

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous
educational institution of higher education
NORTH CAUCASIAN FEDERAL UNIVERSITY

I APPROVE

Dean Faculty of Mathematics and
Computer Science named after Professor
N. I. Chervyakov , Candidate of Physical
and Mathematical Sciences, Associate
Professor

_____ T.A. Grobova

**PROGRAM
STATE EXAM**

Direction of training
Directionality (profile)
Graduate qualifications
Form of study
Year of commencement of studies
Implemented in the 4th semester

02.04.01 Mathematics and Computer Science
Training Program for Electronic Information
Master's degree
Full-time
2026

DEVELOPED BY:

Head of the Department of Computational
Mathematics and Cybernetics

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"__" _____ 2026

Stavropol, 2026

1. Goals and objectives of the state examination . The state final examination is an integral part of the state final assessment for students studying in the program 02.04.01 - Mathematics and Computer Science. It is designed to assess the theoretical preparedness of master's degree students in mathematics and computer science to perform the professional tasks established by the educational standard.

2. A list of competencies that a student must master upon completion of the educational program and demonstrate in the state exam

Code competencies	Formulation
<u>UK-(No.)</u>	<u>Universal competencies</u>
UK-1	Able to carry out a critical analysis of problematic situations based on a systems approach and develop an action strategy
UK-4	Able to apply modern communication technologies, including in foreign language(s), for academic and professional interaction
UK-5	Able to analyze and take into account cultural diversity in the process of intercultural interaction
UK-6	Able to identify and implement priorities for one's own activities and ways to improve them based on self-assessment
<u>PC-(No.)</u>	<u>Professional competencies</u>
PC-1	Able to demonstrate fundamental knowledge of mathematics and natural sciences, programming and information technology
PC-2	Able to conduct scientific research based on existing methods in a specific area of professional activity
PC-3	Capable of conducting methodological and expert work in the field of mathematics and computer science
PC-5	Able to present and adapt mathematical knowledge, programming methods and information technology in various ways, taking into account the level of the audience

3. Structure of the state exam

The state exam is interdisciplinary in nature.

The state exam includes questions and tasks on the following disciplines of the curriculum for preparation 02.04.01 Mathematics and Computer Science:

- Information security;
- Ethics and safety of artificial intelligence;
- Application of artificial neural networks and deep learning in steganalysis ;
- Data analysis in cybersecurity .

The state exam is administered using questions compiled in accordance with the exam syllabus. The exam question consists of two theoretical questions that comprehensively reflect the knowledge and skills tested in the disciplines that form the essential competencies in mathematics.

4. Contents of the state exam.

The state examination program for the field of study 02.04.01 Mathematics and Computer Science includes the fundamental topics of the following academic disciplines:

Information security

Introduction to Information Security (IS). Key concepts: threats, vulnerabilities, attacks, risks. Information security principles: confidentiality, integrity, availability. Mathematical security models. Cryptography. Symmetric encryption. Asymmetric encryption. Hash functions. Theory of cryptographic hashes . Digital signatures. Cryptanalysis : linear, differential, side-channel attacks. Mathematical foundations of information security. Number theory in cryptography: prime numbers, discrete logarithm, factorization. Algebraic structures: groups, rings, fields in cryptography. Probabilistic methods in cryptography. Formal security verification methods. Security logic. Verification of cryptographic protocols. Automatic vulnerability analysis. Modern threats and protection. Quantum cryptography and post-quantum algorithms. Blockchain and smart contracts from a security point of view. Machine learning in IS: attacks and protection. Practical aspects. Implementation of cryptographic algorithms . System security analysis. Legal and ethical aspects of information security.

Ethics and Safety of Artificial Intelligence

Introduction to AI Ethics and Security. Key concepts: trusted AI, responsible AI, bias , transparency, accountability. Ethical dilemmas, malicious use of AI, autonomous systems. Mathematical aspects: formal models of decision making, risk assessment. Mathematical foundations of safe AI. Algorithm reliability: resistance to attacks, robustness assessment . Interpretability of models. Formal verification of AI: logical and probabilistic methods for checking the correctness of models. Ethical principles in AI development. Key principles: fairness, privacy, security, control. Mathematical approaches to fairness : equality metrics (demographic parity , equalized odds). Bayesian and game models for ethical dilemmas (e.g., the trolley problem). Security of AI systems. Attacks on AI. AI protection. Cryptography in AI. Regulation and standards in AI. International initiatives (EU AI Act , GOSTs, IEEE recommendations). Mathematical models for compliance checks. Social risk assessment: system dynamics, agent-based Modeling. Current challenges and the future of AI. AI in critical systems. Superintelligent AI. Quantum AI and new security threats.

Application of artificial neural networks and deep learning in steganalysis

Introduction to Steganography and Steganalysis . Key concepts: steganography, steganalysis . Mathematical models of steganographic systems. Classical steganography methods and their vulnerabilities. Fundamentals of deep learning for steganalysis . Neural networks (CNN, RNN, GAN) and their architectures. Mathematical foundations of neural network training : loss functions, optimization. Features of image, audio, and video processing for steganalysis . Application of neural networks in steganalysis. Using convolutional networks to detect hidden data. Application of transfer learning methods. Adversarial attacks on steganographic algorithms. Generative adversarial networks for improving steganalysis . Mathematical methods in steganography and steganalysis . Statistical analysis. Machine learning methods in comparison with neural network approaches. Evaluation of the effectiveness of steganalysis . Current trends and research. Autoencoders for data hiding. Neural network Steganographic systems. Detection-resistant steganography methods. Application of differential privacy. Tools and libraries. Analysis of real data. Ethical and legal issues in the application of steganalysis .

Data analysis in cybersecurity

Introduction to Data Analysis for Cybersecurity . Key concepts: cyber threats , incidents, data in information security. Data types: network traffic, logs , security metrics, scan results. Mathematical foundations: probability theory, statistics, linear algebra. Mathematical methods for processing security data. Data preprocessing: cleaning, normalization, transformation. Dimensionality reduction methods: PCA, t-SNE, UMAP. Statistical analysis methods: correlation analysis, regression models. Time series in cybersecurity : anomaly analysis, forecasting. Machine learning in cybersecurity . Threat classification: SVM, Random Forest , Gradient Boosting . Anomaly detection: isolation forest, one-class SVM, autoencoders . Clustering: k- means , DBSCAN, hierarchical clustering. Model evaluation: ROC analysis, confusion matrix, precision-recall . Deep learning for threat analysis. Neural network approaches: Convolutional Neural Networks (CNN) for network traffic analysis, RNN for time series. Intrusion detection using deep learning. Natural language processing for log and report analysis. Model interpretability in cybersecurity . Network traffic analysis. Network data processing methods: NetFlow , packet analysis. DDoS attack and port scanning detection. Malicious traffic detection. Network activity visualization. Malware analysis. Static analysis methods. Dynamic analysis. Malicious sample classification. Malware attribution. Current challenges and prospects. Big data analysis in cybersecurity . Application of graph models to threat analysis. Quantum methods in security data analysis. Ethical aspects and privacy in data analysis.

