

"AGREED"

Teaching and Methodological Association of the
Coordinating Council of OshSU Associate
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"APPROVED"

Rector Osh State University Professor
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OSH STATE UNIVERSITY

Standard of Higher Professional Education (Master's)

FIELD OF STUDY: 510100 – Mathematics

Qualification: Master

The Higher Professional Education Standard for the Master's Degree Program in the Field of 510100 – Mathematics

The Higher Professional Education Standard for the Master's Degree Program in the Field of 510100 – Mathematics was discussed by the Sectoral Committee on "Physical-Mathematical and Engineering-Technical" education programs of the Educational-Methodological Association of Osh State University.

It was approved by the Coordination Council of the Educational-Methodological Association of Osh State University by Resolution No. 4 dated June 24, 2025.

It was proposed for approval by the Academic Council of Osh State University by Resolution No. 9 dated July 5, 2025, and was approved by the Rector's order No. 3426.

Expert opinions on the education standard were obtained from the following foreign experts:

1. Mikesh J. – Doctor of Physical and Mathematical Sciences, Professor, Palacký University Olomouc, Czech Republic.
2. Artikbayev A. – Doctor of Physical and Mathematical Sciences, Professor, Tashkent State Transport University, Uzbekistan.
3. Aldai M. – Candidate of Physical and Mathematical Sciences, Associate Professor, L.N. Gumilyov Eurasian National University, Kazakhstan.

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Chapter 1. General Provisions

This independently developed standard for higher professional education, specifically for Master's training in the **510100 – Mathematics** program at Osh State University (hereinafter – OshSU), has been approved by the order of the university rector. This education standard was developed independently by OshSU, taking into account the requirements of the state standard for higher professional education at the Master's level.

The independently developed education standard at OshSU (hereinafter – the education standard) is equivalent to state educational standards and shares a unified structure of higher professional education requirements. It fulfills its functions by ensuring the unity and quality of education, the objectivity of control, and also sets specific requirements for the development of the implemented educational program.

The requirements for the conditions and results of mastering the main educational program, as established by this education standard, are no lower than the corresponding requirements of state educational standards.

The education standard was developed with the participation of the following parties:

I. From the Institute of Mathematics, Physics, Engineering, and Information Technologies:

1. Matieva G. – Doctor of Physical and Mathematical Sciences, Professor of the Department of Algebra and Geometry, Corresponding Member of the National Academy of Sciences of the Kyrgyz Republic.
2. Selivanova N.S. – Senior Lecturer, Department of Algebra and Geometry.
3. Mustapakulova Ch.A. – Senior Lecturer, Department of Algebra and Geometry.
4. Sarygulova N.A. – Lecturer, Department of Algebra and Geometry.

II. From Employers and Graduates:

1. Isakova V.T. – Candidate of Pedagogical Sciences, Associate Professor, Dean of the Faculty of Mathematics and Computer Technologies, Osh State Pedagogical University (employer).
2. Mamatova A. – Mathematics Teacher, A. Navoi Secondary School No. 18 (employer).
3. Akylbek u. N. – Mathematics Teacher, Kyrgyz-Turkish Friendship School-Lyceum No. 52 (graduate).
4. Mamasidikov E. – Mathematics Teacher, Kyrgyz-Turkish Friendship School-Lyceum No. 52 (graduate).

III. From Staff of Domestic Universities:

1. Abdullaeva Ch.Kh. – Doctor of Physical and Mathematical Sciences, Associate Professor, Director of the Professional College at B. Sydykov Kyrgyz-Uzbek International University.
2. Kanetov B.E. – Doctor of Physical and Mathematical Sciences, Professor, Head of the Academician A.A. Borubaev Department of Algebra, Geometry, Topology, and Higher Mathematics Teaching at Kyrgyz National University (KNU).
3. Kasymova T.J. – Candidate of Physical and Mathematical Sciences, Associate Professor, Head of the "Information Technologies" Educational Program.
4. Khalmatov A.A. – Candidate of Physical and Mathematical Sciences, Associate Professor, Department of Physics, Mathematics, and Teaching Methodology at B. Sydykov Kyrgyz-Uzbek International University.

IV. From Staff of Foreign Universities:

1. Mikes J. – Doctor of Physical and Mathematical Sciences, Professor, Palacký University Olomouc, Czech Republic.
2. Ismoilov Sh.Sh. – PhD in Mathematics, Tashkent State Transport University, Uzbekistan.
3. Sultonov B.A. – PhD in Mathematics, Urgench State University, Uzbekistan.
4. Ergasheva Sh.R. – PhD in Mathematics, Tashkent State Transport University, Uzbekistan.

V. From Representatives of Scientific Organizations and Academic Structures, State and Public Organizations:

1. Attokurova Ch.A. – Senior Researcher, Laboratory of Natural Sciences and Mathematical Education, Kyrgyz Academy of Education.

This educational standard was developed in accordance with the requirements set forth in the following resolutions, laws, regulations, and other normative legal documents:

- Decree of the President of the Kyrgyz Republic No. 243 of July 18, 2022, "On measures to increase the potential and competitiveness of higher professional education organizations of the Kyrgyz Republic";
- Resolution of the Cabinet of Ministers of the Kyrgyz Republic No. 654 of November 21, 2022, "On amendments to certain decisions of the Government of the Kyrgyz Republic regarding the granting of special status to state higher educational institutions";
- Resolution No. 45 of February 5, 2024, "On amendments to certain resolutions of the Government of the Kyrgyz Republic, Cabinet of Ministers of the Kyrgyz Republic regarding the granting of special status to state higher educational institutions";
- Law "On Education," adopted on August 11, 2023;
- The National Qualifications System, National Qualifications Framework, European Qualifications Framework, and Sectoral Qualifications Frameworks of the Kyrgyz Republic;
- Standard developed for the field 510100 – Mathematics, approved by Order No. 1578/1 of September 21, 2021, "On the Approval of State Educational Standards for Higher Professional Education";
- "On the Approval of the Layout of the State Educational Standard for Primary, Secondary, and Higher Professional Education of the Kyrgyz Republic" No. 371 of July 8, 2024;
- The Charter of OshSU and normative local documents valid at the time of approval of this standard;

The procedure for developing, approving, and amending this educational standard is regulated by the "Regulations on the Development, Approval, and Amendment of Educational Standards at OshSU";

CHAPTER 2. ABBREVIATIONS

EP - educational programme;

HPE - higher professional education;

SSES – self-set educational standard;

BEP - basic educational programme;

EMA - educational and methodological association;

GPC - general professional competences;

PC - professional competences;

LO – learning outcomes;

HEI – higher educational institution;

TS - teaching staff.

