completing independent learning tasks (ASS);	For answers during the intermediate control - intermediate control assessment (ICA);	For answers during the final control - final control assessment (FCA)
The maximum score of the current control 15+15=***30 score:*** ΣCC = CA + ASS	***The maximum score of the intermediate control 20 score:*** ΣIC = ICA + ASS	***The maximum score of the final control(FCA) 50 score.***

A student is allowed to pass the final exam when he has a score higher than ΣCC + ΣIC > 30

Mastery indicator from the module (subject). (MI):