5. List of questions to prepare for the state exam

Students who have completed the course of study in the field of training 02.04.01 Mathematics and Computer Science, focus (profile) « Training Program for Electronic Information » as a result of training should know:

Information security

1. Describe the Bell - LaPadula model . What mathematical structures underlie it? How does it ensure confidentiality?
2. Prove the correctness of the RSA algorithm. What number-theoretic statements are used in its justification?
3. How is the group of points of an elliptic curve constructed over a finite field? Why is the discrete logarithm problem on elliptic curves considered difficult?
4. Describe linear and differential cryptanalysis of block ciphers. What mathematical methods are used to evaluate their effectiveness?
5. What properties must a cryptographic hash function satisfy? How is collision resistance mathematically formalized?

6. Analyze the Schnorr authentication protocol. How does it use the discrete logarithm problem?
7. Shor's algorithm for number factorization work? What implications does it have for RSA and ECC?
8. How is game theory used to model the interaction between an attacker and a defender? Provide an example of a formal model.
9. How is an interactive zero-knowledge proof mathematically constructed? Give an example.
10. What mathematical problems are considered resistant to quantum attacks? Describe the operating principles of lattice cryptosystems.

Ethics and Safety of Artificial Intelligence

1. How can fairness principles in machine learning be mathematically formalized? Give an example of a metric.
2. Describe the mathematical model of adversarial attack on a neural network. How can the model's resilience be improved?
3. Provide a rigorous mathematical definition of (ϵ, δ) -differential privacy. How is it applied to training AI models?
4. Explain how Federated works Learning from a mathematical optimization perspective. What security threats can it mitigate ?
5. How can the trolley problem be represented within the framework of game theory or Bayesian networks?
6. Given a sample with bias , propose a mathematical method to correct it.
7. What methods from mathematical logic can be applied to verify the properties of neural network models?
8. Describe the mathematical basis of the SHAP method (Shapley values) to explain AI predictions. How does this relate to theory?
9. What mathematical models (e.g., ordinal optimization, catastrophe theory) might be useful for controlling hypothetical superintelligence ?
10. How could quantum computers compromise the security of modern AI systems (e.g., by breaking cryptography)? What mathematical methods of protection exist?

Application of artificial neural networks and deep learning in steganalysis

1. Describe the mathematical model of LSB steganography in the spatial domain. What statistical anomalies arise with such an implementation, and how can they be detected?
2. What features of the CNN architecture make it effective for image steganalysis tasks ? Compare approaches using pre-trained models and custom-designed architectures.
3. How can adversarial example generation methods be applied to: a) improve the stealth of steganographic methods? b) counteract neural network attacks? steganalyzers ?
4. Describe how GANs can be used to generate steganographic containers. What mathematical features of GAN training are most important in this context?
5. Compare the effectiveness of classical statistical methods (χ^2 test, RS analysis) and neural network approaches for detecting steganography. In what cases is each method preferable?
6. Which neural network architectures (RNN, LSTM, Transformer) are most suitable for analyzing steganography in audio signals and network traffic? Justify your choice based on the mathematical properties of these architectures.
7. What mathematical metrics are most appropriate for assessing: a) the quality of steganographic implementation? b) the effectiveness of a steganalyzer ? Provide formulas and explain their meaning.
8. How can (ϵ, δ) -differential privacy be applied to protect steganosystems from detection? Provide a mathematical formalization of the approach.
9. Propose a mathematical model of a cascade steganalyzer that combines: a) first-level statistical methods and b) second-level neural network analysis. What advantages does this approach offer?

10. Describe the possible applications of: a) transformer architectures in steganalysis; b) quantum neural networks for steganography. What mathematical challenges arise in their implementation?

Data analysis in cybersecurity

1. Describe how methods of probability theory and mathematical statistics are applied to cybersecurity risk assessment . Provide an example of calculating the probability of a successful attack on a system.
2. What mathematical data transformation methods are most effective for: network normalization; processing categorical features in access logs?
3. Compare the effectiveness of z-scores, interquartile range, and local outlier factor for detecting network anomalies. Provide mathematical justifications.
4. What mathematical features make the Random algorithm Is forest-based approach preferable for cyberthreat classification compared to logistic regression? Justify this in terms of decision tree theory.
5. Describe the optimal convolutional neural network (CNN) architecture for analyzing NetFlow data. What mathematical operations in the layers are most important for detecting DDoS attacks?
6. How can we mathematically formalize the problem of predicting cyberattacks based on time series? Which models (ARIMA, LSTM, Prophet) are most suitable for this task, and why?
7. Derive the formula for the F1-score using precision and recall . Why is this metric preferable to accuracy for detecting rare attacks (e.g., APTs)?
8. How can network infrastructure be represented as a graph for threat analysis? Describe a mathematical model for identifying: hidden communication channels, anomalous access patterns
9. Which mathematical models are most effective for: classifying security logs, extracting IoCs from text logs? Justify your choice.
10. Describe the mathematical problems that arise when analyzing encrypted traffic and processing real-time data. What machine learning methods can solve them?