CHAPTER 3. TERMS

The following terms and definitions are used in this self-set educational standard of higher professional education:

- **basic educational programme** - a set of educational and methodological documentation regulating the goals, expected outcomes, content, organization and implementation of the educational process in the relevant direction of training;
- **bachelor** - qualification level of higher professional education, which entitles the student to enter a Master's programme and to carry out professional activities;
- **double qualification** - qualification obtained in the process of implementing an educational programme at the junction of educational standards of two directions (profiles) / specialties;
- **valid normative internal regulations** - normative internal regulations enter into force during the development of this Regulation;
- **distance education** - distant form of education - educational process with the use of a set of telecommunication technologies, aimed at providing an opportunity for students to master the bulk of the required information without direct contact between students and teachers during the learning process;
- **elective disciplines** - academic disciplines reflecting the individual preparedness of the student, included in the elective component within the credits established by educational organisations, taking into account the peculiarities of socio-economic development and the needs of a particular region;
- **individual student study plan (ISP)** - defines the student's study programme for a semester, formed on the basis of academic disciplines offered for the semester;
- **competence** - a predetermined social requirement (norm) to the educational training of a student necessary for his/her effective, productive activity in a certain sphere;
- **credit** - a conditional measure of labour intensity of a basic professional educational programme;
- **credit technology of education** - education based on independent choice and planning of the sequence of study of disciplines of the student by accumulating credits;
- **Master** - the level of qualification of higher professional education, which gives the right to enter postgraduate studies and (or) basic doctoral studies (PhD on the profile) and to carry out professional activities;
- **training direction** - a set of educational programmes for training graduates with higher professional education (bachelors, masters, specialists) of different profiles, integrated on the basis of common fundamental training;
- **general competences** - professionally oriented competence related to the formation and solution of cognitive problems, search for non-standard solutions and determining the fundamental nature of science;
- **online education** - distance education with the use of information technologies in real time;
- **basic educational programme** - a set of educational and methodological documentation regulating the goals, expected outcomes, content, organization and implementation of the educational process in the relevant area of training;
- **profile** - focus of the main educational programme on a specific type and (or) object of professional activity, major;

- **learning outcome** - competences acquired as a result of training on the main educational programme/module;
- **self-developed competences** - competences introduced by the developers of the standard;
- **form of sectoral education** - implementation of an educational programme by several educational organisations;
- **ECTS** - European Credit Transfer and Accumulation System.

CHAPTER 4. SCOPE OF APPLICATION

4.1. This independently developed standard at Osh State University (hereinafter, the educational standard - ES) presents a set of norms, rules, and requirements for the development and implementation of the Main Educational Program (MEP) for obtaining a Master's degree in higher professional education in the field 510100 – MATHEMATICS.

4.2. This educational standard defines the requirements for training specialists with a Master's degree in the field 510100 – MATHEMATICS. Upon completion of the program, graduates are awarded the qualification "Master" in this field.

4.3. This educational standard serves as the basis for the development, practical implementation, and teaching of organizational and methodological documents, such as: the Main Educational Program, the Basic Curriculum, work programs for academic disciplines and practical training, and the state final аттестация (attestation) program for the Master's educational program in the field 510100 – MATHEMATICS.

4.4. The main users of this educational standard are:

- Administration and scientific-pedagogical staff (professors, lecturers, researchers) of universities responsible for developing, effectively implementing, and updating core professional educational programs, taking into account advancements in science, technology, and social spheres relevant to this field and level of training;
- The Rector, Vice-Rectors, the Teaching and Methodological Association of OshSU and its relevant sectoral committees, deans of faculties, directors of institutes and colleges, heads of departments, heads of divisions, heads of PCCs (Professional Competence Committees), and others responsible, within their competence, for the quality of graduate training and the organization of the educational process;
- Students responsible for the effective implementation of their learning activities to master the university's main educational program in this field of study;
- Associations of specialists and employers in the relevant professional field;
- Examination and state final attestation commissions evaluating the academic achievements and quality of knowledge of OshSU graduates;
- Employers in the relevant professional field for guiding the employment of graduates;
- Organizations funding higher professional education;
- Authorized organizations that accredit educational programs in the field of education.
- Representatives of state executive bodies ensuring compliance with legislation in the education system, and control and oversight of quality in higher professional education;
- Accreditation agencies that accredit educational programs and organizations in higher professional education;
- Bachelors when choosing Master's fields of study;

Chapter 5. Normative Period of Study and Workload of the Master's Educational Program in the Field 510100 - MATHEMATICS

5.1. Requirements for Applicant Knowledge Level

Applicants aspiring to obtain higher professional education with the qualification "**Master**" must have one of the following levels of education:

- Higher professional education with the qualification "**Bachelor**";
- Higher professional education with the qualification "**Specialist**";

They must provide:

- A diploma of higher professional education from a Bachelor's program;
- A diploma of higher professional education from a Specialist's program;
- A diploma of higher professional education from a Master's program (for second Master's degree).

5.2. Forms of Study;

When implementing this educational standard, a Master's degree in the field **510100 – MATHEMATICS** can be obtained through the following forms of study:

- Full-time;
- Full-time-online (using distance learning technologies where appropriate conditions exist);
- Part-time (using distance learning technologies) (the study period for this form is extended by 6 months);

5.3. Total Workload of the Master's Educational Program in 510100 – MATHEMATICS

The total workload for the Master's educational program in **510100 – MATHEMATICS** is **at least 120 credits**, regardless of the form of study, educational technologies used, whether it's a dual degree, a network form (program implemented by several educational organizations), or an individual student's study plan, including accelerated learning.

