

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution
higher education
NORTH CAUCASIAN FEDERAL UNIVERSITY

I APPROVE

Dean of the Faculty of Mathematics
and computer science named after
Professor N.I. Chervyakov, candidate
physical and mathematical sciences, associate professor

Grobova T.A.

Full name

**ASSESSMENT TOOLS FUND
FOR INDUSTRIAL PRACTICE**

Pre-graduation Internship / Преддипломная практика

Direction of training
Directionality (profile)
Year of commencement of studies
Form of study
Implemented in a semester

02.04.01 Mathematics and Computer Science
Training Program for Electronic Information
2026
full-time
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Introduction

1. Purpose: conducting ongoing monitoring of academic performance and midterm assessment for industrial practice "Pre-graduation Internship / Преддипломная практика"

2. FOS is an appendix to the industrial practice program "Pre-graduation Internship / Преддипломная практика"

3. Developer Lyudmila Vladimirovna Belokon – Candidate of Technical Sciences, Associate Professor, Associate Professor of the Department of Mathematical Analysis, Algebra and Geometry

4. An examination of the FOS was carried out
Members of the expert group:

Chairman L.B. Kopytkova – Chairman of the Teaching and Methodological Complex of the Faculty of Mathematics and Computer Science named after Professor N.I. Chervyakov

(Full name, position)

Members of the Commission: Gladkov A.V. – member of the Teaching and Methodological Committee of the Department of Computational Mathematics and Cybernetics

Andrukhiv L.V. – member of the teaching and methodological committee of the Department of Mathematical Modeling;

Belokon L.V. – member of the teaching and methodological committee of the Department of Mathematical Analysis, Algebra and Geometry;

Representative of the employer organization Podoprigora N.B. – General Director of LLC “Medicine IT”

(Full name, position)

Expert opinion: the fund of assessment tools corresponds to the educational program for the specialty 02.04.01 Mathematics and computer science, profile «Training Program for Electronic Information» and is recommended for conducting ongoing monitoring of students’ academic performance and midterm assessment.

5. The validity period of the FOS is determined by the period of implementation of the educational program.

1. Description of the criteria for assessing competence at various stages of its development, description of assessment scales

Competence (ii), indicator (s)	Levels of development competence (s),			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactorily) 3 points	Intermediate level (Fine) 4 points	High level (excellent) 5 points
<i>Competence: UK-1 Able to carry out a critical analysis of problematic situations based on a systems approach and develop an action strategy</i>				
ID-1 UK-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.	Some sources are not up to the task or are of questionable reliability. Only basic resources are used, without analysis of other sources.	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.	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.
ID-2 UK-1 Systematizes information obtained from various sources in accordance with the requirements for completing the educational assignment.	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.	The assessment of reliability is superficial or absent. A limited number of search methods are used, no filters are applied. The information is collected, but poorly structured or important aspects are missing.	Standard search methods are used, but without the use of complex operators and filters. The information is structured, but there are minor gaps in the disclosure of the topic. The information has been analyzed, but	The reliability and relevance of the information found are reasonably assessed. Information obtained from various sources
ID-3 UK-1 Formulates and argues conclusions and judgments, including using the philosophical conceptual apparatus.	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 conclusions are formulated unclearly; there is no logical connection between	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 wording of		

	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.	conclusions and 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.	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. The conclusions are generally 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	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. The conclusio
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			be minor logical gaps or stylistic flaws.	ns and judgments 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
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				academic requirements, the conclusions are based on logic and facts, and there are no errors in reasoning.
<i>Competence: UK-6 Able to determine and implement priorities of one's own activities and ways to improve them based on self-assessment</i>				
ID-1 ^{UK-6} Ready for self-development, self-realization, and use of creative potential ID-2 ^{UK-6} Defines and implements the priorities of its own activities	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 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. Inability to prioritize, choosing unimportant or non-urgent tasks. Either completely absent or lacking a logical structure. Does not achieve set goals, work is not completed on time or is of poor quality. Unable to adapt to	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. 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. Prioritization is not always effective; errors in assessing the importance of tasks are possible.	Strives for development, but may show insufficient regularity or depth in studying 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. 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	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 creativity, offers unconventional solutions, and implements