6. List of recommended literature

Main literature:

1. Барский А.Б. Параллельные информационные технологии [Электронный ресурс]: учебное пособие / А.Б. Барский. – Электрон. текстовые данные. – Москва, Саратов: Интернет-Университет Информационных Технологий (ИНТУИТ), Вузовское образование, 2017. – 503 с. – 978-5-4487-0087-3. Режим доступа: <http://www.iprbookshop.ru/67379.html>
2. Modular Arithmetic and Its Applications in Infocommunication Technologies: [monograph] / N. I. Chervyakov et al. – Moscow: FIZMATLIT, 2017. – 400 p.: ill., table, port. – Bibliography at the end of the section. – ISBN 978-5-9221-1716-6
3. Обработка информации в системе остаточных классов (СОК) [Электронный ресурс]: учебное пособие / Н.И. Червяков [и др.]. — Электрон. текстовые данные. – Ставрополь: Северо-Кавказский федеральный университет, 2016. – 225 с. – 2227-8397. Режим доступа: <http://www.iprbookshop.ru/69412.html>
4. Шаньгин В.Ф. Информационная безопасность и защита информации [Электронный ресурс] / В.Ф. Шаньгин. – Электрон. текстовые данные. – Саратов: Профобразование, 2017. – 702 с. – 978-5-4488-0070-2. Режим доступа: <http://www.iprbookshop.ru/63594.html>

Further reading:

1. Application of artificial neural networks and residual class systems in cryptography / N. I. Chervyakov [et al.]. – M.: FIZMATLIT, 2012. – 280 p.: ill., app. – ISBN 978-5-9221-1386-1
2. Интеллектуальные системы [Электронный ресурс]: учебное пособие / А.М. Семенов [и др.]. – Электрон. текстовые данные. – Оренбург: Оренбургский государственный университет, ЭБС АСВ, 2013. – 236 с. – 2227-8397. Режим доступа: <http://www.iprbookshop.ru/30055.html>

7. Organization and conduct of the state examination

The organization and conduct of the state examination is built in accordance with the main requirements of the "Regulations on the procedure for conducting state final certification for educational programs of higher education - bachelor's programs, specialist programs and master's programs at the federal state autonomous educational institution of higher education " North Caucasus Federal University"

The state examination is conducted according to an approved program, which contains a list of questions included in the state examination, a brief description of the sections of the question, recommendations for students on how to prepare for the state examination, including a list of recommended literature for preparing for the state examination, and evaluation criteria.

The topics of examination questions and tasks for the state examination, compiled from the control and measuring materials of the assessment tools fund, for an objective assessment of competencies, must be comprehensive and correspond to selected sections from various educational cycles that develop specific competencies.

Before the state examination, students are consulted on issues included in the state examination program (hereinafter referred to as pre-examination consultation).

The schedule for conducting the State Final Attestation (GFA) in areas of training (specialties) and forms of education is formed by the educational and methodological department in accordance with the curricula and schedule of the educational process on the basis of memos of the directors of institutes (branches).

The heads of the graduating departments, no later than six months before the start of the State Final Attestation (GFA), inform students of the procedure for conducting state certification

tests (the procedure for filing and considering appeals), provide students with GFA programs, create the necessary conditions for preparation and organize pre-examination consultations.

One month before the state examination, the heads of the graduating departments prepare and approve examination tickets at a department meeting.

The state examination is conducted at a meeting of the examination committee with the participation of at least two-thirds of its list of members.

For the work of the examination committee, the secretary of this committee presents the following documents: certificates of the implementation of the curriculum for each student admitted to the State Final Attestation in accordance with the order of the Rector of SKFU, an examination report on the results of the state examination.

The state examination is conducted within the timeframe established by the order of the rector in accordance with the approved schedule, which is communicated to the students.

No more than 10 students are allowed in the auditorium for the state exam. Each student independently selects an exam ticket once by random drawing. The ticket number is recorded by the State Examination Commission secretary in the corresponding report.

Students are typically given 30 minutes to prepare their answers. During preparation, they are allowed to use the state exam syllabus and, with the permission of the State Examination Commission, reference books. Students who use other textbooks in preparation for their answers are disqualified from the state exam. The student's score is recorded as "unsatisfactory" in the exam report, and they are disqualified from the state exam for cheating. The student's grade on the exam report is "unsatisfactory."

After the student's answer, the chairperson and members of the examination committee have the right to ask additional questions (usually no more than three). The committee secretary records the questions on the exam sheet, additional questions from committee members, and a general summary of the student's answer to all questions.

The response time for the ticket question and additional questions usually takes 30 minutes.

After the committee meeting, students are invited into the auditorium, and the committee chairperson announces the state exam results. The exam results are announced on the day of the exam, after the minutes of the examination committee meetings have been duly compiled and the students' record books have been completed, signed by the chairperson and members of the examination committee.

Students who fail to appear for the exam for a valid reason have the right to retake it within six months of completing the state final assessment. Students who receive a "fail" grade or who fail to appear for an invalid reason are expelled.

Based on the results of the state certification examinations, students have the right to appeal. Students have the right to submit a written appeal to the appeals committee regarding what they believe to be a violation of the established procedure for conducting the state certification examination and/or disagreement with the state examination results. The appeal must be submitted in person to the appeals committee no later than the next business day following the announcement of the state certification examination results. The appeal will be considered at a meeting of the appeals committee no later than two business days from the date of its submission, to which the chairperson of the state examination committee and the student filing the appeal will be invited. The appeals committee meeting may be held in the absence of the student filing the appeal if they fail to appear. The appeal deadline is set at the time the student submits the application and is communicated to the student against signature. The decision of the appeals committee is final and not subject to review. Appeals for re-administration of the state certification examination will not be accepted.