If a **dual qualification** is awarded, the program is implemented at the intersection of two field standards, and the workload increases to **at least 180 credits**.

5.4. Normative Period of Study

The normative period of study for Master's students in the **510100 – MATHEMATICS** program for full-time study, including holidays provided after the state final attestation, is **at least 2 years** (if a dual qualification is awarded, the study period is extended by at least 1 year).

5.6. Academic Credit System

When organizing the educational process using the credit-educational technology, the volume of each academic discipline is a whole number of academic credits. **One academic credit is equal to 30 academic hours**. The duration of an academic hour is 45 minutes.

5.7. Individual Study Plan Durations

The norms for the duration of study under an individual study plan for a Master's student are determined based on the current normative internal regulations approved by OshSU's academic policy.

5.8. ECTS Credits

The workload for all types of academic work in the curriculum is established in **ECTS credits**. The workload of the main higher professional education program for full-time study is **60 credits per academic year and 30 credits per semester**.

5.9. Accelerated Programs

When implementing accelerated programs, the educational organization determines the study period based on the results of full or partial re-attestation (re-crediting) of learning outcomes for individual disciplines (modules) and/or individual types of workplace training mastered (completed) by the student during previous education.

5.10. Eligibility for Accelerated Programs

The educational organization grants individuals with higher professional education of the relevant profile (Bachelor's, Master's, Specialist) the right to pursue the educational program through

accelerated programs, taking into account the recognition of results from previous education and training.

5.11. If distance learning is used, the conduct (organization) of practical training (regardless of type) and the final state attestation in a distance format is not permitted.

CHAPTER 6. REQUIREMENTS FOR THE DEVELOPMENT AND IMPLEMENTATION OF THE MAIN EDUCATIONAL PROGRAM

6.1. The educational institution independently develops higher professional education programs, taking into account labor market needs. The Main Educational Program (MEP) is developed based on the educational standard for the field/specialization, the National Qualifications Framework, sectoral qualifications frameworks, and professional standards (if available).

6.2. The goals of the Master's MEP in the field 510100 - MATHEMATICS are:

In the area of education:

- **M1.** To train highly qualified specialists equipped with modern ideas and methods, capable of effectively applying them in their professional activities.

- **M2.** To train young scientists who possess the ability to identify and solve scientific research problems.

- **M3.** To train educators capable of teaching and fostering highly intellectual, morally sound individuals who contribute to the comprehensive development of the state based on acquired knowledge.

In the area of personal development:

- **M4.** To train specialists capable of adapting to societal changes, capable of comprehensive self-development, competent in managerial and organizational activities, and to foster students' socio-personal qualities: purposefulness, organization, diligence, responsibility, civic-mindedness, communication skills, tolerance, and enhancement of general culture.

6.3. The relevant structures of the educational institution update the MEP at least once every 5 (five) years, taking into account the development of science, culture, economics, technology, and the social sphere, as well as in accordance with proposals from stakeholders. Educational program updates include:

- Developing a strategy to ensure the quality of graduate training;
- Periodic monitoring of educational programs;
- Developing objective procedures for assessing students' knowledge, skills, and competencies, based on employer-agreed requirements for graduate competencies;
- Ensuring the quality and competence of the teaching staff;
- Ensuring the implemented educational program has sufficient resources and monitoring the effectiveness of their use;
- Regularly conducting self-assessment against the minimum accreditation requirements established by the Cabinet of Ministers of the Kyrgyz Republic;
- Informing the public about the results of its activities, plans, and innovations;

6.4. An educational organization implementing an educational program is obligated to:

- Form a socio-cultural environment;
- Create necessary conditions for the comprehensive development and socialization of individuals, and for preserving the health of students;
- Develop educational/extra-curricular components of the educational process, including the development of self-governance, and promote student participation in public organizations, sports and creative clubs, and student scientific societies;

6.5. The set of disciplines (modules) and their workload, belonging to each cycle of the educational program, are determined independently by the educational organization (relevant structures of the educational organization: faculty, institute).

6.6. The set of disciplines in the Main Educational Program (MEP) must include both an obligatory (basic) and a variable part. Elective courses are offered for the professional cycle, and the

catalog of disciplines for them is determined by the educational organization (relevant structures of the educational organization: faculty, institute).

6.7. The degree of obligation of disciplines, their sequence of study and workload, as well as their distribution into groups "A," "B," and "C" are organized in accordance with the provisions of the educational organization regarding the organization of the educational process and the appendices to this Layout.

6.8. The educational organization must ensure the availability of academic courses (disciplines, modules) within the MEP for students, conduct introductory courses, and determine elective courses based on student choices and wishes through surveys to form their individual educational trajectory. Students create their individual study plan with the participation of an academic advisor provided by the educational organization.

6.9. When forming the MEP, the educational organization must familiarize students with their rights and obligations, and explain that the disciplines they choose are mandatory for them, and their total workload must not be less than that stipulated in the curriculum.

6.10. When developing and implementing the educational program, the educational organization must take into account gender equality policy, ensure social inclusion, and develop digitalization.

