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

OSH STATE UNIVERSITY

INSTITUTE OF MATHEMATICS, PHYSICS, ENGINEERING AND INFORMATION TECHNOLOGY

DEPARTMENT OF TECHNOLOGY OF TEACHING MATHEMATICS, INFORMATICS AND EDUCATIONAL MANAGEMENT

COURSE SYLLABUS (Syllabus)

Field of Study (Major)	Mathematics, Informatics	Course Code	
Language of Instruction	English	Course Title	Informatics
Academic Year	2025-2026	Credits	4
Instructor	Isaeva Aida Taalaevna	Semester	2
Email	isaeva.aida.taalaevna@gmail.com	Schedule Link	https://myedu.oshsu.kg/
Office Hours / Location	Friday, Room 233, 13:30-16:30	Classroom Location	OshSU Main Building, Room 232 https://classroom.google.com/c/ODQxMTQ1NzA2NTkx?hl=ru&cjc=7jl2krj4
Study Format	Full-time	Course Type	Required

approved at the meeting of the Department of TOMIiOM, protocol No. 6, 01/24/202

Head of the educational program

_____ Keldibekova A. O., Dr. ped. sciences, professor

signature

Ош, 2026

Course Description: the discipline ***"Informatics"*** forms a fundamental basis for future teachers of mathematics and computer science. The course focuses on the theoretical foundations of computer science as a discipline, computer system architecture, mathematical principles of encoding and logic, as well as the fundamentals of algorithm design and basic programming.

Course Objective: the course learning objectives follow from goal ***2 of the Educational Program***: comprehensive and high-quality training of a Bachelor in the field of Physical and Mathematical Education, specialization Mathematics and Computer Science, capable of effectively applying modern educational technologies in professional activities.

1. To master the fundamental principles of computer science (information, coding, logic, computer architecture, algorithms, networks) to form a methodological basis for teaching the school course.

2. Master basic skills in Python programming, working with HTML/CSS, analyzing state educational standards, and creating digital educational resources.

Prerequisites: Information and Communication Technologies in On-Campus and Distance Learning.

Co-requisites: Computer Modeling, Safe Educational Environment and Information Security.

Post-requisites: Programming Languages in School Computer Science Curricula, Solving Subject-Specific Problems in Computer Science.

Course Learning Outcomes (CLO) Table

By the end of the course the student:		
Learning Outcome (LO)	**Course Learning Outcome (CLO) - Concise**	**Competencies**
LO-9: Possesses fundamental knowledge in the field of Mathematics and Computer Science, knows the history of the development of Mathematics and Computer Science, and is capable of solving professional tasks.	**Knows:** number systems, logic algebra, computer architecture, data structures, basic algorithms, network fundamentals. **Can:** encode information, solve logical problems, program in Python (branching, loops, lists), create web pages. **Proficient in:** Python at a basic level of structured programming	**PC-6.** Possesses a deep understanding of fundamental mathematical theories and their interrelations, capable of abstract and logical thinking, able to independently select and adapt didactic materials for the educational process based on pedagogical analysis. **PC-7.** Possesses fundamental knowledge in the field of Computer Science and Discrete Mathematics. Capable of applying this knowledge in combination with information technologies to solve complex professional and educational tasks. **PC-12.** Capable of developing and using mathematical models to solve problems in various fields related to artificial intelligence and neural networks.

Course Assessment Structure

Discipline (Credits)	Contact Hrs	Guided/Self	Module 1 (25 points)				Module 2 (25 points)				Exam (50 pts)
			tcp.		(s)Guided/ Self	(r) AT	tcp.		(s)Guided/ Self	(r) AT	(E) FE
			Lec.	Pract.			Lec.	Pract.			
Informatics (4)	48	72 (12/60)	10	14	6/30		10	14	6/30		
Points Breakdown					4	8	13		4	8	
Module & Exam Scores			(M1 = t*c* + r + s) up to 25				(M2 = t*c* + r + s) up to 25				50
			R*interim* = M1 + M2 (30-50 points)								
Final Grade			Final Grade								100