8. Description of indicators and criteria for assessing competencies, as well as same rating scales

8.1 Description of indicators

Levels of development competencies (ies), indicator (s) Indicators	Descriptors			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactory) 3 points	Intermediate level (good) 4 points	High level (excellent) 5 points
UK-1. Capable of critically analyzing problematic situations based on a systems approach and developing an action strategy.				
Learning outcomes for the course (module): ID-1UK-1 Selects information resources for searching for information in accordance with the assigned educational task.	The sources do not correspond to the set educational task. Only one type of source is used, for example, random websites from the Internet. There is a complete lack of assessment of the reliability and relevance of the information. The search is carried out chaotically, without the use of basic search methods.	Some sources are not up to the task or are of questionable reliability. Only basic resources are used, without analysis of other sources. The assessment of reliability is superficial or absent. A limited number of search methods are used, no filters are applied.	The sources are generally consistent with the task, but there are some minor deviations. Several types of sources are used, but without in-depth analysis. The reliability of the information is assessed, but without in-depth comparative analysis. Standard search methods are used, but without the use of complex operators and filters.	The most relevant and reliable sources of information are used, fully aligned with the task at hand. Various types of sources are employed, and advanced search methods are employed. The reliability and relevance of the information found are reasonably assessed.
Learning outcomes for the course (module): ID-2UK-1 Systematizes information obtained from various sources in accordance with the requirements for completing the educational assignment.	The information is presented chaotically, and there is no logic in combining data. There is no analysis of information; systematization is reduced to simple copying of data. The data is not presented in a convenient form, the task does not meet the requirements. The educational task was completed with significant errors or was not completed.	The information is collected, but poorly structured or important aspects are missing. There is an attempt at analysis, but without deep generalization and identification of key ideas. The information is presented, but without clear logic or poorly formatted. The assignment was partially completed; there were logical errors or shortcomings.	The information is structured, but there are minor gaps in the disclosure of the topic. The information has been analyzed, but may contain minor inconsistencies or insufficient depth of processing. The information is presented in a logical and structured form, but there may be minor design errors.	Information obtained from various sources covers the topic completely and is presented in a logical structure. An in-depth analysis of the data was conducted, key ideas were identified, and contradictions between sources were resolved. The information is formatted in accordance with the requirements of the assignment and presented in a visual form. The educational task was completed in full, without logical errors or omissions.
Learning outcomes for the course	The conclusions are formulated	The wording of conclusions and	The conclusions are generally	The conclusions and judgments

Levels of development competencies (ies), indicator (s) Indicators	Descriptors			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactory) 3 points	Intermediate level (good) 4 points	High level (excellent) 5 points
(module): ID-3UK-1. Formulates and substantiates conclusions and judgments, including through the use of philosophical conceptual frameworks.	unclearly; there is no logical connection between the judgments. The argumentation is weak or absent, the conclusions are declarative. Philosophical categories and concepts are not used or are applied incorrectly. There is no consideration of alternative points of view. The work does not meet the requirements of the academic assignment and contains significant logical and methodological errors.	judgments is sometimes unclear and may contain logical inconsistencies. The argumentation is superficial, the judgments are not sufficiently substantiated. The use of philosophical terms is limited and sometimes incorrect. The analysis of alternative positions was carried out partially or was absent. The work was completed with deviations from the requirements; there are logical errors and shortcomings in the argumentation.	logical, but may contain minor inaccuracies or redundancies in wording. The arguments are presented, but individual assertions could be supported by more convincing evidence. Philosophical terms are used, but not always appropriately or without sufficient depth. Various points of view are considered, but their analysis could have been more detailed. The work generally corresponds to the assignment, but there may be minor logical gaps or stylistic flaws.	are formulated clearly, logically and consistently. The argumentation is detailed, using compelling evidence, examples, and references to authoritative sources. Philosophical categories, terms and concepts that correspond to the topic of discussion are applied correctly. Alternative points of view are considered, and their strengths and weaknesses are substantiated. The work meets the academic requirements, the conclusions are based on logic and facts, and there are no errors in reasoning.
UK-4. Able to apply modern communication technologies, including in a foreign language(s), for academic and professional interactions				
Learning outcomes for the course (module): ID-1 UK-4 Forms and defends one's own opinions and scientific positions, including in foreign language(s)	The judgments are unclear and there is no logical sequence. The argumentation is weak or absent, and the conclusions are not supported by evidence. Unable to defend his point of view; arguments are superficial or incorrect. Significant errors in presentation, does not know the relevant terminology. Does not actively participate in discussions or is unable to	The wording is unclear in some places, and logical inconsistencies are possible. The argumentation is weak and there is a lack of references or substantiated evidence. Defending a position is difficult, the arguments are superficial or incomplete. Foreign language is used with errors, and there may be difficulties in expressing complex scientific ideas.	The judgments are logical, but there may be minor inaccuracies or stylistic excesses. The argumentation is convincing, but individual points could have been supported by more compelling evidence. Able to defend his position, but may allow minor flaws in the logic of reasoning. Presents a scientific position	Own positions and conclusions are formulated clearly, logically, and reasonably. Evidence is presented, references to authoritative sources are made, and scientific theories and concepts are used correctly. Confidently defends his point of view, relying on logic, facts and scientific arguments. Freely expresses and defends his scientific positions in a

Levels of development competencies (ies), indicator (s) Indicators	Descriptors			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactory) 3 points	Intermediate level (good) 4 points	High level (excellent) 5 points
	respond to objections with reason. The work does not meet academic standards and contains serious logical and stylistic errors.	Participates in discussions, but does not always take counterarguments into account or respond to them correctly. The work was completed with deviations from scientific standards; there may be errors in the formatting.	in a foreign language with minor errors and uses specialized vocabulary. Takes part in discussions, but does not always fully analyze the opponents' arguments. The works meet academic standards, but minor stylistic flaws are possible.	foreign language, using specialized vocabulary. Effectively conducts scientific debates, knows how to take into account alternative points of view and oppose them with arguments. Presentations and written works are prepared in accordance with academic standards.
Learning outcomes for the course (module): ID-2 ^{UK-4} Uses Russian and foreign languages as a means of business communication, clearly and distinctly presents problems and solutions, and justifies conclusions	The presentation is incoherent, the logic of the text is broken, and the material is difficult to perceive. A significant number of errors makes the text difficult to understand. Lack of argumentation or use of unsupported, weak arguments. Business communication norms are violated; stylistic and communication errors are possible. Unable to adapt communication style to business situations and experiences significant communication difficulties. Unable to use a foreign language in business communication, makes serious mistakes that interfere with understanding.	The presentation is not structured enough; there may be logical gaps or redundancy of information. Grammatical, spelling and punctuation errors that affect the perception of the text are allowed. The arguments presented are poorly supported by facts, and the conclusions are not convincing enough. Template phrases are used, mistakes in business communication style are made. Has difficulty adapting speech to different formats of business communication. Limited use of foreign language, errors in vocabulary and grammar leading to misunderstandings.	The presentation is coherent and clear, but there may be minor logical or stylistic flaws. Generally fluent in Russian and foreign languages, with occasional mistakes that do not affect understanding. Quite a compelling argument, but in some places there may be weak justification or a lack of evidence. In general, business communication standards are observed, but there may be minor violations of etiquette or style. Can adapt communication style, but sometimes has difficulty choosing the appropriate form of interaction. Uses a foreign language in	The material is presented clearly, consistently and logically, and there are no semantic or stylistic errors. High level of proficiency in Russian and foreign languages, correct use of business vocabulary, absence of spelling, punctuation and grammatical errors. The conclusions are reasoned, supported by evidence, and use critical analysis of information. Business communication standards are observed, and professional terminology is used correctly and appropriately. Able to adapt communication style depending on the situation (official negotiations, business correspondence, presentations, discussions).