	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.	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.	knowledge, but does not always do so actively. 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.	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. Able to correctly prioritize activities, taking into account importance, urgency, and long-term goals. Develops detailed work plans and successfully
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				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.
<i>Competence: PC-2 Able to conduct scientific research based on existing methods in a specific area of professional activity</i>				
ID-1 PC-2 Conducts scientific research in the field of parallel computer	Incapable of conducting independent scientific research in the field of parallel computer technologies. Uses parallel	Conducts scientific research using parallel computing, but the research is often limited to basic or outdated approaches.	Conducts scientific research in the field of parallel computer technologies, solving	Initiates and successfully conducts scientific research in the field of

technologies. ID-2_{PC-2} Conducts reviews of scientific articles, abstracts and dissertations in the fields of mathematics and information technology	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. 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.	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. 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	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. Reviews scientific papers in the fields of mathematics and information science, providing comprehensive and well-reasoned reviews, although the detail could sometimes be improved.	parallel computer technologies, proposing new approaches or solutions. Demonstrated deep knowledge of the theory and practice of parallel computing, applying it 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. Constantly improves
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		knowledge in the field of mathematical and information technologies is required for higher quality peer review.	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.	his knowledge in the field of parallel computer technologies, actively follows new achievements and research in this area. 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
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				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.
<i>Competence: PC-3 Capable of conducting methodological and expert work in the field of mathematics and computer science</i>				
ID-1 PC-3 Conducts expert	Incapable of conducting expert	Conducts expert work in	Conducts expert	Conducts expert

work in mathematics. ID-2 PC-3 Conducts expert work in the field of computer science ID-3 PC-3 Prepares teaching materials in the fields of mathematics and computer science	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. Unable to carry out expert work in the field of computer science at the required level. Demonstrates superficial 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	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. Has basic knowledge in computer science, but may experience difficulties in analyzing complex systems when conducting expert work. Expert opinions are superficial and may contain shortcomings or insufficiently convincing arguments. Evaluates software and technical solutions, but	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	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 substantia
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	practical value. Shows no interest in development and does not follow advances in computer science. 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 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.	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. 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 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.	innovations occurs with some delay. He has a strong knowledge of computer science and applies it when conducting expert work, but may sometimes 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	ted, 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. Deep understanding of computer science, including algorithms, data structures, programming, databases,
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		technological developments, but may not always be able to quickly implement new approaches. 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 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	computer networks and other key areas. Confidentially conducts expert work using modern methodologies and tools, applies 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
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			interactivity.	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. Develops high-quality teaching materials that are clearly structured, accessible, and meet modern requirements. Demonstrates a deep knowledge of mathematics and computer
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				science, which is reflected in the accuracy and 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
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				are positively evaluated by colleagues, students or experts in the field of education.
<i>Competence: PC-4 Able to conduct patent research, determine forms and methods of legal protection and defense of rights to the results of intellectual activity, manage rights to them to solve problems in the field of development of science, engineering and technology</i>				
ID-1 PC-4 Makes rational choices regarding methods of protecting intellectual property rights; ID-2 PC-4 Conducts patent research in the field of computing and communication systems.	Does not have sufficient knowledge about intellectual property protection and is unable to make an informed choice of protection method. Makes mistakes when completing documents, which can lead to registration refusal or vulnerability of intellectual property rights. Does not take into account legal risks, which may lead to the loss of exclusive rights to development or scientific work. Shows no interest in studying legislation and modern methods of protecting intellectual property. Unable to advise colleagues or participate in the process of legal protection of intellectual property. Does not possess patent research methods and is unable to correctly analyze patent information.	Knows the basic methods of protecting intellectual property, but may have difficulty choosing the optimal method. Able to prepare basic documentation, but requires specialist assistance for complex legal issues. Does not always take into account all risks when choosing a protection method, which can lead to insufficient legal protection of the object. Has a superficial knowledge of patenting, licensing and copyright. Updates his knowledge irregularly, which may lead to the use of outdated security methods. Has a general understanding of patent research, but has difficulty	Possesses strong knowledge in the field of intellectual property protection, but may not always take into account all the nuances of specific cases. Makes the right choice of protection method, but in complex situations may require additional analysis or consultation with specialists. Able to prepare documentation for intellectual property protection, but it may require revision. Generally makes rational decisions, but may not take into account some strategic	Deeply understands the laws and regulations governing the protection of intellectual property, including patent law, copyright, trademarks and related rights. Confidently analyzes intellectual property and selects the most effective protection methods depending on the specifics of the development or scientific work.

