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ALIKHAN BOKEIKHAN UNIVERSITY

MODULAR EDUCATIONAL PROGRAM
6B07527 – «Standardization, certification and metrology in construction»

Semey, 2023

Developed by the Department of "Information and Technical Sciences"
Discussed and approved at the meeting of the Department of "Information and Technical Sciences" (Protocol No. 05 of 05.15.2023).
Reviewed and recommended for approval at a meeting of the Academic Quality Council of the Faculty
(protocol No. 05 of 20.05.2023).
Reviewed and approved at the meeting of the Educational and Methodological Council of the University (Protocol No. 05 of 25.05.2023).

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EXPLANATORY NOTE

The modular educational program (MOE) is compiled on the basis of the following regulatory documents of the Ministry of Education and Science of the Republic of Kazakhstan and internal regulatory documents of Alikhan Bokeikhan University:

- The State mandatory standard of Higher Education, approved by Order No. 2 of the Minister of Science and Higher Education of the Republic of Kazakhstan dated 20.07.2022.
- Rules for the organization of the educational process on credit technology of education, approved by the Order of the Minister of Education and Science of the Republic of Kazakhstan dated 20.04.2011 No. 152;
- Standard rules of activity of organizations of higher and (or) postgraduate education, approved by the Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595;
- Structure of the modular educational program, revision No. 3 of 08.10.2021
- Professional standards "Metrology" approved by Order No. 283 dated 22.10.2018.

The modules of the general education disciplines block include the disciplines of the compulsory component (CC) - 51 credits and elective components (EC) - 5 credits, common to all educational programs, during the study of which the graduate must master the following competencies: knowledge of the laws of the development of society and its socio-political, legal, economic, environmental foundations, as well as cultural-historical values, fundamentals of computer science, language communication and understanding of the principles of a healthy lifestyle, possession of information about the political life of the country.

The basic disciplines block includes disciplines of the university component (UC), which is 35 credits; and elective components (EC), which is 78 credits. Modules of these disciplines allow you to form a complex of key (research), subject and special competencies acquired by a graduate.

The professional disciplines block includes the disciplines of the university component (UC), which is 27 credits; and the elective component (EC), which is 36 credits. Modules of these disciplines allow forming a complex of key and special (developing, creative, organizational and methodological) competencies acquired by the graduate.

The final certification is 8 credits; the criterion for the completion of the educational process is the student's mastering of at least 240 credits. The MEP consists of 24 modules that ensure the achievement of the set goals.

The goal is to train highly qualified specialists with a competitive level of knowledge, skills and professional skills in the field of technical regulation and quality management in construction production, with the necessary professional and personal competencies sufficient for successful activities at enterprises of the Republic and beyond

Tasks:

- ensuring compliance of goods and services with safety standards and rules for the life and health of consumers, property of individuals, legal entities, state property, ecology, environment, in particular, animal and plant safety;
- ensuring the safety of facilities for which there is a possibility of various kinds of emergencies; - promoting scientific and technological progress;
- ensuring the competitiveness of products and services;
- economical use of all types of resources;
- compatibility and interchangeability of products;
- unified measurement system.

Expected results of the modular educational program 6B07527 Standardization, certification and metrology in construction:

ON1 the discipline forms an idea of the state and law, legislation and the operation of legal norms, legal relations and legal responsibility, knowledge in the field of market economy, financial literacy and entrepreneurship. It also studies the patterns of corruption, mechanisms and methods of combating it, the main elements of modern market infrastructure, the formation of skills to create your own business.

ON2 show knowledge and understanding of mathematical methods of calculations, calculations, basic concepts of analytical geometry at a professional level.

ON3 describe the knowledge and skills of using fundamental physical laws and theories, as well as methods of physical research; name solutions to typical problems and the use of analogues between phenomena of different nature.

ON4 explain the acquisition of skills in conducting chemical experiments, knowledge of reagents, acquisition of knowledge of methods of chemical water purification, the ability to determine the content of components.