Levels of development competencies (ies), indicator (s) Indicators	Descriptors			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactory) 3 points	Intermediate level (good) 4 points	High level (excellent) 5 points
			business communication, but may have minor errors or lack confidence.	Freely uses a foreign language in business communication and argues his position without difficulty.
UK-5. Able to analyze and take into account cultural diversity in the process of intercultural interaction				
Learning outcomes for the course (module): ID-1 UK-5 Analyzes and draws conclusions on social, ethical, scientific and technical issues arising in professional activities.	The analysis is absent or fragmentary. The conclusions are made without justification and contain logical errors. Scientific methods of analysis are not used and there is no systematic approach. Social and ethical aspects are ignored, and the proposed solutions do not comply with professional ethics. The conclusions are impractical and have no value for professional activity. The text is poorly structured, contains many errors, and is unclear.	The problem is considered superficially; a comprehensive approach is lacking. The conclusions are not sufficiently substantiated, contain logical gaps or weak argumentation. The application of analysis methods is formal in nature or limited to one approach. Social and ethical aspects are only partially touched upon or considered superficially. The conclusions and recommendations are difficult to implement in practice and require significant revision. The text contains stylistic and logical errors, and the presentation is unclear in places.	The analysis covers the main aspects of the problem, but may not be detailed enough. : The conclusions are generally logical and well-founded, but the argumentation may be incomplete or not always convincing. Basic methods of analysis are used, but without in-depth study. In general, social and ethical aspects are taken into account, but the analysis of these factors may not be comprehensive enough. The solutions are applicable, but require refinement or adaptation to specific conditions. The text is logical and literate, but there may be minor stylistic or structural flaws.	A comprehensive analysis of the problem was carried out, taking into account all significant aspects (social, ethical, scientific, technical). The conclusions follow logically from the analysis, are reasoned, and supported by reliable sources and facts. Scientific approaches, methods of analysis, comparative, critical or systemic analysis are used. Social and ethical aspects are taken into account, and the proposed solutions comply with professional ethics. The conclusions and proposed solutions are applicable in practice and take into account the real conditions of professional activity. The text is presented clearly, logically, without stylistic and grammatical errors.
Learning outcomes for the course (module): ID-2 UK-5 Objectively evaluates the	Culture is treated superficially or with errors, and there is a lack of deep understanding of the topic.	Considers cultural diversity superficially, without deeply exploring its aspects.	Covers the topic well, but may not take into account some aspects (such as economic or	Demonstrates a comprehensive understanding of cultural diversity, taking into account

Levels of development competencies (ies), indicator(s) Indicators	Descriptors			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactory) 3 points	Intermediate level (good) 4 points	High level (excellent) 5 points
diversity of cultures and identifies their individual characteristics	There are biased judgments, stereotypes, and no critical analysis of information. Does not differentiate between cultures or makes significant errors in description. Comparative analysis is absent or made without argumentation. Incorrect statements are allowed, intercultural specifics are not taken into account. The text is unstructured and contains numerous grammatical and stylistic errors.	Stereotypes and lack of critical analysis are possible. Provides general facts but does not emphasize the unique features of cultures. Comparison of cultures is formal in nature or limited to simple statements. Respectful, but may use inappropriate terms or simplistic generalizations. The text contains logical and stylistic errors, and the presentation is not clear enough.	historical influence). Generally objective, but some stereotypical or superficial judgments are possible. Describes key characteristics of crops, but does not always emphasize unique features. There are attempts to compare cultures, but not always with clear arguments. Demonstrates respect for cultural differences, but may not take into account all the nuances of intercultural communication. The text is logical and literate, but minor stylistic or structural errors are possible.	historical, social and economic contexts. Analyzes cultures without stereotypes and bias, using scientific sources and reliable data. Clearly articulates the unique characteristics of different cultures and highlights their distinctive features. Competently compares cultures, revealing their similarities and differences based on logical arguments. Shows respect for cultural traditions, uses terminology correctly, and demonstrates a high level of intercultural competence. The information is presented logically, consistently, competently and without stylistic errors.
UK-6. Able to identify and implement priorities for one's own activities and ways to improve them based on self-assessment.				
Learning outcomes for the course (module): ID-1 UK-6 Ready for self-development, self-realization, and use of creative potential	Does not show initiative in learning and professional development. Lack of clear goals and desire to achieve them. Does not show creativity, is not interested in finding new solutions. Does not analyze his actions, does	Shows interest in development, but does so irregularly or formally. Has a general vector of development, but experiences difficulties in achieving set goals. Sometimes he suggests unconventional ideas, but rarely puts them into practice.	Strives for development, but may show insufficient regularity or depth in exploring new areas. Sets goals for himself, but does not always clearly define the ways to achieve them. Shows creativity, but does not always apply it in practice.	Constantly works on his professional and personal growth, strives to acquire new knowledge and skills. Clearly formulates personal and professional goals, successfully achieves them, demonstrating initiative. Demonstrates a high level of