	Makes mistakes in assessing the patentability of developments, which can lead to legal risks or denial of patent registration. Does not know how to work with patent databases, performs searches insufficiently comprehensively or with errors. Patent research reports do not meet requirements, contain incomplete or inaccurate data. Does not follow changes in patent legislation and shows no interest in studying modern methods of patent analysis.	analyzing complex technical solutions. Performs patent information searches but may not fully assess the novelty and patentability of a development. Analyzes only a limited range of sources, which may lead to incomplete or inaccurate conclusions. Able to prepare a report, but it requires significant revisions and additions. Updates his knowledge in the field of patent analysis irregularly, which reduces the effectiveness of research.	or economic factors. Keeps abreast of developments in the field of intellectual property, but does not always apply the latest methods in practice. Has strong knowledge in the field of patent research and is able to analyze technical solutions from the point of view of patent law. Performs searches and analysis of patent information, but may not take into account some specific aspects of international patent law. Formulates well-founded conclusions about the patent purity of developments, but in complex cases requires additional consultations with specialists. Able to prepare a	Able to competently prepare applications for patents, copyright certificates, register trademarks and draw up licensing agreements. Explains and justifies the choice of protection method, taking into account economic, legal and strategic aspects. Monitors changes in legislation and implements modern approaches to protecting intellectual property. Provides advice to colleagues and helps organize the process of protecting intellectual property in
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			patent research report, but may not always consider all potential legal risks. Keeps abreast of new trends in the patent field, but does not always apply the latest search and analysis methods.	scientific and industrial projects. He has a deep understanding of patent law, regulations, and international agreements governing the protection of intellectual property in the field of computing and communications systems. Confidentially conducts patent research, analyzes existing patents, and determines the patent purity of developed solutions. Uses specialized databases (WIPO, EPO, USPTO,
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				Rospatent , etc.) to search and analyze patent information. Provides sound assessments of the novelty and patentability of technical solutions and develops strategies for protecting intellectual property. Competently prepares patent research, compiles reports with a detailed analysis of the technological landscape and potential legal risks. Monitors trends in the patent field and new developments in computing and
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				communication systems, and applies current research methods.
<i>Competency: PC-6 Able to use modern methods of development and implementation of specific algorithms of mathematical models based on programming languages and application packages for modeling</i>				
ID-1 PC-6 Using modern software packages for modeling, it explores newly created mathematical models; ID-2 PC-6 Uses modern methods for developing algorithms for mathematical models ID-3 PC-6 Uses modern programming languages to implement specific algorithms and mathematical models	You're using modeling software packages ineffectively, resulting in models that don't meet requirements. Model analysis and diagnostics are performed without taking into account important factors, making it difficult to identify and resolve problems. Models are not optimized, and approaches to their analysis require significant improvement to achieve accurate results. Experiencing difficulties applying modern algorithm development methods to mathematical models, resulting in low algorithm accuracy and performance. Their choice of methods does not always match the task requirements, making problem solving difficult. Significant improvement in skills in selecting and	You use basic modeling software, but your approach to model analysis and diagnostics is limited. Some model elements require refinement, and a systems approach is not always applied adequately. Modeling results may require improvement in accuracy and efficiency, and problem identification and resolution are often limited to superficial analysis. uses standard algorithm development methods, but their accuracy and efficiency leave much to be desired. Algorithms solve problems, but in some cases, optimization or the use of more complex approaches is required to achieve better results. It is necessary to work	You're choosing the right mathematical modeling packages, but in some cases, your choice of tools or approaches could be improved. Your model analysis and diagnostics are conducted within standard procedures, but not all possible aspects are always considered. The work is high-quality, but additional efforts are needed to optimize and improve the accuracy of the models. Successfully applies current methods for developing algorithms for mathematical models and	Expertly selects and applies modern software packages for mathematical modeling. You successfully identify key aspects of models, conduct comprehensive analysis, and diagnose them using a systems approach. Your models are highly accurate and meet current standards. You effectively research and optimize models, identify

	applying methods for developing effective algorithms is needed. Struggles to use modern programming languages to implement algorithms and mathematical models. Code is often inconsistent, poorly structured, and inappropriate for the task. Algorithm implementation results in poor performance, and the choice of tools is inappropriate. Significant effort is required to improve programming skills and optimize code.	on improving our methods and increasing the efficiency of algorithm development. It uses modern programming languages, but the implementation of algorithms and mathematical models leaves much to be desired. The code solves the problem, but has optimization or performance issues. The code structure and readability could be improved, and the choice of tools is not always optimal for the task. Further development is required to achieve a higher level.	achieves good results. Algorithms perform tasks correctly, but can be improved in terms of accuracy or performance. Proficient in existing approaches, but more complex situations may require the use of more specific methods to improve results. Correctly uses modern programming languages to implement algorithms and mathematical models. The algorithms work, but could be improved in terms of performance and optimization. The code is readable and structured, but there is room for improvement. Overall, the approach is sound, but more suitable tools or methods could be used to	and resolve problems, allowing you to propose new solutions and improvements. He confidently utilizes cutting-edge development methods and algorithms for mathematical models, achieving high accuracy and optimization. His developed algorithms solve complex problems and fully meet modern requirements. He effectively applies cutting-edge tools and approaches, demonstrating a deep
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			improve efficiency.	understanding of the subject and a capacity for innovation. His work not only addresses current challenges but also proposes new, more effective solutions. She expertly utilizes modern programming languages to implement algorithms and mathematical models. Her code is highly performant, readable, and optimized. Her algorithms are implemented with all requirements in mind and deliver
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				excellent results. Her choice of tools and methods is fully justified, allowing her to solve problems with maximum efficiency and accuracy.
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Competency assessment criteria *