ON5 analyze and systematize information on standardization objects obtained from various sources; show knowledge about the basic principles and provisions of certification in the Republic of Kazakhstan, areas of certification, schemes and systems for confirming conformity of products and services; study the Laws of the Republic of Kazakhstan "On ensuring the uniformity of measurements", "On technical regulation", "On accreditation in the field of conformity assessments"

ON6 analyze knowledge of documentation requirements accepted in professional communication; understanding of oral speech within professional topics; study the necessary information from foreign language sources.

ON7 to study the formation of skills to create various genres of monologue texts; the development of the ability to conduct a conversation; purposefully exchange professional information on a specific topic.

ON8 select the characteristics of measuring instruments and their circuit structures; prepare a study of methods for testing building structures, evaluate the determination of quality indicators of building structures; study design and technical documentation for measuring instruments, testing and control. To organize the development and implementation of quality systems in accordance with ISO international standards; to create technologies for designing data models at various levels; to create theoretical foundations for quality assurance and quality management of products and technological processes. Distinguish between the identification of gradations of quality and defects of goods, the causes of their occurrence and measures to prevent the sale of low-quality goods; determine the establishment of principles and methods of commodity science; evaluate the study of the properties and indicators of the assortment.

ON9 analyze legislative and regulatory legal acts, methodological materials on metrological support of production. analyze the state of metrological support, maintain measurement and control equipment in metrological working order, plan and perform measurement, testing and control processes, process results; diagnose the procedure and methods of planning work on metrological control and production support. To determine the mastery of measurement production skills in construction at different stages of manufacturing and installation; distinguish the development of standards, norms, requirements and measurement methods in construction, depending on the type of tasks to be solved; confirm new measurement methods in construction with mandatory compliance with the international quality management system. Organize the verification, calibration and repair of measuring instruments. Develop calendar schedules for verification and calibration of measuring instruments; determine the frequency of maintenance (maintenance), calibration, develop maintenance schedules and equipment calibration.

ON10 study the methods of testing building structures, determining the quality indicators of building structures; apply computer technology to identify and encode goods; show the calculation of barcode control numbers. Discuss calculations of errors, measurement uncertainties, inter-calibration intervals, instrument service life.

ON11 calculate the image of a flat figure from the image of a three-dimensional body; evaluate the shape of objects, apply scale; show methods for solving simple geometric problems. Study the requirements of regulatory documents for equipment and measuring instruments. Develop technical documentation for equipment and measuring equipment.

ON12 compare analytical and numerical analysis of electrical circuits under any influences in the time and frequency domain; calculate transients in linear circuits; determine the parameters of four poles under different operating modes; analyze energy transmission over long lines.

ON13 establish the composition of work operations, construction processes and works; determine the composition of processes and operations of construction works; assign its heat treatment in order to obtain a given structure and properties. To determine the main trends in the development of the production of building materials; to confirm the conditions of environmental impact on materials in structures and structures; to plan tests of building materials; to develop reports on the work performed;

ON14 approve the choice of the design scheme, limit states, systems of reliability coefficients, calculation and construction of building structures. Analyze design schemes, limit states, system of reliability coefficients, calculation and construction of building structures; distinguish between standards of measurement accuracy and control reliability and choose measuring, testing and control tools; develop a nomenclature of building materials; propose a classification of building materials; determine the principles and methods of production of artificial building materials, products and structures; Assess the level of product defects, violations in the process or service and compare the result with the requirements of regulatory documentation; analyze and interpret the data obtained during the evaluation, draw conclusions from observations.