6.11. General Requirements for Student Rights and Obligations in Educational Program Implementation:

- Students have the right to choose specific disciplines within the allocated study time for elective courses in the higher professional education program;
- When forming their individual educational trajectory, students have the right to receive consultations from the educational organization regarding discipline selection and their impact on their future profession;
- To achieve results in mastering the educational program, particularly in competency development, students have the right to develop student self-governance and participate in the activities of public organizations, sports and creative clubs, and student scientific societies;
- Students are obligated to complete all assignments stipulated by the educational program of the educational organization within the established deadlines;
- The volume of a student's academic workload is set at no less than 38 hours per week, including all types of classroom and independent study work. The maximum weekly academic workload is determined by the educational organization;
- For full-time Master's preparation, the volume of classroom sessions must be at least 25% of the total weekly volume;
- The total duration of the vacation period in an academic year is 7-10 weeks, including at least two weeks in winter, depending on the study period;

CHAPTER 7. CHARACTERISTICS OF PROFESSIONAL ACTIVITIES OF GRADUATES OF THE EDUCATIONAL PROGRAM IN THE FIELD 510100 – MATHEMATICS

7.1. Area of Professional Activity

The **area of professional activity** for graduates of the Master's educational program in **510100 – MATHEMATICS** includes:

- Scientific and research activities in fields utilizing mathematical methods and computer technologies;
- Solving various problems using mathematical modeling of processes and objects, and software;
- Developing effective methods for solving problems in natural sciences, engineering, economics, and management;
- Software and information support for scientific, research, design-engineering, and operational-management activities;

- Activities in the sphere of scientific research, production-technological, and organizational-managerial work;
- Teaching mathematical disciplines (including computer science);

Graduates may also engage in professional activities in other areas and/or fields, provided their education level and acquired competencies meet the qualification requirements for the specific work.

7.2. Objects of Professional Activity

The objects of professional activity for graduates of the Master's educational program in 510100 – MATHEMATICS are:

- Concepts, hypotheses, theorems, methods, and mathematical models that constitute the content of fundamental and applied mathematics, mechanics, and other natural sciences.

7.3. Types of Professional Activity

The types of professional activity for which graduates of the Master's educational program in 510100 – MATHEMATICS with the qualification "Master" are prepared include:

- Scientific research;
- Production and technological;
- Organizational and managerial;
- Teaching (as prescribed);

The specific types of professional activity for which a graduate is primarily prepared should determine the content of their educational program, which is developed by the university based on the relevant professional standard (if available). These are discussed and determined at meetings of the working group forming the Master's MEP 510100 – MATHEMATICS, profile "Mathematics," in conjunction with graduates and current students of this field and interested employers. When developing and implementing the educational program in the field 510100 – MATHEMATICS, the graduating department focuses on the specific type of professional activity for which the specialist is being prepared, relying on labor market demands, scientific research data, and the material and technical resources of the educational organization.

7.4. Professional Tasks for a Master's Degree Holder in 510100 – MATHEMATICS

A specialist with a Master's degree and a "Mathematics" qualification in the field 510100 – MATHEMATICS is prepared to solve the following professional tasks, aligned with their type of professional activity:

Scientific and Research Activities:

- Applying mathematical and algorithmic modeling methods to study physical phenomena and objects to effectively solve wide-ranging general scientific, organizational, and applied problems;
- Analyzing and generalizing the results of scientific research in mathematics, utilizing modern scientific and technological advancements, as well as leading domestic and international experience;
- Organizing and conducting seminars, conferences, and symposiums;
- Preparing and editing scientific publications;

Production and Technological Activities:

- Applying fundamental mathematical knowledge and creative skills for quick adaptation to new challenges arising from the development of computing technology and mathematical methods, the growth of mathematical algorithms and models, and the need for rapid decision-making in new situations;
- Appropriately using modern computing technology, software, and artificial intelligence capabilities relevant to the Master's MEP profile;
- Collecting, analyzing, and systematizing necessary data using modern methods of automated data collection and processing;
- Creating normative methodological documents and participating in defining the strategy for corporate network development;

Organizational and Managerial Activities:

- Organizing the work of a scientific research group;
- Using scientific achievements to forecast activity results and to quantitatively and qualitatively assess decisions made;

Teaching Activities:

- Teaching mathematical disciplines (physics and computer science after special retraining) in general education schools and secondary vocational educational institutions;
- Participating in the development of various testing methods for assessing students' academic achievements;

CHAPTER 8. REQUIREMENTS FOR THE LEARNING OUTCOMES OF THE EDUCATIONAL PROGRAM IN THE FIELD 510100 – MATHEMATICS

8.1. As a result of mastering the Master's higher professional education program, graduates should develop professional, research, production-entrepreneurial, organizational and managerial, and other competencies.

Research Competencies:

Competency Number	Independently Developed Competency Content
RIC-1	Ability to independently find, analyze, evaluate, and use information from various sources related to scientific research activities.
RIC-2	Independently identify relevant scientific problems in the field and formulate hypotheses for their solution.
RIC-3	Develop a plan for scientific research activities and select appropriate methods, tools, and computer programs for solving the tasks outlined in the plan.
RIC-4	Independently acquire knowledge, make decisions, generate new ideas, and combine them with relevant concepts and data.
RIC-5	Present scientific research results in the form of a report, preparing it for publication at an academic level with visual aids (diagrams, slides, drawings, etc.) and explanations.
RIC-6	Continuous and systematic development of scientific research and scientific discovery abilities.

Production and Entrepreneurial Competencies:

Competency Number	Content of Independently Developed Competencies
PEC-1	Ability to independently collect, understand, analyze, and systematize scientific information from various fields in multiple languages.
PEC-2	Use modern technologies and computer software packages to solve production and technological problems.

PEC-3	Understand production and technological systems as a set of interconnected elements and identify their general operating principles.
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Management and Entrepreneurial Competencies:

Competency Number	Content of Independently Developed Competencies
MEC-1	Ability to organize, manage, and lead the scientific work of a team.
MEC-2	Ability to work in an interdisciplinary team, unleash the potential of team members, motivate, and develop them.
MEC-3	Goal setting, action planning, resource allocation, and time management in the relevant field of activity.
MEC-4	Overcoming difficulties in the field of activity and resilience in stressful situations.
MEC-5	Identifying problems, developing strategies for their solution, and evaluating the effectiveness of chosen methods.
MEC-6	Acquiring deep legal and ethical knowledge when evaluating professional activities and implementing socially significant projects.

Teaching Competencies

Competency Number	Content of Independently Developed Competencies
TC-1	Creative application of modern teaching technologies in educational institutions.
TC-2	Ensuring quality in the organization and management of the educational process in educational institutions through the creative use of theoretical foundations, methods, and techniques of teaching, upbringing, and scientific research activities.