«Excellent» grade is awarded to the student if the most relevant and reliable sources of information are used, fully corresponding to the assigned task. Various types of sources are used. Advanced search methods are employed. The reliability and relevance of the information found are reasonably assessed. Information obtained from various sources fully covers the topic 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 assignment requirements and presented in a visual form. The assignment is completed in full, without logical errors and omissions. Conclusions and judgments are formulated clearly, logically, and consistently. The argumentation is expanded, using compelling evidence, examples, and references to authoritative sources. Philosophical categories, terms, and concepts relevant to the topic of the discussion are correctly applied. Alternative points of view are considered, and their strengths and weaknesses are substantiated. The work meets the academic requirements; conclusions are based on logic and facts, and there are no errors in reasoning. Constantly strives for professional and personal growth, striving to acquire new knowledge and skills. Clearly articulates personal and professional goals and successfully achieves them, demonstrating initiative. Demonstrates a high level of creativity, offers unconventional solutions, and implements innovative ideas. Analyzes their achievements and mistakes, and adjusts their self-development strategies. Effectively manages their time, utilizes a variety of methods and resources for learning and development. Shares experience, inspires, and motivates others to develop. Ability to wisely prioritize activities, considering importance, urgency, and long-term goals. Develops detailed work plans, successfully allocates resources and time. Achieves assigned tasks on time, demonstrating organization and independence. Quickly adapts to change, adjusting priorities if necessary without losing effectiveness. Evaluates their performance, identifies strengths and weaknesses, and uses these for further development. Takes responsibility for decisions made and their implementation. Initiates and successfully conducts scientific research in the field of parallel computer technologies, proposing new approaches and 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 merit. His work is of high scientific significance, published in leading scientific journals, or presented at international conferences. He continuously improves his knowledge of parallel computing technologies and actively monitors new advances and research in this field. He reviews scientific

articles, abstracts, and dissertations in mathematical and information science fields at a high level, providing detailed, well-founded, and constructive comments. He demonstrates deep knowledge of mathematics and information technology, which allows him to draw informed conclusions about the scientific significance and novelty of the presented materials. He skillfully identifies the strengths and weaknesses of his work, analyzes the methodology and research results, and offers well-founded recommendations for improvement or revision. The reviewed works are of high quality, and the comments are constructive and aimed at advancing the research topic. Continuously improves their knowledge, monitors new advances in science, and actively participates in the scientific community. Conducts high-level expert work in mathematics, providing comprehensive and insightful analysis based on cutting-edge mathematical theories and methods. Possesses deep knowledge and experience in various areas of mathematics, allowing them 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, possessing scientific value. Continuously improves their knowledge and practical skills, monitors new advances in mathematics, and actively participates in the scientific community. The results of their work influence the development of projects, research, or solutions to professional problems. Has a deep understanding of computer science, including algorithms, data structures, programming, databases, computer networks, and other key areas. Confidently conducts expert work using modern methodologies and tools, applying analytical and systems 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 for optimizing systems and processes. Actively improves knowledge, monitors current trends in computer science, and utilizes cutting-edge technologies in their expert work. Expert opinions are recognized by colleagues, used in scientific and applied projects, and have a high level of reliability. Develops high-quality teaching materials that are clearly structured, accessible, and compliant with modern requirements. Demonstrates in-depth knowledge of mathematics and computer science, which is reflected in the accuracy and relevance of the material presented. Uses modern teaching methods, interactive technologies, and illustrative examples to facilitate effective learning. Prepares materials that can be used both for independent study and in the educational process. Updates and improves teaching materials in accordance with the latest scientific and technological advances. Materials are positively evaluated by colleagues, students, and educational experts. Has a thorough understanding of laws and regulations governing the protection of intellectual property, including patent law, copyright, trademarks, and related rights. Confidently analyzes intellectual property and selects the most effective protection methods depending on the specifics of the development or scientific work. Capable of competently drafting patent applications, copyright certificates, registering trademarks, and drafting licensing agreements. Explains and justifies the choice of protection method, taking into account economic, legal, and strategic aspects. Monitors legislative changes and implements modern approaches to intellectual property protection. Consults colleagues and helps organize the intellectual property protection process in scientific and industrial projects. Has a thorough understanding of patent law, regulations, and international agreements governing intellectual property protection in the field of computing and communications systems. Confidently conducts patent research, analyzes existing patents, and determines the patentability of developed solutions. Uses specialized databases (WIPO, EPO, USPTO, Rospatent, etc.) to search and analyze patent information. Reasonably assesses the novelty and patentability of technical solutions and develops strategies for protecting intellectual property. Expertly prepares patent research, compiling reports with a detailed analysis of the technological landscape and potential legal risks. Stays abreast of patent trends and new developments in computing and communications systems, applying cutting-edge research methods. Expertly selects and applies modern software packages for mathematical modeling. During your work, you successfully identify key aspects of models, conduct comprehensive analysis, and diagnose them using a