2. The graduate's competence model

Competencies that a graduate of the educational program 6B07527 should have Standardization, certification and metrology in construction:

Competence of general education

- labor legislation of the Republic of Kazakhstan;
- industrial safety rules, labor protection rules and regulations;
- safety requirements and first aid techniques in case of accidents;
- basic methods of protecting production personnel and the public from the possible consequences of accidents, catastrophes, natural disasters, the ability to make decisions in risk conditions;
- methods of assessing the state of the natural environment;
- to choose technical means and technologies taking into account the environmental consequences of their application;
- to monitor the parameters and the level of negative impacts on their compliance with regulatory requirements;
- effectively apply means of protection against negative effects;
- develop measures to improve the safety and environmental friendliness of production activities; plan and implement measures to improve the sustainability of production systems and facilities;
- plan measures to protect production personnel and the public in emergency situations and, if necessary, take part in carrying out rescue and other urgent work in the aftermath of emergencies;
- methods of cognition for solving professional problems, the ability to solve problems professionally, work in a team, knowledge of safe working conditions in the workplace.

Basic competencies:

- principles of building a modern operating system and system software;
- economic and political factors of information and communication technology development;
- features of various operating systems, architecture.
- basic models, methods and tools used in computer systems to automate the solution of intellectual tasks;
- theoretical and practical problems of computational informatics as a field of knowledge and practical human activity related to the need for information analysis;
- trends in the development of microelectronics, promising circuit solutions in the field of digital and analog technology;

- about the current state and trends in the development of PC architectures, computing systems, complexes and networks;
- about the architecture and capabilities of microprocessor tools;
- about the problems and directions of development of programming technology, about the main methods and means of design automation about software, about methods of organizing work in software development teams.
- identify technical and logical problems when analyzing specific situations for programming, suggest ways to solve them and evaluate the expected results;
- identify the main trends in the field of information and communication technologies; use information resources to search and store information;
- work with spreadsheets, perform data consolidation, build graphs;
- apply methods and means of information protection
- systematize and summarize information, prepare references and reviews on professional activities, edit, refer, review texts; use basic and special methods of analyzing information in the field of professional activity; develop and justify options for effective solutions;
- critically evaluate from different sides (production, motivational, institutional, etc.) trends in the development of objects in the field of professional activity; apply the knowledge gained in the study of mathematics, physics;
- plan and conduct research, analyze and interpret the data obtained;
- analyze, program, design and operate software and hardware complexes and protection systems;
- to use modern technical means necessary in engineering practice.
- special technical terminology and vocabulary of the specialty, skills of self-mastery of new knowledge using modern educational technologies;
- database structure development;
- designing and creating presentations, receiving data from the server;
- creating video files
- work with smartmart applications
- professional argumentation in the analysis of standard situations in the field of upcoming activities;
- work with technical documentation and literature for solving problems of computer technology and telecommunications;
- methods of mathematical, simulation and computer modeling of processes and devices of computer technology;
- organization of individual stages of the process of developing objects of professional activity.

Professional competencies:

- the essence and content of standardization and certification, the technology of standards development, the system of supervision over compliance with mandatory requirements of regulatory documents on standardization;
- methods of obtaining and developing new structural materials and methods of their processing;
- methods of creating rational concentration quality level programs based on modern technologies;
- modern technological processes of processing structural materials.
- physical fundamentals of mechanics;
- basic concepts and axioms of theoretical mechanics, methods of modification of force systems, equilibrium conditions of a solid body, methods for determining the velocity and acceleration of point motion, the main types of solid physical movements, complex displacement of points, the main problems of the dynamics of a mathematical point, the dynamics of a mechanical system to know the general theorem;
- methodology for calculating building structures by limit states;
- methodology of material selection for structural elements and their connections;
- principles of design of building structures;
- basic provisions and definitions of patent law;
- regulatory legal acts on patenting;
- basic concepts used in the field of patenting;
- the main objectives, principles and criteria of patenting;
- rules for registration of patent documentation;
- the structure of the national patenting system and the competence of the bodies included in this structure;
- general theoretical principles of standardization, certification and metrology;
- the main provisions of the state system of standardization and certification;
- standardization methods;
- certification schemes and systems, rules and procedure for certification;
- basic concepts related to measurement objects; basic concepts related to measuring instruments;
- regularities of the formation of the measurement result;
- organizational, scientific and methodological foundations of metrological support;
- basic numerical methods used in solving problems of underground and urban construction;