Weekly Schedule of Lectures and Practical Sessions

№	Week	Topics Hours Lec.	Pract.	Points	Week	Literature
	Module 1					
1.	**L1.** Computer Science as a Fundamental Discipline. **P1.** Analysis of the State Standard for School Computer Science.	2	2	0.5	Week 1/ Week 1	ER [1,5,6] ET [3]
2.	**L2.** Mathematical Foundations of CS I: Number Systems and Encoding. **P2.** Number Systems. Information Encoding.	2	2	0.5	Week 2/ Week 2	ER [4] ET [3]
3.	**L3.** Mathematical Foundations of CS II: Boolean Algebra. **P3.** Solving Logic Problems. Boolean Algebra.	2	2	1	Week 3/ Week 3	ET [3]; ER [1,4, 6]
4.	**L4.** Computer Architecture. Von Neumann Principles. **P4.** Computer Arithmetic.	2	2	1	Week 4/ Week 4	ET [3] ER [4]
5.	**L5.** Software Classification and Levels. **P5.** Analysis of PC Configuration.	2	2	1	Week 5/ Week 5	ET [3, 4] ET [3]
	Total	**10**	**10**	**–/4**		
	Module 2					
6.	**L6.** Fundamentals of Computer Networks and Network Technologies. **P6.** Command Line Basics and Network Utilities. **P7.** Working in a Visual Algorithm Design Environment.	2	4	0.5	Week 6/ Weeks 6, 7	ET [3]
7.	**L7.** The Concept of an Algorithm. Properties and Representation Methods. **P8.** HTML and CSS Basics. Creating a Web Page.	2	2	0.5	Week 8/ Week 8	ET [3] ER [1, 6]
8.	**L8.** Introduction to Structured Programming. Python I. **P9.** First Programs in Python. Variables, Input/Output. **P10.** Programming Conditional Statements.	2	4	1	Week 10/ Weeks 10, 11	ER [2, 3] ET [5, 6];
9.	**L9.** Control Structures in Programming. **P11.** Programming Loops. **P12.** Working with One-Dimensional Lists in Python.	2	4	1	Week 12/ Weeks 12, 13	ET [5, 6]; ER [2, 3]
10.	**L10.** Data Structures: Arrays (Lists). Introduction to Algorithm Complexity. **P13.** Final Practical. Complex Problem. **P14.** Creating an Interactive Learning Element.	2	6	1	Week 14/Weeks 14, 15	ET [5, 6]; ER [2,3, 6]
	Total	**10**	**18**	**–/4**		

Plan for Guided Independent Work (GIW) – 12 hours

№	Topic	GIW Assignment	Hrs	Assessment	Pts	Lit.	Deadline
1	Information Theory Fundamentals (Probabilistic Approach).	Study concepts of entropy, Shannon information measure. Prepare notes and solve 3-5 calculation problems.	2	Review of notes and solved problems.	1	ET [3]	23.03-28.03

2	Comparative Analysis of Programming Environments for School Teaching.	Create a comparative table of two environments (e.g., Scratch vs. Python) based on criteria: target age, educational potential, ease of use for teachers. Prepare brief conclusions.	2	Defense of analysis, review of table.	2	ER [2,3,5,6] / ET[5,6]	23.03-28.03
3	Digital Mini-Project "Calculation Automation".	Write a Python program for a typical task (e.g., solving a quadratic equation). Provide code with comments and examples of output.	2	Review of program functionality and code.	1	ER [2,3] / ET[5,6]	23.03-28.03
	Deadline for submission					**30.03 - 04.04**	
	Module 1 (giw1)	**Total Average Score**			**-/4**		
4	Philosophical and Social Aspects of CS. AI.	Write an essay (1.5-2 pages) on "Challenges of Digital Ethics and Artificial Intelligence in the Work of a Modern Teacher".	2	Essay evaluation based on depth and argumentation.	1	ET [4] / ER [1,6]	18.05-23.05
5	Designing a "Performance" Database Prototype.	Design a DB schema (Tables: Students, Subjects, Grades) and describe relationships. Present as a diagram (on paper/graphical editor).	2	Project defense, review of schema.	2	ET [3]	18.05-23.05
6	Creating a Teacher's Web Portfolio Page.	Using HTML and CSS, create a simple static web page with sections: "About Me", "My Educational Projects", "Contacts".	2	Demonstration of the functional page.	2	ER [3]	18.05-23.05
	Deadline for submission					**25.05 - 30.05**	
	Module 2 (giw2)	**Total Average Score**			**-/4**		