Levels of development competencies (ies), indicator(s) Indicators	Descriptors			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactory) 3 points	Intermediate level (good) 4 points	High level (excellent) 5 points
	not draw conclusions from mistakes. Does not plan his development, does not use available educational and professional resources. Does not share experience, does not show interest in teaching others.	Poor analysis of one's achievements and mistakes, lack of behavioral adjustments based on experience. Self-development planning is chaotic and available resources are not always used. Shares knowledge sporadically, without a systematic approach.	Analyzes his actions, but does not always draw conclusions for further growth. Generally effective in planning his/her learning and development, but sometimes has difficulty with time management. Ready to share knowledge, but does not always do so actively.	creativity, offers unconventional solutions, and implements innovative ideas. Analyzes his achievements and mistakes, adjusts self-development strategies. Manages time effectively and uses a variety of methods and resources for learning and development. Shares experience, inspires and motivates others to develop.
Learning outcomes for the course (module): ID-2 UK-6 Defines and implements priorities of own activities	Doesn't know how to prioritize, chooses unimportant or non-urgent tasks. Either completely absent or has no logical structure. Does not achieve set goals, work is not completed on time or is of poor quality. Unable to adapt to changing conditions, has difficulty adjusting his plans. There is no analysis of one's own activities; the same mistakes are repeated. Avoids responsibility, requires constant external control.	Prioritization is not always effective; errors in assessing the importance of tasks are possible. Plans his work, but often deviates from the plan or does not complete it completely. Achieves goals with delays or requires additional support. Difficulty adapting to changes, requires significant time for restructuring. Poorly analyzes the results of activities and does not use the experience gained for further improvement. Can perform tasks, but without the proper level of initiative and responsibility.	Sets priorities correctly, but can sometimes underestimate important tasks. Makes a work plan, but does not always adhere to it strictly. In most cases, it successfully completes the assigned tasks, but minor delays are possible. Can change plans when circumstances change, but sometimes this requires additional time. Evaluates the results of work, but does not always apply the findings in practice. Takes a responsible approach to completing tasks, but may require outside supervision.	Able to correctly prioritize activities, taking into account importance, urgency and long-term goals. Develops detailed work plans and successfully allocates resources and time. Achieves assigned tasks on time, demonstrates organization and independence. Quickly adapts to changes, adjusting priorities as necessary without loss of efficiency. Evaluates the results of his activities, identifies strengths and weaknesses, and uses this for further development. Takes responsibility for decisions made and their implementation.
PC-1. Able to demonstrate fundamental knowledge of mathematical and natural sciences, programming, and information technology.				

Levels of development competencies (ies), indicator (s) Indicators	Descriptors			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactory) 3 points	Intermediate level (good) 4 points	High level (excellent) 5 points
Learning outcomes for the course (module): ID-1 _{PC-1} In his professional activities, he demonstrates fundamental knowledge of mathematics and natural sciences.	Has limited knowledge in mathematics and natural sciences, which is insufficient for professional activity Incapable of applying knowledge in professional practice or does so extremely rarely and with a large number of errors. Difficulties in solving problems that require even basic knowledge often require help and correction. Shows no interest in updating knowledge and scientific development. Does not understand basic concepts and principles, or understands them only partially.	Has basic knowledge in mathematics and science. Can apply basic concepts but has difficulty solving more complex problems. Sometimes makes mistakes in applying knowledge in professional activities. Requires additional assistance to solve problems that require deeper understanding. Understands the basic principles, but does not actively improve his knowledge.	Has fairly deep knowledge in the field of mathematics and natural sciences. Applies knowledge to professional activities with little or no assistance. Can solve most problems, although sometimes additional explanation is required. Understands basic concepts and principles, but may make minor errors in complex situations. Regularly updates his knowledge, but may not be as active in mastering innovations.	Demonstrates deep and comprehensive knowledge of mathematics and science. Freely and confidently applies acquired knowledge in professional practice. Explains theoretical concepts logically and reasonably and solves complex problems. Identifies and effectively solves problems requiring an interdisciplinary approach. Constantly improves his knowledge and actively follows new achievements in the field of science.
Learning outcomes for the course (module): ID-2 _{PC-1} Solves problems of professional activity using programming and information technology tools	Has limited knowledge and skills in programming and information technology and is unable to effectively solve problems using them. Does not solve problems independently or solves them with significant errors requiring significant intervention. Does not use modern programming tools or information technologies, despite the availability of such capabilities. He practically does not update his knowledge in this area and does not apply new approaches.	Can use basic programming tools and information technology, but has difficulty solving more complex problems. Requires assistance in solving non-standard problems or uses ineffective methods. Applies standard approaches to problem solving, but sometimes makes mistakes or misses important details. Knowledge in programming and IT is limited and requires additional practice to improve.	Uses programming tools and information technology to solve problems, dealing effectively with most situations. Can develop standard solutions, but in some cases additional assistance or time is required to resolve complexities. Understands basic tools and technologies, but sometimes does not use them fully or with maximum effectiveness. Constantly improves his knowledge, but is sometimes	Confidently and effectively uses various programming tools and information technologies to solve professional problems. Develops complex and custom software solutions, taking into account all necessary requirements and details. Initiates and applies new tools and technologies to improve work efficiency. Solves problems logically, consistently and with high accuracy, demonstrating a creative approach to problem solving.

Levels of development competencies (ies), indicator (s) Indicators	Descriptors			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactory) 3 points	Intermediate level (good) 4 points	High level (excellent) 5 points
			slow to master new approaches or technologies.	Actively improves his skills and knowledge in the field of programming and information technology, follows the latest trends and implements innovations.
PC-2. Capable of conducting scientific research based on existing methods in a specific area of professional activity.				
Learning outcomes for the course (module): ID-1 _{PC-2} Conducts scientific research in the field of parallel computer technologies.	Incapable of conducting independent scientific research in the field of parallel computer technologies. Uses parallel computing with a large number of errors or does not use modern approaches in research at all. The works have no scientific value or do not lead to significant results. Incapable of solving problems that require advanced knowledge in the field of parallel computing. Does not follow advances in the field, does not update his knowledge and does not apply modern methods.	Conducts scientific research using parallel computing, but the research is often limited to basic or outdated approaches. Uses parallel technologies, but mainly to solve simple or well-known problems. Demonstrates basic knowledge of parallel computing technologies, but work often lacks originality or scientific merit. Not always able to offer optimal solutions or methods, often requires consultations and assistance. Does not show active interest in innovations in the field, sometimes uses outdated methods and approaches.	Conducts scientific research in the field of parallel computer technologies, solving problems using existing methods and algorithms. Uses parallel computing in his research, but may encounter difficulties when solving more complex and non-standard problems. Develops and applies parallel algorithms, but the work may require modifications to improve their efficiency or accuracy. The work has scientific significance, but may be presented on less prestigious scientific platforms. Keeps up to date with advances in parallel computing, but does not update his knowledge and skills as actively as the field requires.	Initiates and successfully conducts scientific research in the field of parallel computer technologies, proposing new approaches or solutions. Demonstrated deep knowledge of the theory and practice of parallel computing, applying them to solve complex scientific and engineering problems. Creates and optimizes parallel algorithms and systems, demonstrating a high degree of originality and scientific value of the work. The works are of high scientific significance, published in leading scientific journals or presented at international conferences. He constantly improves his knowledge in the field of parallel computer technologies and actively follows new achievements and research in