systems approach. Your models are highly accurate and meet current standards. You effectively research and optimize models, identifying and resolving problems, enabling you to propose new solutions and improvements. Confidently utilizes the latest methods for developing algorithms for mathematical models, achieving high accuracy and optimization. The developed algorithms solve complex problems and fully comply with modern requirements. Effectively applies cutting-edge tools and approaches, demonstrating a deep understanding of the subject matter and a capacity for innovation. Your work not only solves current problems but also proposes new, more effective solutions. She expertly utilizes modern programming languages to implement algorithms and mathematical models. Her code is highly performant, readable, and optimized. Her algorithms are implemented with all requirements in mind and deliver excellent results. Her choice of tools and methods is fully justified, allowing her to solve problems with maximum efficiency and accuracy.

a grade of **"good"** if the sources generally correspond to the task, but with 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 information is structured, but there are minor gaps in the coverage of the topic. The information has been analyzed, but it may contain minor inconsistencies or insufficient depth of processing. The information is presented in a logical and structured form, but minor flaws in formatting are possible. Conclusions are generally logical, but may contain minor inaccuracies or redundant wording. Arguments are presented, but individual judgments 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 be more detailed. The work generally corresponds to the task, but there may be minor logical gaps or stylistic flaws. Striving for development, but may lack regularity or depth in exploring new areas. Sets goals, but does not always clearly define the path to achieving them. Demonstrates creativity, but does not always apply it in practice. Analyzes their actions, but does not always draw conclusions for further growth. Generally plans their training and development effectively, but sometimes experiences difficulties with time management. Ready to share knowledge, but does not always do so proactively. Prioritizes correctly, but may sometimes underestimate the importance of tasks. Creates a work plan, but does not always adhere to it strictly. In most cases, successfully completes assigned tasks, but minor delays are possible. Can revise plans when circumstances change, but this sometimes requires additional time. Evaluates work results, but does not always apply the findings in practice. Takes a responsible approach to completing tasks, but may require outside supervision. Conducts scientific research in the field of parallel computer technologies, solving problems using existing methods and algorithms. Employs parallel computing in their research, but may encounter difficulties when solving more complex and non-standard problems. Develops and applies parallel algorithms; however, the work may require refinement to improve their efficiency or accuracy. The work is scientifically significant, but may be presented on less prestigious scientific platforms. Keeps abreast of advances in parallel computing, but does not actively update their knowledge and skills as required by the field. Reviews scientific papers in mathematical and information science fields, providing comprehensive and well-founded feedback, although the detail could sometimes be improved. Possesses a strong knowledge of the relevant fields, which enables them to identify the key strengths and weaknesses of papers. Recommendations and comments provide useful directions for revising articles and dissertations, but may not always be sufficient for a thorough reworking of the work. Objective in their assessments and clearly articulates their conclusions, but may sometimes overlook certain nuances or details. Regularly updates their knowledge, but may not actively participate in new scientific trends. Conducts expert work in mathematics effectively, providing well-founded conclusions and recommendations, although details may sometimes require clarification or improvement. Possesses a sound knowledge and understanding of fundamental mathematical

theories and methods, enabling them to solve moderately complex problems with satisfactory quality. Expert opinions are clear, but may not always be as detailed or in-depth as possible. Their work is valuable for practical use, but may require additional clarification or adjustments. Regularly updates their knowledge and identifies new approaches, although the implementation of innovations is somewhat delayed. Possesses a solid understanding of computer science and applies it in their expert work, but may occasionally make minor errors. Able to analyze and evaluate information systems, software solutions, and databases, but may sometimes require clarification or additional research. Draws logical and well-founded 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 up with technological developments, but may not always promptly implement new approaches. Develops teaching materials that meet educational standards and requirements. The materials are structured and logical, but additional clarification or examples may be needed in some areas. Utilizes modern approaches to teaching, but may not be proactive in implementing innovative technologies. Teaching materials are clear and useful, but may require periodic revision or updating. Overall, the materials are successfully applied in the teaching process, but could be improved in terms of clarity and interactivity. Possesses a solid knowledge of intellectual property protection, but may not always take into account all the nuances of specific cases. Makes appropriate selection of protection methods, but in complex situations may require additional analysis or consultation with specialists. Able to prepare documentation for intellectual property protection, but it may require revision. Generally makes rational decisions, but may not take into account certain strategic or economic factors. Follows developments in the field of intellectual property, but does not always apply the latest methods in practice. Possesses a solid knowledge of patent research and is able to analyze technical solutions from a patent law perspective. Searches for and analyzes patent information, but may not take into account certain specific aspects of international patent law. Formulates well-founded conclusions about the patent purity of developments, but in complex cases requires additional consultation with specialists. Able to prepare a patent research report, but may not always consider all potential legal risks. Aware of new trends in the patent field, but does not always apply the latest search and analysis techniques. Correctly selects packages for modeling mathematical models, but in some cases the choice of tools or approaches could be improved. Your analysis and diagnostics of models are carried out within the framework of standard procedures, but not always all possible aspects are taken into account. The work is performed to a high standard, but additional effort is required to optimize and improve the accuracy of the models. Successfully applies current methods for developing algorithms for mathematical models and achieves good results. The algorithms correctly perform tasks, but can be improved in terms of accuracy or performance. Well-versed in existing approaches, but in more complex situations, more specific methods may be required to improve results. Correctly uses modern programming languages to implement algorithms and mathematical models. The algorithms work, but can be improved in terms of performance and optimization. The code is readable and structured, but there is room for improvement. Overall, the approach is correct, but more suitable tools or methods can be used to increase the efficiency of the work.

