MINISTRY OF SCIENCE, HIGHER EDUCATION AND INNOVATIONS OF THE KYRGYZ REPUBLIC

OSH STATE UNIVERSITY

INSTITUTE OF MATHEMATICS, PHYSICS, ENGINEERING AND INFORMATION TECHNOLOGIES

DEPARTMENT OF TECHNOLOGY OF TEACHING MATHEMATICS, INFORMATICS AND EDUCATIONAL MANAGEMENT

STUDY PROGRAM (Syllabus)

Specialty (Program/Major)	Mathematics, Informatics	Course Code	
Language of Instruction	English	Course Title	Elementary algebra
Academic Year	2025-2026	Number of Credits	4
Instructor / Lecturer	Isaeva Aida Taalaevna	Semester	1
E-Mail	isaeva.aida.taalaevna@gmail.com	Schedule Link	https://myedu.o shsu.kg/
Consultation Hours (Time / Room)	Thursday, Room 233, Time: 13:30–16:30	Location (Building / Room)	OshSU Main Building, Room 231 https://classroom.google.com/c/ODE1Njc2NjY4Nzc4?cjc=k7ssf4tp
Mode of Study (Full-Time / Part-Time / Evening / Distance)	Full-Time	Course Type: (Compulsory / Elective)	Compulsory

Head of the Educational Program: First Department Meeting, August 26, 2025

Mr- Keldibekova A. O., d-r of ped. sc., prof.

(Full Name, Signature, Date)

Osh, 2025

Course Description: the course **"Elementary Algebra"** is dedicated to studying the fundamental concepts and methods of algebra necessary for the further study of mathematics and related sciences. Within the course, students will master the basics of number theory, algebraic expressions, equations, and inequalities.

Course Goal: The objectives of the course are derived from ***Objective 2 of the Educational Program:*** comprehensive and high-quality training of a bachelor in the field of Physics and Mathematics Education, majoring in Mathematics and Computer Science, capable of effectively applying modern educational technologies in professional activities.

1. To study the fundamental concepts of number theory, algebraic expressions, equations, inequalities, matrices, and functions, forming the basis for further study of mathematical disciplines.

2. To develop skills in transforming algebraic expressions, solving equations, inequalities, and systems using various methods, and performing operations with matrices and complex numbers.

Co-requisites: network mathematics

Post-requisites: elementary geometry

Course Learning Outcomes (CLO) Table

By the end of the course, the student:		
Program Learning Outcome (PLO)	**Course Learning Outcome (CLO) - Concise**	**Competencies**
PLO-9: Possesses fundamental knowledge in the field of mathematics and computer science, knows the history of mathematics and computer science, and is able to solve professional problems.	**Knows:** the properties of number sets, algebraic expressions, methods for solving equations and inequalities, and the fundamentals of matrix algebra and complex numbers. **Can:** factor polynomials, solve rational equations and inequalities, solve systems of linear equations using matrix methods, and perform operations with complex numbers. **Masters:** techniques for transforming algebraic and logarithmic expressions, solving equations and inequalities using the interval method, and applying Cramer's rule.	**PC-6.** Possesses a deep understanding of fundamental mathematical theories and their interrelations, is capable of abstract and logical thinking, and is able to independently select and adapt didactic materials for the educational process based on pedagogical analysis. **PC-12.** Capable of developing and using mathematical models to solve problems in various fields related to artificial intelligence and neural networks. **PC-17.** Capable of analyzing and critically evaluating mathematical reasoning and proofs, and is also able to clearly and effectively present mathematical ideas and results, including the ability to work with interdisciplinary groups.

Course Credit Distribution

Course (Credits)	Ауд.	Independent Study / Self-Study	Module 1 (25 pts.)				Module 2 (25 pts.)				Exam (50pts.)
			tcp.		(s) Independent Study / Self-Study	(r) AT	tcp.		(s) Independent Study / Self-Study	(r) AT	(E) W-H
			Lec.	Prac.			Lec.	Prac.			
Elementary algebra (4 Cr.)	48	72	10	14	6/30		10	14	6/30		
Score Calculation Map				4	8	13		4	8	13	
Module and Exam Grades Results			(M1=tcp.+r+s) до 25				(M2=tcp.+r+s) до 25				50
			Rдоп. = M1 + M2 (30-50)								
Final Grade			I = Rдоп. + E								100