8.2. These are the professional competencies a Master's degree holder with a "Mathematics" qualification should possess for professional activity in the research sphere:

Research-Oriented Professional Competencies for a Master of Mathematics

Competency Number	Content of Independently Developed Competencies
PC -1	Possess methods for creating and using algorithmic models to perform mathematical calculations when analyzing natural science problems
PC -2	Command methods of mathematical modeling for analyzing global problems, grounded in deep knowledge of fundamental mathematical disciplines and computer science
PC -3	Understand abstract concepts in mathematics and apply various approaches to solve

	non-standard mathematical problems
PC –4	Utilize logical thinking to analyze mathematical data, prove theorems, and draw conclusions based on them
PC –5	Be able to identify application aspects of mathematical formulations and clearly and precisely explain ideas
PC –6	Be able to understand, analyze, and make predictions, as well as describe complex systems in real-world phenomena using mathematical models

Professional Activities in the Production and Technology Sphere:

Competency Number	Content of Independently Developed Competencies
PC -7	Full use of computer technology in modern mathematics education and research
PC -8	Adaptation to modern algorithms of computer mathematics, the ability to improve, deepen and develop the mathematical theories underlying them
PC -9	Mastery of mathematical and algorithmic modeling methods in the analysis of economic and social processes in business, financial and actuarial mathematics problems
PC -10	Using computer programs to perform mathematical calculations

Professional activity in the organizational and managerial sphere:

Competency Number	Content of Independently Developed Competencies
PC -11	Able to apply mathematical and algorithmic modeling methods in the analysis of management problems in the scientific and technical sphere
PC -12	Able to determine the future of the organization, set long-term goals and see ways to achieve them
PC -13	Efficient use of financial, material and time resources
PC -14	Resolving conflicts in a team and organization through constructive dialogue
PC -15	Able to identify common forms, patterns and tools for a group of disciplines

Professional activity in the teaching field:

Competency Number	Content of Independently Developed Competencies
PC -16	The opportunity to teach mathematical disciplines in comprehensive schools, primary, secondary and higher vocational education institutions, relying on general professional knowledge and a scientific worldview
PC -17	Ability to apply various approaches to the formation of mathematical knowledge, taking into account the level of the audience

CHAPTER 9. REQUIREMENTS TO THE CONDITIONS OF IMPLEMENTATION OF THE MASTER'S EDUCATIONAL PROGRAM IN THE DIRECTION 510100 – MATHEMATICS

9.1. Staffing Requirements for Educational Program Implementation

9.1.1. General Requirements for Staffing the Educational Process:

- The educational program for Master's degree preparation must be staffed by scientific and pedagogical personnel who have a basic education corresponding to the profile of the discipline they teach;

- The proportion of full-time faculty among all instructors involved in the Master's educational program must be at least 70%;

- Invited lecturers from industry (enterprises), whose profile matches the educational program, must have at least 3 years of work experience in the relevant professional field;

- The faculty implementing the Master's program must have at least 5 scientific articles published within the last 5 years, with at least 1 article published in Scopus or Web of Science journals, etc;

9.1.2. Staffing Requirements for the Educational Process in Accordance with the Specifics of the Educational Field

These requirements ensure the quality and specialized nature of the Master's program:

- The core educational program for Master's degree preparation must be delivered by qualified pedagogical staff. Specifically, 60% of all disciplines must have lectures taught by instructors holding academic degrees of Candidate of Sciences or Doctor of Sciences;

- The overall academic and educational leadership of the Master's program must be provided by a Professor or Doctor of Sciences;

- One Professor or Doctor of Sciences can oversee no more than two Master's programs;

- By decision of the university's academic council, Candidate of Sciences with the academic title of Associate Professor may also lead Master's programs;

- At least 5% of the total teaching staff delivering the Master's higher professional education program must be employees from production or relevant research institutions;

- At least 5% of the total teaching staff delivering the Master's higher professional education program must be experienced instructors from abroad, utilizing either online or offline teaching methods;

Direct supervision of Master's students is carried out by academic advisors who possess an academic degree and/or title, or have relevant managerial experience in the field.

9.2. Requirements for educational, methodological and information support of the educational process

9.2.1. Literature Fund Requirements

Here are the requirements for the literature fund supporting the educational program:

- The main educational program for specialist training must be equipped with textbooks, educational and methodological documentation, and materials for all courses and disciplines within the program;

- The educational institution is obligated to provide normative legal acts related to the field of education, as well as the institution's local acts;

- The provision of necessary educational and electronic literature for students to implement the educational program must comply with licensing requirements;

- The educational institution must regularly update its literature fund in accordance with established procedures;
- The literature fund must include textbooks and study guides published within the last 10 years for mathematical and natural sciences, and within the last 5 years for humanities, social, and economic disciplines, all containing up-to-date information;
- The educational institution is required to provide students with monographs, scientific journals, and periodicals (in print or electronic form) relevant to their research direction;
- The educational institution must provide students with access to bibliographic databases such as Scopus, Web of Science, and others;
- The list of mandatory textbooks and methodological guides for each discipline is determined by the educational institution in accordance with licensing requirements (with at least 0.5 copies per student);
- The provision of methodological guides for laboratory and practical work must be 1:1 (one guide per student).

9.2.2. Requirements for Electronic Textbooks

Here are the requirements for electronic textbooks and resources:

- There must be a wide array of e-books, e-journals, scholarly articles, and other academic materials available, essential for study and research across all disciplines;
- The educational institution is obligated to provide students with access to modern electronic libraries, databases, and search engines for working with the e-library platform;
- Electronic versions of mandatory and supplementary academic literature must be available for every discipline within the main educational program;
- Electronic resources must be accessible for distance learning through the educational institution's portal.