- existing software products and information technologies for the design of construction facilities
- manufacturing technologies, control methods and properties of modern wall materials and products, in accordance with the requirements of the current GOST
- fundamentals of construction design, engineering preparation of the construction site in the conditions of new construction and reconstruction;
- technical regulations for the construction, repair and reconstruction of buildings and structures, acceptance and quality control of works;
- structures of the accreditation body;
- directions and basic principles of international cooperation in the field of standardization, conformity assessment, accreditation;
- international, regional, foreign practice of conformity assessment;
- general principles of building quality management systems in accordance with ISO 9000 standards;
- use the information base on standardization, national and international standards, regulatory and technical documents in the field of certification;
- to apply in practice the rules for the development of standards and the introduction of amendments and cancellations of standards;
- apply methods of quality control of products and processes when carrying out work on conformity assessment;
- apply methods of product quality control;
- apply computer technologies for planning and carrying out standardization and conformity assessment works;
- determine measurement errors and the laws of their distribution;
- methods of processing measurement results;
- build mathematical models of measurement objects;
- to estimate the errors of the functions of approximate parameter values;
- to carry out summation of error components, both deterministic and random.
- to give a conclusion on the conformity (non-conformity) of product information for any group of goods;
- organize the search and use regulatory documents in the field of information about goods in professional activities;
- analyze complaints and claims to goods, prepare conclusions based on the results of their consideration;
- apply the standards of the organization in the practice of trade;

- assess the compliance of product information with the requirements of regulatory documentation.
- apply computer technologies for identification and coding;
- navigate the structure of barcodes;
- perform calculation of barcode control numbers.
- work with standards;
- develop questionnaires in preparation for the audit;
- develop audit documentation;
- draw up protocols based on the audit results;
- evaluate actions based on the results of the audit.
- to carry out the audit procedure of the quality system, collection of audit evidence;
- use statistical methods for conducting audits;
- build an audit sample and evaluate its results;
- conduct internal audit;
- analyze and summarize the audit results;
- to draw up the results of the audit;
- determine measurement errors and the laws of their distribution, methods of processing measurement results;
- read electrical and electronic circuits, primary converters and actuators;
- identify the simplest malfunctions, make specifications;
- solve problems of theoretical mechanics;
- use ways to transform systems of forces;
- determine the speed and acceleration of point movement;
- to draw up documents using language variants depending on the purpose of the content and type of document;
- unify the texts of documents;
- to draw up documents in accordance with the requirements of regulatory acts and state standards;
- register the accounting of documents;
- use unified forms of documents;
- -analyze the accreditation documentation, prepare for on-site examination and conduct it, perform an audit;
- analyze equipment objects;

- from the totality of the essential features of the developed object, to make a description and a formula of the invention, to identify and prove its protectability, as well as to draw up the documents of the patent application;

- apply principles and criteria in the field of patenting;

- protect their patent developments as objects of intellectual property;

- to use the acquired knowledge in practice when performing design work, production planning, work on the construction site and conducting research on the technology of construction production.

- to use the acquired knowledge in practice when performing design work, production planning, work on the construction site and conducting research on the technology of construction production.

- carry out tests of raw materials; perform work to ensure quality control of finished products; rationally use raw materials

- correctly identify the features of building materials; justify the choice of materials and products in design solutions for the specified conditions of their operation; ensure the quality of materials; predict the reliability and durability of materials in structures;

- to conduct an examination of the documents submitted for accreditation, to assess the compliance of the accreditation area of the testing laboratory with the areas of accreditation of certification bodies with which the laboratory has an agreement to conduct certification tests, to issue an expert opinion;

- organize control tests of specific products and evaluate the qualifications of testers for testing, processing and registration of test results, as well as the technical (declared) capabilities of the testing laboratory (center);

- to assess compliance with the current legislation of the status of the organization applying for accreditation as a testing (measuring) laboratory;

- elimination of technical barriers to trade, which largely depends on accreditation;

- solving problems on the problems of the certification and accreditation system of the Republic of Kazakhstan.