Plan for Independent Study (IS) – 60 hours

№	Topic	Assignment for IS	Hours	Assessment	Pts	Lit	Deadline
1	History of Computing: From Abacus to Quantum Computers.	Prepare a presentation (10-15 slides) or essay (3-5 pages) covering key stages and their impact on society and education.	5	Evaluation of presentation/essay based on depth of analysis and clarity of presentation.	0.5	ET [3]	09.02 – 14.02
2	Role and Place of Computer Science in the School Curriculum: Comparative Analysis of Curricula.	Conduct a comparative analysis of curricula (State Standards) for Computer Science and other subjects (Mathematics, Physics). Prepare an essay (4-6 pages) with conclusions on interdisciplinary connections.	5	Review of essay, assessment of analysis quality and argumentation.	0.5	ET[1,2,4] ER[1,5,6]	16.02 – 21.02

3	Modern Issues in Information Encoding: Emoji, New Alphabets, Universality of Unicode.	Research one of the problems. Prepare a presentation (10-12 slides) with examples and explanation of technical or cultural aspects.	5	Evaluation of presentation, checking understanding of encoding principles beyond the basics.	0.5	ET [3]; ER [1]	23.02 – 28.02
4	Logic Problems as a Tool for Developing Algorithmic Thinking in Schoolchildren.	Select and systematize 5-7 logic problems of different types. Prepare an essay (2-4 pages) analyzing their pedagogical value and solution methods.	5	Evaluation of task selection and pedagogical justification in the essay.	0.5	ER [4, 6]; ET[1,2,3]	02.03 – 07.03
5	Comparative Analysis of Operating Systems for a Computer Lab: Windows, Linux, Chrome OS.	Prepare an analytical presentation (12-15 slides) or a detailed essay (4-6 pages) based on criteria: cost, security, ease of administration, software availability.	5	Evaluation of presentation/essay based on completeness of comparison and substantiation of conclusions.	1	ET [3, 4]; ER [1, 6]	09.03 – 14.03
6	Ethical and Legal Aspects of Software Use in Schools.	Research issues of licensing (FOSS, freeware), copyright for digital resources. Prepare an essay (3-5 pages) with recommendations for teachers.	5	Review of essay for knowledge of legal norms and ability to formulate recommendations.	1	ET [4]; ER [1, 6]	16.03 – 21.03
	Deadline for submission					23.03 - 28.03	
	Module 1 (giw1)	**Total Average Score**			**-/4**		
7	Safety in Computer Networks: Threats to School Networks and Protection Methods (User Level).	Prepare a presentation (10-15 slides) for a hypothetical session with schoolchildren: describe main threats (phishing, viruses) and simple digital hygiene rules.	5	Evaluation of presentation in terms of clarity, usefulness, and adaptation to the audience.	0.5	ET [3, 4]	06.04 – 11.04
8	Visual and Text-Based Programming Languages for Early Education: Scratch vs. Python.	Conduct a comparative analysis of the environments. Prepare an essay (4-6 pages) with arguments in favor of each for different age groups (grades 5-7, 8-9).	5	Evaluation of essay based on depth of comparative analysis and pedagogical argumentation.	0.5	ER[2,5,6] ET [5, 6]	13.04 – 18.04
9	Software Lifecycle: From Idea to Execution. Role of Algorithm and Debugging Stages.	Using the example of one simple program (e.g., from the practical), describe all stages of its creation. Prepare a detailed presentation (12-15 slides) or essay (3-5 pages).	5	Evaluation of completeness in covering the topic and clarity in explaining the stages.	0.5	ER [2, 3]; ET[3,5,6]	20.04 – 25.04