9.2.3. Requirements for Hosting Electronic Forms of Educational and Methodological Materials (Complexes) on the Educational Organization's Digital Platforms

Here's what's required for placing educational and methodological materials on digital platforms:

- Educational and methodological materials must be accessible for remote access by students via university portals and mobile devices;
- The educational organization is obligated to provide educational and methodological materials that consider the unique characteristics and needs of students with special educational needs. This includes, for example, individuals with disabilities or those temporarily studying remotely due to health conditions;
- For each discipline within the main educational program, educational and methodological complexes must include text, graphics, audio, and video materials, along with multimedia resources. These must be uploaded to the educational organization's digital platforms before the start of the academic process and be accessible to every student;
- The platforms must ensure data security to protect personal information and copyrights;
- Depending on the relevance of scientific issues, educational and methodological materials should be structured for periodic updates on the digital platform.

9.2.4. Requirements for Educational and Methodological Materials (Complexes) for Distance/Online Learning and Their Placement on the Educational Organization's Digital Platforms

Here are the requirements for online learning materials and their availability:

- The educational process for distance learning must be conducted in accordance with semester curricula;
- Educational and methodological support for disciplines within the university's educational programs that utilize distance learning is provided through the creation of electronic educational and methodological complexes (EUMC);
- Access to the university's information resources for educational programs using distance learning is facilitated by placing electronic study materials and EUMCs on the university's educational portal;
- Educational and methodological support for the distance learning process is carried out by the relevant university departments. The authors and developers of electronic study materials and EUMCs are the faculty members of these departments;
- Responsibility for the timely and high-quality preparation of electronic educational and methodological materials for educational programs using distance learning rests with the heads of the departments;
- The author of an electronic educational and methodological complex bears personal responsibility for the content, quality, and timely placement of distance learning information resources.

9.3. Material and Technical Support Requirements for the Educational Process

9.3.1. Specialized Classrooms (Laboratories, Computer Labs)

- The educational institution running the program must have a material and technical base that complies with sanitary and fire safety rules and regulations. This base needs to support all types of laboratory, disciplinary, and interdisciplinary training, as well as practical and scientific research work for students, as outlined in the educational institution's curriculum.
- The educational institution must provide classrooms equipped with necessary materials for theoretical and practical sessions, computer labs, research centers, studios, a library, an assembly hall, a sports hall, a cafeteria, and a medical aid station.

All these facilities must be either owned by the educational institution or held under another legal basis. It's also necessary to secure clinical bases for program implementation and, when required, create appropriate conditions for people with disabilities.

9.3.2. Conditions for Training at Production Facilities (On-the-Job Training)

Here are the requirements for practical training conducted at external organizations:

- Host organizations (enterprises, institutions, research institutes, and organizations selected as training sites) must organize appropriate training sessions;
- Students must be provided access to modern technologies, equipment, and production processes to ensure they're well-prepared for their professional careers;

Collaboration with Employers:

- To create opportunities for Master's students to gain practical experience in production settings, agreements must be signed with partner enterprises and institutions;

Event Organization:

- During industrial practice, Master's students should be offered seminars, training sessions, and mentorship programs;

Evaluation and Reporting:

- Mechanisms for assessing the effectiveness of on-the-job training must be defined. Student reports and reviews must be approved by the employers.

9.4.2. Requirements for Knowledge Quality Assessment

Here are the requirements for how knowledge quality should be assessed:

- The educational institution must develop a system for evaluating knowledge that aligns with the requirements of the educational standard;
- The educational institution must develop and implement knowledge assessment criteria that are transparent for both instructors and students;
- The student knowledge quality assessment system must include current, intermediate, and final control, as well as state final attestation for graduates;
- Students must have real-time access to their academic achievements;
- Responsibility for the quality of student knowledge rests with the instructor teaching the discipline;
- To analyze knowledge quality, make decisions, and plan future steps, the educational institution will conduct a student satisfaction survey regarding the learning process at the end of the academic year;
- Student knowledge quality assessment will be conducted using modern technologies through practice-oriented, integrated assignments that foster interdisciplinary connections.

9.4.1. Types of Assessment

The assessment of the quality of mastering the main educational program for Master's degrees must include the following types of control:

- Initial control;
- Intermediate control;
- Ongoing academic progress control;
- Final control.

Requirements

- Initial control should be conducted at the initial stage of training to check students' residual knowledge and determine their level of preparedness;
- Ongoing control should be carried out throughout the academic semester in accordance with the internal regulations established (approved by the academic council) by the educational institution implementing the educational program;
- Intermediate control of students is conducted during the semester, and the number of intermediate assessments is carried out in accordance with the internal regulations of the educational institution;
- Final control is conducted for all academic disciplines and must be carried out in accordance with the internal regulatory provisions of the educational institution.

9.4.2. Fund of Assessment Tools and Evaluation Criteria

To assess students' attainment of the stage-specific requirements of the Master's core educational program (for ongoing and intermediate assessments), funds of assessment tools are established. These funds include:

- Typical assignments;
- Control works (tests/quizzes);
- Tests;
- Control methods.

These tools allow for the evaluation of students' knowledge, skills, and the level of acquired competencies. The funds of assessment tools are developed and approved by the university.

The funds of assessment tools must be comprehensive and adequately reflect the State Educational Standard of Higher Professional Education (ГОС ВПО) for the given field of study. They should align with the goals and objectives of the Master's program's specific profile and its

curriculum. Their purpose is to ensure the quality assessment of the general cultural and professional competencies acquired by graduates.

Here are the criteria for assessing student knowledge:

- Assessment tools must be diverse, utilizing various methods such as tests, control works (quizzes/assignments), oral questioning, project defense, scientific research work, practical activities, and so on;
- Each assessment tool should be aimed at developing specified competencies and directly linked to specific competencies;
- Evaluation criteria must be developed for each assessment tool;
- Knowledge assessment should be technically supported, and conditions must be created for evaluation using modern automated platforms;
- Principles of inclusive education must be observed in assessment (e.g., creating accessible conditions, extending time);
- The linguistic specificities of international Master's students must be considered (e.g., translation of assignments, instructor's understanding of the language in which the student responds);
- Assignments developed for knowledge assessment must correspond to the educational level, have methodological guidelines, and be accessible and understandable to students;
- The fund of assessment tools must be updated to reflect advancements in science and technology;
- Databases and criteria for assessment tools must be developed. These should include typical assignments for ongoing, intermediate, and final control, control works, module tests, and practical assignments. These tools must allow for the evaluation of acquired competencies and the alignment of individual student achievements with the stage-by-stage or final requirements of the educational program;
- For each type of control and for every discipline, assessment tools and evaluation criteria must be developed before the start of the academic process and be accessible and transparent to students.