- understand the design developments of adjacent parts of the project; perform all types of architectural and construction drawings at different stages of design.

- learn how to work with educational, methodological and reference literature corresponding to the topics included in the program. Learn how to choose a scheme for conducting national certification of products based on certification.

Special competencies:

- methods of obtaining and developing new structural materials and methods of their processing; methods of creating rational concentration quality level programs based on modern technologies;
- crystallization of metals and alloys; mechanical properties of materials; heat treatment of metals and their types; importance of chemical heat treatment of steel; properties of non-ferrous metals and alloys.
- basic requirements, regularities of documentation, terminology of documentation; methods of classification, unification and standardization of documents, the composition of unified documentation systems;
- accreditation of US bodies of organizational and administrative documentation;
- legal support, legal norms, to learn the classification of regulatory documents and standards, principles and methods of building standards and regulatory documentation.
- types of technical, regulatory, legal acts, rules for the development and application of technical codes of established practice.
- general theoretical principles of standardization, certification and metrology; the main provisions of the state system of standardization and certification;
- classification of measurements by types of measurements and types of measuring instruments; measurement scales;
- methods of estimating the cost of quality of products and services, the cost of metrological support
- perform work to ensure quality control of finished products; rationally use raw materials selection of design scheme, limit conditions, system of reliability coefficients, calculation and construction of building structures.
- basic numerical methods used in solving problems of underground and urban construction;
- manufacturing technologies, control methods and properties of modern wall materials and products, in accordance with the requirements of the current GOST
- to give an opinion on the conformity (non-conformity) of commodity information for any group of goods; to organize a search and use regulatory documents in the field of information about goods in professional activities;
- work with standards, develop questionnaires in preparation for the audit;
- develop audit documentation;
- draw up protocols based on the audit results;
- evaluate actions based on the results of the audit.
- to carry out the audit procedure of the quality system, collection of audit evidence;

- use statistical methods for conducting audits;
- build an audit sample and evaluate its results;
- assign and choose a rational technology for manufacturing machine parts;
- correctly draw up documents and execute them in accordance with state standards; unify, design forms of documents;
- use legal norms, legislative acts, possess practical skills in the development, approval of the examination of standards and other regulatory documentation.
- distinguish between types of technical regulations. The procedure, rules for the development and application of technical regulations.
- use methods of forecasting and optimization, unification and aggregation of systems of preferred numbers in the development of standards; - evaluate the accuracy of the results obtained and minimize possible errors in measurements.
- the location of the main points in the technological process, which require constant and periodic monitoring of changes in the properties of raw materials, semi-finished products and finished products
- to process the information obtained in the course of research by mathematical and statistical methods, to analyze and comprehend it taking into account the tasks of research
- to use the acquired knowledge in practice when performing design work, production planning, work on the construction site and conducting research on the technology of construction production.
- correctly identify the features of building materials;
- knowledge of the requirements for product information;
- use of information obtained from the Internet;
- the basics of the implementation of the organization's standards in the practice of trade;
- work on the organization of coding in developed countries;
- international organizations for unification and coding; processing of coding results, coding of products, technologies and organizations.
- fundamentals of industrial relations during quality audits.
- product quality management and quality management
- modern methods and principles of forming a quality management system
- application of analytical procedures and methods of selection of documentation and records during inspections;
- the methodology of the auditor's work; quality management systems;