10	Classification and Examples of Basic Algorithms: Search, Sort, Traversal.	Create a visual presentation (10-12 slides) or a structured summary/essay (3-4 pages) with examples of algorithms from everyday life and school computer science.	5	Evaluation of ability to classify and explain algorithms using accessible examples.	0.5	ET [3]; ER [4]	27.04 – 02.05
11	Role and Place of Programming in the School Computer Science Curriculum: Discussions and Modern Approaches.	Based on analysis of State Standards and textbooks, prepare an essay (4-6 pages) reflecting different approaches to programming's place in the course (from a separate module to a cross-cutting theme).	5	Evaluation of essay based on depth of analysis of educational materials and argumentation of the position.	1	ET[1,2,4] ER [5, 6]	04.05 – 09.05
12	A Simple Website as a Modern Teacher's Digital Portfolio: Structure and Content.	Design the structure and write textual content for a personal portfolio page. Prepare a mock-up (as a diagram) and an explanatory note (2-3 pages).	5	Evaluation of thoughtfulness of structure and quality of textual content for professional presentation.	1	ER [3]; ET [4]	11.05 – 16.05
	Deadline for submission					18.05 - 23.05	
	Module 2 (giw2)	**Total Average Score**			**-/4**		

Course Policies

Core Requirements for Course Completion:

- attendance at all scheduled classes (lectures, practicals) and GIW consultations is mandatory. Active participation in discussions, in-class task completion, and teamwork are integral parts of the learning process.
- during lectures, students must listen attentively, take notes of key concepts, and avoid conversations or actions disrupting the class.
- in practical sessions, students must not only complete and present their work but also respect peers' work: listen carefully to presentations, participate constructively in discussions, and take notes.
- punctuality is required. Tardiness and early departure without valid reason are unacceptable and may affect the current grade.
- during all classes, mobile phones and personal electronic devices must be set to silent mode and kept off the desk unless used for a learning task.
- all independent work (IS, GIW) must be submitted by the set deadlines. Late submissions without documented valid reason will be penalized or not accepted.
- all written work and code must be the result of the student's own intellectual effort. Any form of plagiarism, copying, or data fabrication is strictly prohibited.
- use of Artificial Intelligence (AI) systems for text or code generation is permitted only as an auxiliary tool for analysis, brainstorming, or structuring information. Any AI use must be explicitly stated in the work with an explanation of its purpose and application. Presenting text or code fully generated by AI without critical reflection and processing by the student is considered academic dishonesty.
- students must observe norms of politeness and respect during classes and in online communication (course chats, email): do not interrupt speakers, formulate questions and remarks appropriately, use respectful forms of address.
- students are personally responsible for mastering the course material, including self-study of missed topics, timely clarification of questions during consultations, and regular monitoring of their progress in the

university's information system**.**

Educational Resources	
lectronic Resources (ER)	*1.* *https://inf.1sept.ru/* *2.* *https://www.geeksforgeeks.org/python/python-programming-language-tutorial/* *3.* *https://www.w3schools.com/python/default.asp* *4.* *https://stepik.org/course/123677/promo* *5.* *https://www.yaklass.ru/* *6.* *https://infourok.ru/*
Electronic Textbooks (ET)	*1.* Informatics. 5-6 grade. A.A. Belyaev, I.N. Tsybulya, N.N. Osipova, U.E. Mambetakunov, L.A. Samykbaeva. *2.* Informatics: 7-9 grade. I.N. Tsybulya, L.A. Samykbaeva, A.A. Belyaev, N.N. Osipova, U.E. Mambetakunov.] *3.* *"Informatics. Basic Course"* Ed. by S.V. Simonovich. *4.* *"Digital Transformation of Education: Challenges and Solutions"* Collection of articles ed. by A.Y. Uvarov. *5.* *"Python for Everybody. Fundamentals of Programming"* Charles R. Severance. *6.* *"A Byte of Python"* – Clearly, simply, and structurally explains all basic Python elements.
Classroom Resources	Laptop, interactive whiteboard, presentations, e-books.