Levels of development competencies (ies), indicator (s) Indicators	Descriptors			
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				this area.
Learning outcomes for the course (module): ID-2 _{PC-2} Conducts reviews of scientific articles, abstracts and dissertations in the fields of mathematics and information technology	Incapable of objectively and fully reviewing scientific articles, abstracts and dissertations in the fields of mathematics and information technology. Reviews are not well-founded, are often superficial or incomplete, and do not provide valuable recommendations for improving the work. Peer-reviewed materials are assessed superficially, without a deep understanding of the subject of the study, which can lead to incomplete or erroneous conclusions. Does not update his knowledge of scientific research, which may result in missing important aspects during peer review. Demonstrates a lack of commitment and professionalism in reviewing.	Reviews papers in mathematical and information science fields, but the analysis is not always deep or detailed. Knowledge in this area is sufficient for a general understanding of the work, but may be insufficient for a critical and comprehensive analysis. It identifies key weaknesses, but the recommendations are often general and do not always lead to significant improvements. Occasionally makes oversimplified or inaccurate judgments, especially in complex scientific matters. Further development and updating of knowledge in the field of mathematical and information technologies is required for higher quality peer review.	Reviews scientific papers in the fields of mathematics and information science, providing thorough and well-reasoned reviews, although the detail could sometimes be improved. Possesses good knowledge in relevant areas, which allows him to identify the main strengths and weaknesses of the work. Recommendations and comments provide useful directions for revising articles and dissertations, but may not always be sufficient for a thorough revision of the work. He is objective in his assessments and clearly formulates his conclusions, but sometimes he may not take into account certain nuances or details. Regularly updates their knowledge, but may not be as actively involved in new scientific trends.	Reviews research articles, abstracts, and dissertations in the fields of mathematics and information science at a high level, providing detailed, informed, and constructive comments. Demonstrates a deep knowledge of mathematics and information technology, which allows for informed conclusions about the scientific significance and novelty of the materials presented. Skillfully identifies the strengths and weaknesses of work, analyzes the methodology and results of research, and offers well-founded recommendations for improvement or revision. The peer-reviewed works are of high quality, and the comments are constructive and aimed at developing the topic under study. Constantly improves his knowledge, monitors new achievements in the field of science and actively participates in the scientific community.

Levels of development competencies (ies), indicator (s) Indicators	Descriptors			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactory) 3 points	Intermediate level (good) 4 points	High level (excellent) 5 points
PC-3. Capable of conducting methodological and expert work in the field of mathematics and computer science.				
Learning outcomes for the course (module): ID-1 _{PC-3} Conducts expert work in mathematics.	Incapable of conducting expert work in mathematics at the required level and does not provide substantiated conclusions or recommendations. Knowledge in the field of mathematics is limited and insufficient to perform expert functions. Expert opinions are either incomplete or erroneous and do not help in solving the assigned tasks. Requires constant assistance and intervention to complete work, and does not demonstrate a desire to develop in his or her field. Does not update his knowledge or follow new developments in mathematics, which affects the quality of his work.	Conducts expert work in mathematics, but often reveals shortcomings in the depth of analysis or justification of conclusions. Knowledge in the field of mathematics is limited and sufficient only for solving basic problems. Expert opinions are often general in nature and do not always provide a high degree of accuracy and validity. Recommended solutions may not be detailed enough or may not address all aspects of the problem. Additional practice and updating of knowledge is required to improve the quality of expert work.	Conducts expert assessments of mathematics effectively, providing sound conclusions and recommendations, although details may occasionally require clarification or improvement. Possesses good knowledge and understanding of basic mathematical theories and methods, which allows solving problems of medium complexity with satisfactory quality. Expert opinions are clear, but may not always be as detailed or in-depth as possible. The works are valuable for practice, but may require additional clarification or adjustments. Regularly updates his knowledge and finds new approaches, although the implementation of innovations occurs with some delay.	Conducts expert work in mathematics at a high level, providing comprehensive and insightful analysis based on advanced mathematical theories and methods. He has deep knowledge and experience in various fields of mathematics, which allows him to solve complex and multifaceted problems and provide recommendations with a high degree of accuracy. Expert opinions and recommendations are high-quality, detailed and substantiated, and have scientific value. He constantly improves his knowledge and practical skills, follows new achievements in mathematics and actively participates in the scientific community. The results of the work influence the development of a project, research or the solution of professional problems.
Learning outcomes for the course (module): ID-2 _{PC-3} Conducts expert work in the field of	Unable to carry out expert work in the field of computer science at the required level. Demonstrates superficial	Has basic knowledge in computer science, but may experience difficulties in analyzing complex systems when conducting expert	He has a strong knowledge of computer science and applies it when conducting expert work, but may sometimes	Deep understanding of computer science, including algorithms, data structures, programming, databases,

Levels of development competencies (ies), indicator (s) Indicators	Descriptors			
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computer science	knowledge, which leads to erroneous conclusions in expert opinions. Does not take into account modern methods and technologies and cannot objectively evaluate software and information systems. Expert opinions are inaccurate, incomplete or lack practical value. Shows no interest in development and does not follow advances in computer science.	work. Expert opinions are superficial and may contain shortcomings or insufficiently convincing arguments. Evaluates software and technical solutions, but cannot always suggest optimal ways to improve them. Requires additional verification or consultation from more experienced specialists. Knowledge is being updated slowly, and work is being carried out primarily using outdated methods and without taking into account modern trends.	make minor mistakes. Able to analyze and evaluate information systems, software solutions and databases, but sometimes requires clarification or additional study of the issue. Makes logical and reasonable conclusions, but may not analyze the details of complex problems in sufficient depth. Expert opinions are useful and applicable in practice, but sometimes require minor revisions or more detailed justification. Keeps abreast of technological developments, but may not always be able to quickly implement new approaches.	computer networks and other key areas. Confidently conducts expert work using modern methodologies and tools, applying analytical and systemic approaches. Provides detailed, well-reasoned expert opinions based on objective data analysis and modern scientific approaches. Able to identify potential risks, point out vulnerabilities and propose effective solutions to optimize systems and processes. He actively improves his knowledge, follows current trends in computer science, and uses advanced technologies in his expert work. Expert opinions are recognized by colleagues, used in scientific and applied projects, and have a high level of reliability.
Learning outcomes for the course (module): ID-3 _{PC-3} Prepares teaching materials in the fields of mathematics and computer science	ID-3 _{PC-3} Prepares teaching materials in the fields of mathematics and computer science The material presented does not meet modern requirements or educational standards. There are no examples, practical	Prepares teaching materials, but they may not be complete or structured enough. The information is presented clearly, but may contain inaccuracies or outdated information. Uses traditional methods of	Develops teaching materials that comply with educational standards and requirements. The materials are structured and logical, but in some places additional explanations or examples may be required. Uses modern approaches to	Develops high-quality teaching materials that are clearly structured, accessible, and meet modern requirements. Demonstrates a deep knowledge of mathematics and computer science, which is reflected in the accuracy and