"satisfactory" grade is given to the student if: Some sources are not relevant to the task or are of questionable reliability. Only basic resources are used, without analyzing other sources. The assessment of reliability is superficial or absent. A limited number of search methods are used, and no filters are applied. Information is collected, but poorly structured, or important aspects are omitted. There is an attempt at analysis, but without in-depth generalization and identification of key ideas. Information is presented, but without clear logic or poorly formatted. The learning assignment is partially completed, with logical errors or omissions. The wording of conclusions and judgments is sometimes unclear, and logical inconsistencies may be present. The argumentation is superficial, and judgments are insufficiently substantiated. The use of

philosophical terminology is limited, sometimes incorrect. Analysis of alternative positions is partial or absent. The work is completed with deviations from requirements, and logical errors and deficiencies in argumentation are present. Shows an interest in developing, but does so irregularly or formally. Has a general development vector, but experiences difficulties in achieving the set goals. Sometimes offers innovative ideas, but rarely puts them into practice. Poorly analyzes own achievements and mistakes, and fails to adjust behavior based on experience. Self-development planning is chaotic, and available resources are not always utilized. Shares knowledge sporadically, without a systematic approach. Prioritizes ineffectively, and may misjudge the importance of tasks. Plans work, but often deviates from the plan or does not complete it completely. Achieves goals with delays or requires additional support. Difficulty adapting to change, requiring significant time for restructuring. Weakly analyzes performance results and does not use acquired experience for further improvement. Can complete tasks, but without the necessary level of initiative and responsibility. Conducts scientific research using parallel computing, but the research is often limited to basic or outdated approaches. Applies parallel technologies, but mainly to solving simple or well-known problems. Demonstrates basic knowledge of parallel computer technologies, but their work often lacks originality or scientific significance. Not always able to offer optimal solutions or methods, often requires consultations and assistance. Lacks an active interest in innovations in the field and sometimes uses outdated methods and approaches. Reviews works in mathematical and information technology areas, 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. Identifies key shortcomings, but recommendations are often general in nature and do not always contribute to significant improvement of the work. Occasionally makes simplified or inaccurate conclusions, especially on complex scientific issues. Further development and updating of knowledge in the field of mathematical and information technology is required to improve the quality of reviews. Conducts expert work in mathematics, but often shortcomings in the depth of analysis or justification of conclusions are identified. Knowledge of mathematics is limited and sufficient only for solving basic problems. Expert opinions are often general in nature, not always ensuring a high degree of accuracy and validity. Recommended solutions may not be detailed enough or do not take into account all aspects of the problem. Additional practice and updating of knowledge are required to improve the quality of expert work. Possesses basic knowledge of computer science, but may experience difficulties analyzing complex systems when conducting expert work. Expert opinions are superficial and may contain flaws or insufficiently convincing arguments. Evaluates software and technical solutions, but cannot always suggest optimal ways to improve them. Requires additional verification or consultation with more experienced specialists. Knowledge is updated slowly, and work is conducted primarily using outdated methods and without regard for modern trends. Prepares teaching materials, but they may not be comprehensive or structured enough. Information is presented clearly, but may contain inaccuracies or outdated information. Uses traditional methods of presenting information, without regard for modern educational trends. Teaching materials require significant revision to improve their effectiveness. The materials can be useful, but require additional clarification from the instructor. Knows the basic methods of protecting intellectual property, but may experience difficulty choosing the optimal method. Able to prepare basic documentation, but requires the assistance of specialists for complex legal issues. Does not always consider all the risks when choosing a protection method, which may lead to insufficient legal protection of the property. Possesses a superficial knowledge of patenting, licensing, and copyright. Updates this knowledge inconsistently, which may result in the use of outdated protection methods. Has a general understanding of patent research, but struggles with analyzing complex technical solutions. Searches for patent information, but may not fully assess the novelty and patentability of a development. Analyzes only a limited range of sources, which may lead to incomplete or inaccurate conclusions. Is able to prepare a report, but it requires significant revision and additions. Updates their knowledge of patent analysis inconsistently,