- development of accounting documentation, corrective and preventive actions;
- planning an audit, forming a schedule and a working group of auditors;
- skills in designing and manufacturing technological parts and structures;
- methods of analysis and search of materials for the production of this type of products. mechanical properties of materials; properties and methods of structural and tool materials, structures and their hardening.
- negotiation and evaluation methods, analyze accreditation documentation, prepare for on-site expertise and conduct it, perform an audit.
- possess the skills of control and verification; regulatory framework of metrology, standardization and certification;
- The formation of a modern engineer is impossible without mastering the methods of quality control of manufacturing, installation and erection of building structures, buildings and structures The formation of a modern engineer is impossible without mastering the methods of quality control of manufacturing, installation and erection of building structures, buildings and structures
- to determine the nomenclature of measured and controlled parameters of products and technological processes, to establish optimal standards of measurement accuracy and control reliability, to choose measuring and control tools
- to determine the technologies of wall materials and structures designed to create modern enclosing structures of buildings and structures that meet modern standards.

Table 1. The sequence of mastering disciplines in the process of forming special competencies

№	Competencies	The list of compulsory, elective disciplines and the sequence of their study by choice for the educational program		Expected results
		List of disciplines	**The sequence of their study (sem.)**	
1	Special competencies	Product identification and labeling/ Basics of Product Coding	3	Know: types, forms and means of commodity information; basic regulatory and legal documents in accordance with the direction and profile of training; requirements for information of commodity products; accompanying documents, carriers and composition of labeling, groups of information signs; Be able to: give an opinion on the conformity (non-conformity) of commodity information for any group of goods; organize a search and use regulatory documents in the field of information about goods in professional activities; analyze complaints and claims to goods, prepare conclusions based on the results of their consideration; apply organization standards in trade practice; assess compliance of commodity information with the requirements of regulatory documentation. Possess skills: knowledge of requirements for commodity information; use of information obtained from the Internet; methodology for searching and using existing technical regulations, standards, codes of rules; work with complaints and claims; basics of implementing organization standards in trade practice; methods of operational accounting of information data in commercial activities; work with labeling of goods of different groups of goods; methods of classification and coding of goods, methods and means of determining the indicators of the assortment and quality of goods and ways to preserve the quality of goods
				Know: legislation in the field of identification and coding; regulatory legal acts and methodological materials; types of state classifiers. Be able to: apply computer technologies for identification and coding; navigate the structure of barcodes; perform the calculation of barcode control numbers. Possess the skills of: work on the organization of coding in developed countries; international organizations for unification and coding; processing the results of coding, coding products, technology and organization.
2		Quality audit/Audit of the quality management system of products and services	6	To know: -the main provisions of regulatory documents; --basic concepts related to quality audit; -objectives, principles, types of quality audit and their features; -qualification requirements of experts (auditors); -procedures for planning, preparing, and conducting quality audits;

				-algorithm for preparing and conducting a quality audit. Be able to: -work with standards; -develop questionnaires in preparation for the audit; -to develop audit documentation; - to draw up protocols on the results of the audit; - to evaluate actions based on the results of the audit. Possess skills: -fundamentals of industrial relations during quality audits. -product quality management and quality management -modern methods and principles of forming a quality management system
				To know: -the essence, goals and objectives of quality audit; - quality system audits; - audit principles; - stages of the audit; - audits of quality management systems; -the essence and objectives of internal control, the content of the main regulations related to internal control. Be able to: - to carry out the audit procedure of the quality system, collection of audit evidence; - use statistical methods for conducting audits; - build an audit sample and evaluate its results; - conduct internal audit; - analyze and summarize the audit results; - to draw up the results of the audit; - Possess skills: -application of analytical procedures and methods of selection of documentation and records during inspections; - the methodology of the auditor's work; quality management systems; - development of accounting documentation, corrective and preventive actions; - planning an audit, forming a schedule and a working group of auditors;
3		Technology of structural materials/ Technological machines and equipment	4	To know: methods of obtaining and developing new structural materials and methods of their processing; methods of creating rational concentration quality level programs based on modern technologies; modern technological processes for processing structural materials.