Course Calendar and Thematic Plan for Lectures and Practical Classes

№	Topic Title	Number of Hours		Points	Week	References
		Lec.	Prac.			
	Module 1					
1.	**№1 Lecture.** Sets and Operations on Them. Numerical sets. **№1 Practical Class.** Construction and Analysis of Number Sets. Operations.	2	2	1	Week 1 / Week 1	ER [1,2,4] DT [1,5]
2.	**№2. Lecture.** Algebraic Expressions. Factoring polynomials. **№2. Practical Class.** Factoring Polynomials using Special Product Formulas (or Factoring using Formulae for Shortened Multiplication).	2	2	0,5	Week 2 / Week 2	ER [1,4,5] DT [1,2,4]
3.	**№3. Lecture.** Fractions (Rational Expressions). The fundamental property of fractions. Operations with fractions. **№3. Practical Class.** Simplification of Complex Rational Expressions.	2	2	0,5	Week 3 / Week 3	ER [1,4,6] DT [1,4,6]
4.	**№4. Lecture.** Equations and Systems of Equations. The concept of an equation. The root of an equation. **№4. Practical Class.** Solving Quadratic and Rational Fractional Equations. **№5. Practical Class.** Solving Simple Non-linear Systems and Systems by Substitution.	2	4	1	Week 4 / Weeks 4, 5	ER [1,2,3] DT [5,6]
5.	**№5. Lecture.** Inequalities. The concept of an inequality. Solving inequalities. **№6. Practical Class.** Quadratic Inequalities and Systems of Inequalities. **№7. Practical Class.** Rational Inequalities. The Interval Method.	2	4	1	Week 5 / Weeks 6, 7	ER [1,2,3] DT [1,5,6]
	All	**10**	**14**	**-/4**		
	2-модуль					
6.	**№6. Lecture.** Matrices. Operations on matrices. Inverse matrix. **№8. Practical Class.** Operations on Matrices and Finding the Inverse Matrix. **№9. Practical Class.** Solving Systems of Equations using Cramer's Rule and the Gaussian Elimination Method.	2	4	1	Week 6 / Weeks 8, 10	ER [1,3] DT [5,6]

7.	**№7. Lecture.** Matrix Method for Solving Systems of Equations. **№10. Practical Class.** Plotting and Analyzing Graphs of Quadratic Functions. **№11. Practical Class.** Properties of Logarithms and Transformation of Logarithmic Expressions.	2	4	1	Week 8 / Weeks 11, 12	ER [1,2,3] DT [5,6]
8.	**№8. Lecture.** Functions. Properties of Functions. The concept of a function. Domain and range of a function. **№12. Practical Class.** Solving Simple Exponential and Logarithmic Equations.	2	2	1	Week 11 / Weeks 13	ER [1,2,6] DT [1,5,6]
9.	**№9. Lecture.** Exponential Function. Logarithmic Function. **№13. Practical Class.** Arithmetic Operations with Complex Numbers in Algebraic Form.	2	2	0,5	Week 13 / Weeks 14	ER [1,3] DT [5,6]
10.	**№10. Lecture.** Complex Numbers. Imaginary unit. Real and imaginary parts of a complex number. **№14. Practical Class.** Mixed Problems. Equations and Inequalities with Parameters (Introductory).	2	2	0,5	Week 15 / Weeks 15	ER [4,5,6] DT [3,6]
	All	**10**	**14**	**-/4**		

Plan for Organizing Independent Study with Instructor Guidance (9 hours)

№	Topic	Assignment for Independent Study	Hours	Assessment Tools	Points (Lec./Prac.)	References	Deadline
1.	Sets and Operations on Them.	Create a **Venn diagram** for two arbitrary sets A and B. Solve problems on finding the **union, intersection, and difference of sets**.	2	Discussion (Q&A format)		ER [1,2,4] DT [1,5]	20.10-25.10
2.	Algebraic Expressions and Fractions.	**Factor** polynomials of various degrees using different methods (grouping, shortened multiplication formulas).	2	Discussion (Q&A format)	2	ER [1,4,5] DT[1,2,4.6]	20.10-25.10
3.	Equations and Systems of Equations.	Solve a **system of linear equations** with two unknowns using the **graphical** and **algebraic** methods. Compare the results.	2	Check the correctness of the solution by both methods and the accuracy of graph construction.	2	ER [1,3,4] DT [1,5,6]	20.10-25.10
	Final Submission Deadline					**27.10 - 01.11**	
	Module 2: Independent Study1	**Average Accumulated Score**			**-/2**		
4.	Comparative Analysis of Methods for Solving Systems of Linear Equations	Review the advantages and disadvantages of each method, comparing their efficiency on various types of equation systems (in terms of computational complexity, accuracy, and stability).	2	Prepare a Presentation		ER [1,2,3] DT [5,6]	15.12-20.12

5.	Matrices in Computer Graphics and Computer Vision.	Demonstrate how matrices are used to describe various geometric transformations (**rotation, scaling, translation**) in 2D and 3D space.	2	Discussion (Q&A format)	2	ER [1,2] DT [6]	15.12-20.12
6.	Functions. Properties of Functions.	**Construct the graph** of the function y=kx+b for various values of k and b. Analyze how the graph changes when the parameters are modified.	1	Write a Summary (or Abstract)	2	ER [1,2,6] DT [1,5,6]	15.12-20.12
	Final Submission Deadline					**22.12 - 27.12**	
	Module 2: Independent Study2			**Average Accumulated Score**	**-/8**		

Plan for Organizing Student Self-Study (60 hours)