which reduces the effectiveness of research. Uses basic modeling programs, but your approach to model analysis and diagnostics is limited. Some model elements require refinement, and a systems approach is not always applied adequately. Modeling results may require improvement in accuracy and efficiency, and problem identification and resolution are often limited to superficial analysis. Uses standard algorithm development methods, but their accuracy and efficiency leave much to be desired. Algorithms solve problems, but in some cases, optimization or the use of more complex approaches is required to achieve better results. It is necessary to refine its methods and improve the efficiency of algorithm development. It uses modern programming languages, but the implementation of algorithms and mathematical models leaves much to be desired. The code solves the problem but has optimization or performance issues. The code structure and readability could be improved, but the choice of tools is not always optimal for the task. Further development is required to achieve a higher level.

"failing" grade if the sources do not correspond to the assigned learning objective. Only one type of source is used, such as random websites. The reliability and relevance of the information is completely lacking. The search is conducted haphazardly, without the use of basic search methods. The information is presented chaotically, and there is no logic to data integration. There is no analysis of the information, and systematization is reduced to simple copying of data. The data is not presented in a user-friendly format, and the assignment does not meet the requirements. The assignment was completed with significant errors or was not completed at all. Conclusions are unclear, and there is no logical connection between judgments. Argumentation is weak or absent, and conclusions are declarative. Philosophical categories and concepts are not used or applied incorrectly. Alternative viewpoints are not considered. The work does not meet the requirements of the assignment and contains significant logical and methodological errors. The student lacks initiative in learning and professional development. The student lacks clear goals and a desire to achieve them. The student lacks creativity and is not interested in finding new solutions. Doesn't analyze their actions or learn from mistakes. Doesn't plan for their own development or utilize available educational and professional resources. Doesn't share their experience or show interest in teaching others. Incapable of prioritizing, choosing tasks that are unimportant or non-urgent. Has no logical structure or is completely absent. Fails to achieve goals, and work is completed late or of poor quality. Incapable of adapting to changing conditions and has difficulty adjusting their plans. Lacks self-analysis and repeats the same mistakes. Avoids responsibility and requires constant external supervision. Incapable of conducting independent scientific research in the field of parallel computing. Uses parallel computing with a high number of errors or does not use modern research approaches at all. Work has no scientific value or does not lead to significant results. Incapable of solving problems that require in-depth knowledge of parallel computing. Does not follow advances in the field, does not update their knowledge, and does not apply modern methods. Unable to objectively and fully review scientific articles, abstracts, and dissertations in mathematical and information science fields. Reviews are insufficiently substantiated, often superficial or incomplete, and do not provide valuable recommendations for improving the work. The reviewed materials are assessed superficially, without a deep understanding of the research subject, which may lead to incomplete or erroneous conclusions. Fails to update their knowledge in the field of scientific research, which may result in missing important aspects during review. Demonstrates a lack of engagement and professionalism in reviewing. Incapable of conducting expert work in mathematics at the required level and does not provide substantiated conclusions or recommendations. Knowledge 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 problems. Requires constant assistance and intervention to complete work and does not demonstrate a desire to develop in their field. Does not update their knowledge and does not follow new advances in mathematics, which impacts the quality of their work. Incapable of conducting expert work in the field of computer science at the required level. Demonstrates

superficial knowledge, which leads to erroneous conclusions in expert reports. Fails to take into account modern methods and technologies and is unable to objectively evaluate software and information systems. Expert reports are inaccurate, incomplete, or lack practical value. Shows no interest in development and does not follow advances in computer science. Prepares teaching materials in the field of mathematics and computer science. The presented material does not meet modern requirements or educational standards. Examples, practical applications, and clarity are lacking, which hinders comprehension of the information. The materials do not contribute to effective learning and require significant revision. Shows no commitment to improving and updating teaching materials. Insufficient knowledge of intellectual property protection and is unable to make an informed choice of protection method. Makes errors in document preparation, which may result in denial of registration or vulnerability of intellectual property rights. Fails to consider legal risks, which may lead to the loss of exclusive rights to a development or scientific work. Shows little interest in studying legislation and modern methods of intellectual property protection. Incapable of consulting colleagues or participating in the process of legal protection of intellectual property. Lacks knowledge of patent research methods and is unable to correctly analyze patent information. Makes errors in assessing the patentability of developments, which may lead to legal risks or the denial of patent registration. Unable to work with patent databases, performs incomplete or error-prone searches. Patent research reports do not meet requirements and contain incomplete or inaccurate data. Does not follow changes in patent law and shows no interest in studying modern methods of patent analysis. Ineffective use of application software packages for modeling, resulting in the creation of models that do not meet requirements. Analysis and diagnostics of models are conducted without taking into account important factors, which complicates problem identification and resolution. Models are not optimized, and approaches to their research require significant improvements to achieve correct results. Experiencing difficulties in applying modern methods of algorithm development for mathematical models, resulting in low accuracy and performance of algorithms. Their choice of methods doesn't always match the task requirements, which complicates problem solving. Significant improvement in skills in selecting and applying methods is needed to develop effective algorithms. They struggle with using modern programming languages to implement algorithms and mathematical models. Code often doesn't work correctly, is poorly structured, and doesn't meet the task requirements. Algorithm implementation results in poor performance, and their choice of tools is inappropriate. Significant effort is required to improve programming skills and optimize code.