9.5. Requirements for Organizing Practical Training

9.5.1. General Provisions on Practical Training

- Practical training aims to develop skills and reinforce theoretical knowledge among students in research, production, and scientific-pedagogical activities;
- The duration and workload of practical training within the educational process are implemented according to the schedule set by the approved curriculum. These practical experiences are designed to strengthen the theoretical knowledge of higher education specialists in a production environment. A practical training program must be developed, which should include: a schedule, key provisions, instructions for report writing, supervision of the practical training progress, and timely, effective assistance to the trainee;
- Students are assigned to practical training by an order from the rector of the educational institution, based on a report from the head of the relevant academic unit (institute director). Before practical training begins, an introductory conference/briefing is held, and upon its completion, a final conference. The results of the practical training (the Master's trainee's report) are heard, discussed, and evaluated at a meeting of the graduating departments;
- Practical training for students in a Master's level educational program at an educational institution is considered a form of the educational process that builds professional competencies in specialist training;
- The scope and types of practical training are approved based on the requirements established by state educational standards for higher professional education fields;
- The goals and objectives of practical training are approved by the practical training programs proposed by the relevant educational and methodological associations;
- Practical training is conducted based on the regulations on the organization and conduct of practical training developed by the educational institution.

9.5.2. Types of Practical Training for Higher Professional Education Programs

The following types of practical training are conducted during the higher professional education program:

- Research Practice;
- Production Practice;
- Scientific and Pedagogical Practice.

9.5.3. Requirements for Each Type of Practical Training:

- Practical training must involve conducting research aligned with the approved topic of the student's Master's dissertation;

- The educational institution is obligated to provide students with the necessary working documents (e.g., diaries), depending on the type of practical training;

- Every student is required to complete all types of practical training specified by the educational institution.

Research Practice

This type of practice focuses on **developing the Master's student's research skills**, including the collection and analysis of materials relevant to their Master's dissertation topic, and the formulation of conclusions.

Requirements for Research Practice:

- The practice must last for 6 weeks;
- The practice is conducted in scientific institutions with internet access and relevant literature for the field;
- The practice supervisor must hold an academic degree corresponding to the field.

Production Practice:

This practice aims to develop skills in applying mathematical knowledge to production processes and forming abilities in creating and analyzing mathematical models.

Requirements for Production Practice:

- The practice must last for at least 6 weeks;
- The practice must be conducted in production or scientific institutions with internet access and relevance to the field 510100 – MATHEMATICS;
- The practice supervisor must hold an academic degree corresponding to the field, and work in a scientific institution, a production enterprise, or an organization that utilizes mathematical apparatus.

Scientific and Pedagogical Practice:

This practice aims to develop skills in teaching mathematics in higher education institutions, secondary vocational schools, and general secondary schools.

Requirements for Scientific and Pedagogical Practice:

- The practice duration is at least 9 weeks;
- The practice must be conducted in educational institutions or centers that implement the educational process;
- The practice supervisor must have a pedagogical professional education and experience relevant to the field.

9.6. State Final Attestation

The "State Final Attestation" includes preparing for and passing state examinations, and completing and defending a final qualifying paper (if the university includes it as part of the state final attestation).

The requirements for the content, scope, and structure of the Bachelor's work, as well as the requirements for state attestation examinations, are determined independently by the higher educational institution.

Requirements:

- Final state attestation for students must be conducted after the completion of the full course of study. The types of state attestation examinations and the procedures for their organization are

determined by the educational institution in accordance with the regulatory legal acts of the Kyrgyz Republic and the educational institution governing the conduct of final state attestation for graduates;

- Students are admitted to the final state attestation if they have no academic debts and have fully mastered the curriculum of the higher professional education program. Additionally, they must have published at least 1 scientific article based on their research conducted during their study period, before the defense of their Master's dissertation;

- Graduates who successfully pass the final state attestation are awarded a diploma of higher education with the academic degree "Master," granting them the right to engage in professional activity and to pursue postgraduate studies (aspirantura) or PhD doctoral programs;

- The assessment of students' knowledge, skills, abilities, and readiness for their future profession during the final state attestation is conducted based on specially developed evaluation criteria;

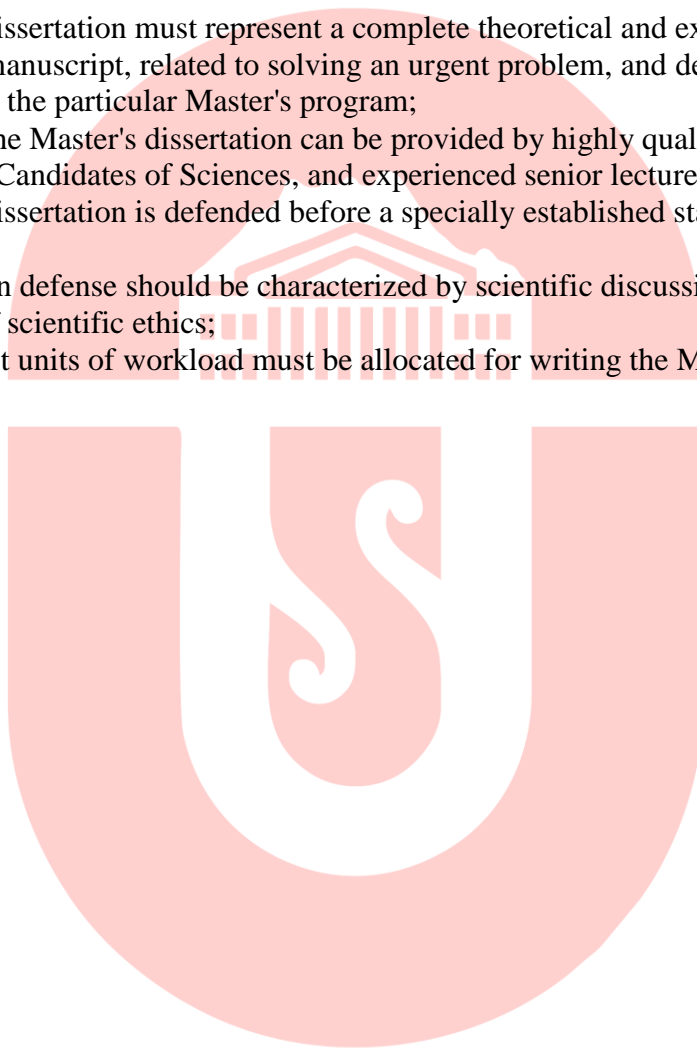
- The Master's dissertation must represent a complete theoretical and experimental research work, presented as a manuscript, related to solving an urgent problem, and determined by the specifics of training in the particular Master's program;