№	Topic	Assignment for Self-Study	Hours	Assessment Tools	Points (Lec./Prac.)	References	Deadline
1.	Sets and Operations on Them in Probability Theory Problems.	Presentation, writing a summary (or abstract).	6	Differentiated Assessment Test		ER [1,4] DT [1,6]	20.10-25.10
2.	Factoring Polynomials: Practical Application.	Presentation, writing a summary (or abstract).	6	Differentiated Assessment Test		ER [1,4,5] DT [2,4]	20.10-25.10
3.	Fractions: History of Origin and Application in Various Fields of Knowledge.	Presentation, writing a summary (or abstract).	6	Mobile Applications for Learning: opportunities and limitations.		ER [1,6] DT [2,6]	20.10-25.10
4.	Equations and Inequalities with Parameters: Geometric Interpretation.	Presentation, writing a summary (or abstract).	6	Differentiated Assessment Test	1	ER [1,2,4] DT [3,6]	20.10-25.10
5.	Functions: Graph Construction using various transformations.	Presentation, writing a summary (or abstract).	6	Differentiated Assessment Test	2	ER [1,2,6] DT [1,5,6]	20.10-25.10
	Final Submission Deadline					**27.10 - 01.11**	
	Module 1: Student Self- Study1			**Average Accumulated Score**	**-/4**		
6.	Matrices and Their Applications in Various Fields of Science and Technology.	Presentation, writing a summary (or abstract).	6	Differentiated Assessment Test		ER [1,2,] DT [5,6]	15.12-20.12
7.	Inverse Matrix: Concept, Properties, and Application.	Presentation, writing a summary (or abstract).	6	Differentiated Assessment Test		ER [1,2,3] DT [5,6]	15.12-20.12
8.	Numerical Methods for Solving Systems of Linear Equations	Presentation, writing a summary (or abstract).	6	Mobile Applications for Learning:	1	ER [3] DT [6]	15.12-20.12

	of Large Dimensions.			opportunities and limitations.			
9.	Exponential and Logarithmic Functions: Connection and Application in Economic Growth Problems.	Presentation, writing a summary (or abstract).	6	Differentiated Assessment Test	1	ER [1,6] DT[1,5,6]	15.12-20.12
10.	Complex Numbers: Geometric Interpretation and Application in Electrical Engineering.	Presentation, writing a summary (or abstract).	6	Differentiated Assessment Test		ER [1,2] DT [5,6]	15.12-20.12
	Final Submission Deadline					**22.12 - 27.12**	
	Module 2: Student Self-Study2		**Average Accumulated Score**		**-/4**		

Course Policy

- Core Requirements for Successful Completion of the Course:
- Attendance and Participation: Students must attend classes and actively participate in group work during both Independent Study with Instructor Guidance (СРСП) and Student Self-Study (СРС), as well as during practical classes.
- Lectures: Students are required to take notes on the lecture content, listen attentively, and maintain classroom discipline.
- Practical Classes: It is important not only to present one's own work but also to listen carefully to classmates, evaluate their responses, and record new information.
- Punctuality: Do not be late; enter the classroom before the bell (or scheduled start time).
- Technology Use: Mobile phones must be switched off (or silenced).
- Respectful Communication: Do not interrupt the instructor or classmates during discussions or lectures.
- AI Usage: If Artificial Intelligence tools are used, proper citations and analysis of the material must be provided.
- Academic Integrity: All submitted assignments must be original and completed independently.

Educational Resources	
Electronic Resources	1. https://ru.khanacademy.org/math 2. https://www.geogebra.org/math/algebra 3. https://tutorial.math.lamar.edu/ 4. https://www.yaklass.ru/p/algebra?YklShowAll=1 5. https://epmat.ru/ 6. https://foxford.ru/wiki/matematika
Digital Textbooks	1. https://kstu.kg/fileadmin/user_upload/algebra_10-11_kl_ja_alimov_.pdf ***Алимов Ш.А. (10-11 кл.)*** 2. https://old.mccme.ru/free-books/shen/gelfand-shen-algebra.pdf 3. https://books.google.kg/books?id=Z9z7iliyFD0C&printsec=frontcover&hl=ru#v=onepage&q&f=false ***Гельфанд, Шен "Алгебра"*** 4. https://ru.scribd.com/document/523690678/%D0%A1%D0%BA%D0%B0%D0%BD%D0%B0%D0%B2%D0%B8 ***"Сборник задач по алгебре" - М.И. Сканави (ред.)*** 5. https://nastmath.ru/textbooks/7_9 ***Макарычев Ю.Н. (7-9 кл.)*** 6. https://go.11klasov.net/6849-algebra-i-nachala-matematicheskogo-analiza-10-11-klassy-v-2-chastjah-chast-1-uchebnik-bazovyj-uroven-mordkovich-ag.html ***Мордкович А.Г. (10-11 кл.)*** 7. https://www.at.alleng.org/d/math/math864.htm***Цыпкин "Справочник"***
Resources Used	Laptop, Interactive Whiteboard, Presentations, Digital Textbooks (or E-books)