Assessment tools for Industrial Internship Pre-graduation Internship

1. Tasks to assess knowledge gained in practice (basic level)

Controlled competencies or their parts (competence code)	Formulation of the task	
UK-1 UK-6 PC-2 PC-3 PC-4 PC-6	Task 1	Conduct a study using mathematical and computer modeling methods in a given area to solve a relevant applied problem
	Task 2	Develop proposals for the use of acquired knowledge in the field of mathematics and computer science in practice.
	Task 1	Conduct research in the field of planning pedagogical activities within the framework of the mathematical direction
	Task 2	Develop proposals for the practical use of the results obtained during the final qualifying work.

2. Tasks to assess knowledge gained in practice (advanced level)

Controlled competencies or their parts (competency code)	Formulation of the task	
UK-1 UK-6 PC-2 PC-3 PC-4 PC-6	Task 1	Conduct a study using mathematical and computer modeling methods in a given area to solve a relevant applied problem (develop a mathematical model and evaluate its effectiveness)
	Task 2	To develop proposals and recommendations for the use of acquired knowledge in the field of mathematics and computer science in practice.
	Task 1	Conduct research and monitoring in the field of planning pedagogical activities within the framework of the mathematical direction
	Task 2	Develop proposals and recommendations for the practical use of the results obtained during the final qualifying work.

3. Tasks to assess skills and abilities acquired in practice (basic level)

Controlled competencies or their parts (competence code)	Formulation of the task	
UK-1	Task 1	Conduct a study using mathematical and computer

UK-6 PC-2 PC-3 PC-4 PC-6		modeling methods in a given area to solve a relevant applied problem
	Task 2	Develop proposals for the use of acquired knowledge in the field of mathematics and computer science in practice.
UK-1 UK-6 PC-2 PC-3 PC-4 PC-6	Task 1	Conduct research in the field of planning pedagogical activities within the framework of the mathematical direction
	Task 2	Develop proposals for the practical use of the results obtained during the final qualifying work.

4. Tasks that allow you to assess the skills and abilities acquired in practice (advanced level)

Controlled competencies or their parts (competency code)	Formulation of the task	
UK-1 UK-6 PC-2 PC-3 PC-4 PC-6	Task 1	Conduct a study using mathematical and computer modeling methods in a given area to solve a relevant applied problem (develop a mathematical model and evaluate its effectiveness)
	Task 2	To develop proposals and recommendations for the use of acquired knowledge in the field of mathematics and computer science in practice.
UK-1 UK-6 PC-2 PC-3 PC-4 PC-6	Task 1	Conduct research and monitoring in the field of planning pedagogical activities within the framework of the mathematical direction
	Task 2	Develop proposals and recommendations for the practical use of the results obtained during the final qualifying work.

5. Methodological materials defining the procedures for assessing knowledge, skills, abilities and (or) work experience, characterizing the stages of competence development

The procedure for completing the training The practice includes the following stages:

- preparatory;
- functional- activity-based ;
- final.

At each stage of the internship, ongoing monitoring of competency development is carried out. The tasks offered to the student allow them to test competencies: UK-1, UK-6, PC-2, PC-3, PC-4, and PC-6.

The assignments require mastery of competencies at different levels: basic and advanced . At the basic level, students are expected to use known methods and technologies to solve production problems, while at the advanced level, a heuristic approach to solving assigned production tasks is added.

When checking assignments, the following are assessed:

- consistency and rationality of task execution;
- quantity and quality of studies conducted;
- independent contribution to the range of issues studied.

When checking reports, the following are assessed:

- correctness of design;
- quality of the results presented;
- the quality of the presented graphic and tabular material.

When defending a report, the following are assessed:

- the student's proficiency in the material being presented;
- independence of judgment;
- the ability to make informed conclusions.