- Guidance for the Master's dissertation can be provided by highly qualified specialists (Doctors of Sciences, Candidates of Sciences, and experienced senior lecturers);

- The Master's dissertation is defended before a specially established state attestation commission;

- The dissertation defense should be characterized by scientific discussion, be rigorous, and adhere to principles of scientific ethics;

- At least 8 credit units of workload must be allocated for writing the Master's dissertation.



CHAPTER 10. SAMPLE OF THE BASIC CURRICULUM OF A MASTER'S DEGREE PROGRAMME

Block	Cycle	Directions	Disciplines	Credit allocation to groups			Distribution of hours			1 academic year		2 academic year	
				“A”	“B”	“C”	To tal	Au dit ori um	SI W	1 seme ster	2 seme ster	3 seme ster	4 seme ster
Cycle 1.	1. General Education	General education Language and communication skills											
		Philosophical and conceptual problems of science											
		Professional disciplines											
Cycle 2.	Professional Education												
Block 2	Internship and research (industrial and technological) work												
Block 3	Final State exam (5 - 10 credits)												
Total labour intensity											Not less than 120 credits		

The first block consists of 2 cycles: general science education and professional education. The cycle of general scientific education should include foreign languages of professional sphere and disciplines oriented to philosophical and conceptual problems of science.

All academic disciplines are divided into the following three groups of disciplines for all cycles according to the degree of compulsory and sequence of assimilation, taking into account their logical interrelation:

‘A’ - the sequence of disciplines studied obligatory and strictly in the specified semesters of the curriculum is observed;

‘B’ - a group of disciplines studied necessarily, but not necessarily in the sequence of semesters; the study of disciplines of this group is independently planned by the student in the specified semesters of academic years;

‘C’ - disciplines of the learner's choice, from each group (discipline) of which the learner must study only one (at his choice) in the semester recommended in the semester curriculum. Each group (discipline) offers a catalogue of disciplines, the learner can choose only one discipline from each catalogue. Disciplines in the same catalogue must be related.

‘C’ - disciplines of this group allow the learner to deepen the disciplines of group “A”. They provide an opportunity to acquire additional competences in order to ensure the competitiveness of the graduate and taking into account scientific and technical achievements and labour market requirements.

Distribution of the total labour intensity of the basic curriculum of the Master's degree programme

Structure of the educational programme			Workload (credits) of the blocks of the educational programme		
	Disciplines		«A»	«B»	«C»
Block			70-85 credits.		
	Cycle	Foreign language in professional activity			
		Philosophical, conceptual scientific problems			
		Professional cycle			
		Professional desiplines	40% - 50%	25% - 30%	25% - 30%
Block 2	Practical training and research (production and technological) work		30-40 credits		
Block 3	Final state certification		5-10 credits		
Total labour intensity			No less than 120 credits		

	Directions	Disciplines	Credit allocation to groups			Distribution of hours			1 academic year	
			“A”	“B”	“C”	Total	Auditorium	SIW	1 semester	2 semester
General Education	General education Language and communication skills	Catalogue of disciplines №1.								
	Philosophical and conceptual problems of science	Catalogue of disciplines №2.								
Professional	Professional disciplines									
Practical training and research (30-40 credits)										
Final exam (5 - 10 credits)										
Total labour intensity						Not less than 120 credits				

Block	Cycle	Directions	Disciplines	Credit allocation to groups			Distribution of hours			1 academic year		2 academic year	
				“A”	“B”	“C”	Total	Auditorium	SIW	1 semester	2 semester	3 semester	4 semester
Cycle 1.	2. General Education	General education Language and communication skills	Catalogue of disciplines №1.										
		Philosophical and conceptual problems of science	Catalogue of disciplines №2.										
	2. Professional education	Professional disciplines											
Block 2	Practical training and research (30-40 credits)												
Block 3	Final State exam (5 - 10 credits)												
	Total labour intensity						Not less than 120 credits						

Catalogue of disciplines of the core curriculum

Catalogue #	Catalogue direction	Title of catalogue disciplines	Amount of credit
1 discipline catalogue	Foreign languages in the professional field	Russian	4
		English	
		Latin	
		German and so on...	
		...	
2 discipline catalogue	Philosophical, conceptual problems in science	Discipline1	4
		Discipline2	
		Discipline3	
		Discipline4	
3 discipline catalogue	...	Discipline5	4
		Discipline6	
		Discipline7	
		Discipline8	
4 discipline catalogue	...	Discipline9	4
		Discipline10	
		Discipline11	
		...	

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II. From Employers and Graduates:

№	Full Name	Place of Work, Position, Academic Degree, and Academic Title	Signature
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3	Sultonov B.A.	PhD in Mathematics, Urgench State University, Uzbekistan	
4	Ergasheva Sh.R.	PhD in Mathematics, Tashkent State Transport University, Uzbekistan	