Levels of development competencies (ies), indicator (s) Indicators	Descriptors			
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	applications, or clarity, which makes it difficult to understand the information. The materials do not promote effective learning and require significant revision. Does not show any desire to improve and update teaching materials.	presenting information without taking into account modern educational trends. The teaching materials require significant revision to improve their effectiveness. The materials may be useful, but require additional clarification from the teacher.	teaching, but may not be active enough in introducing innovative technologies. The teaching materials are clear and useful, but may require periodic revision or updating. Overall, the materials are successfully used in the educational process, but they could be improved in terms of clarity and interactivity.	relevance of the material presented. Uses modern teaching methods, interactive technologies and visual examples, which promotes effective assimilation of the material. Prepares materials that can be used both for independent learning and in the educational process. Updates and improves teaching materials taking into account the latest scientific and technological advances. The materials are positively evaluated by colleagues, students or experts in the field of education.
PC-5. Able to present and adapt mathematical knowledge, programming methods, and information technology in various ways, taking into account the audience's level.				
Learning outcomes for the course (module): ID-1_{PC-5} Assesses the level of preparation of listeners during their public speeches	Does not assess the audience's level of preparation before and during the presentation. The presentation of the material does not take into account the differences in the preparation of the listeners, which leads to difficulties in understanding. Does not use feedback or ignores audience questions. Does not adjust the presentation of material depending on the audience's reaction.	Partially assesses the audience's level of preparation, but does so intuitively, without using objective methods. Limited variation in presentation of material depending on the level of the audience, which can lead to misunderstanding or oversimplification of complex topics. Uses feedback, but does not always take it into account when further developing presentations.	Analyzes the audience's level of preparation, but may not always take into account all factors (different levels of knowledge among listeners, specifics of the topic). Uses standard assessment methods (questions, discussions), but less frequently uses interactive or adaptive approaches. Corrects the presentation of the material, but sometimes	Confidently analyzes the audience's level of preparation before and during a presentation, adapting the presentation of material depending on the audience's knowledge and experience. Uses various assessment methods (surveys, testing, discussions, analysis of questions from the audience and feedback). Flexible adjustment of the pace

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	The presentations are ineffective, and the audience does not absorb the material because its complexity does not correspond to their level of preparation.	Able to interact with an audience, but sometimes has difficulty adapting explanations.	does not respond quickly enough to the difficulties in understanding of the listeners. Receives feedback from the audience and takes it into account when preparing subsequent speeches. Knows how to interact with the audience, but may not always respond effectively to their needs.	and complexity of the material, ensuring its accessibility for all categories of listeners. Able to effectively interact with audiences, explaining complex topics in understandable language. Draws conclusions from the results of assessing the level of preparation of listeners and uses them to improve future presentations. Uses interactive methods (cases, dialogues, discussions) to more accurately determine the audience's level of knowledge.
Learning outcomes for the course (module): ID-2 _{PC-5} Adapts the presentation of mathematical knowledge and programming methods to the level of the students	Does not adapt the presentation of the material to the level of the audience, which leads to its misunderstanding. Uses overly complex or, conversely, simplified explanations that do not correspond to the level of the listeners. Does not assess the audience's level of preparation and does not adjust the presentation of the material depending on the audience's reaction. Ignores feedback and does not analyze the effectiveness of the	Assesses the level of students formally, without a deep analysis of their knowledge and needs. Partially adapts the material, but does not always make it understandable for all listeners. Limited to basic explanation methods, without the use of additional visual and interactive tools. The balance between theory and practice can be disrupted, making it difficult to learn the material. Feedback from listeners is not always analyzed and taken into account in future performances.	Assesses the level of preparation of the audience and adapts the presentation of the material, but may not always take into account differences in the level of knowledge within the group. Uses a variety of teaching methods, but may limit itself to standard examples and exercises. It balances theory and practice fairly well, but may not always take into account the needs of a specific audience. Able to explain complex	Confidently determines the audience's level of preparation and flexibly adapts the presentation of material, making it accessible and understandable. Uses a variety of teaching methods, including visualization, real-world examples, analogies, and interactive elements. Finds the optimal balance between theory and practice, helping students effectively absorb the material. Able to explain complex

Levels of development competencies (ies), indicator (s) Indicators	Descriptors			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactory) 3 points	Intermediate level (good) 4 points	High level (excellent) 5 points
	information presented. The presentation of the material is formal, with no effort to make it accessible and understandable.		topics clearly, but in some cases requires additional preparation or clarification. Uses feedback to improve delivery, but does not always make significant adjustments.	mathematical concepts and programming methods in a variety of ways, tailored to the audience. Demonstrates a high level of proficiency in mathematical knowledge and programming methods, supporting theory with practical problems. Prepares educational materials of varying levels of difficulty, allowing the audience to gradually deepen their knowledge.

8.2 Criteria for assessing competencies in the state examination

Excellent rating is given to the student if he shows deep, comprehensive knowledge of all program material, understanding the essence and interrelationships of the processes and phenomena under consideration, provides logically consistent, meaningful, complete, correct and specific answers to all questions on the examination ticket and additional questions from members of the examination committee.

Rating: "Good" is exhibited to the student if he shows A solid and sufficiently comprehensive knowledge of all program material, a correct understanding of the essence and interrelationships of the processes and phenomena under consideration; provides consistent, correct, and specific answers to questions posed while freely addressing comments on individual issues.

Rating "satisfactory" is given to the student if he shows Knowledge and understanding of the main issues of the program; correct and specific answers to the questions posed, without gross errors, while eliminating inaccuracies and minor errors in the coverage of individual provisions when asked leading questions by the examiner.

is given **a grade of "unsatisfactory"** if they give an incorrect answer to at least one of the main questions, make gross errors in their answer, misunderstand the nature of the questions being asked, or give uncertain and inaccurate answers to additional questions.

8.3 Description of the rating scale

The state exam is assessed on a 5-point scale.