				Be able to: assign and choose a rational technology for the manufacture of machine parts; make a choice of methods for obtaining structural materials, technology for the manufacture of blanks, machining technology; Possess skills: skills of designing and manufacturing technological parts and structures; methods of analysis and search of materials for the production of this type of products.
				Know: crystallization of metals and alloys; mechanical properties of materials; heat treatment of metals and their types; importance of chemical heat treatment of steel; properties of non-ferrous metals and alloys. Be able to: analyze microscopic carbon steel; analyze microscopic cast iron; thermally (cultivation and softening) process carbon steel; investigate aluminum alloys and microstructures of bacteria; analyze microstructures of copper and copper alloys. Possess the skills of: mechanical properties of materials; properties and methods of structural and tool materials, structures and their hardenings.
4		Unified documentation system/ Unification and standardization of management documents	5	To know: basic requirements, regularities of documentation, terminology of documentation; methods of classification, unification and standardization of documents, the composition of unified documentation systems; rules for drawing up and processing documents using modern technology; documentation terminology; legislative and regulatory legal acts and regulatory and methodological materials for documenting management activities; methods and means of documentation; classification of documentary information; characteristics and composition of unified documentation systems Be able to: correctly draw up documents and issue them in accordance with state standards; unify, design forms of documents; make a nomenclature of cases and document storage; draw up documents using language variants depending on the purpose of the content and type of document; unify the texts of documents; issue documents in accordance with the requirements of regulations and state standards; register accounting documents; use unified forms of documents; Possess the skills of: compilation, registration, processing, accounting, registration, control, storage, systematization, preparation of documents for archival storage, destruction of documents, application of the requirements of regulations and state standards in the preparation and execution of documents; development of unified forms of documents and report card forms of documents; skills of using new information technologies in the creation of management documents, development of document templates; application of criteria and principles for determining the scientific, historical and practical value of documents
				To know: accreditation of the US bodies of organizational and administrative documentation;

				Be able to: analyze the accreditation documentation, prepare for on-site examination and conduct it, perform an audit; Possess the skills of: negotiation and evaluation techniques, analyze accreditation documentation, prepare for on-site expertise and conduct it, perform an audit.
5		Technology of development of standards and regulatory documents/ Technology and construction of construction products	8	To know: legal support, legal norms, to master the classification of normative documents and standards, principles and methods of building standards and normative documentation. Be able to: use legal norms, legislative acts, possess practical skills in developing, approving the examination of standards and other regulatory documentation. Possess the skills: development of technical conditions. The procedure for approval and approval of technical specifications. Application, verification procedure, modification, revision and cancellation of technical conditions
				Know: types of technical, regulatory, legal acts, rules for the development and application of technical codes of established practice. Be able to: distinguish between types of technical regulations. The procedure, rules for the development and application of technical regulations. Possess the skills: development of technical conditions. The procedure for approval and approval of technical specifications. Application, verification procedure, modification, revision and cancellation of technical conditions;
6		Regulatory framework for standardization and certification/ Norm control of documents in standardization and certification	5	To know: general theoretical principles of standardization, certification and metrology; the main provisions of the state system of standardization and certification; standardization methods; certification schemes and systems, rules and procedures for certification; organizational, scientific and methodological foundations of metrology, legal foundations for ensuring the uniformity of measurements; Be able to: use methods of forecasting and optimization, unification and aggregation of systems of preferred numbers in the development of standards; verify (calibrate) measuring instruments; control the quality of measurements, plan measurements, verify and calibrate measuring instruments; Possess the skills: possess the skills of control and verification; regulatory framework of metrology, standardization and certification; theory of evaluation of the quality of measurement results and their mathematical measurements
				Know: classification of measurements by types of measurements and types of measuring instruments; measurement scales; Be able to: use methods of forecasting and optimization, unification and aggregation of systems of preferred numbers in the development of standards; Possess the skills: have the skills to calculate measurement errors and evaluate measurement results; determine the nomenclature of measured and controlled

				parameters of products and technological processes, establish optimal standards for measurement accuracy and control reliability, choose measurement and control tools
7		Measurements in construction/ Fundamentals of measurement in construction	6	To know: the organization and technology of product certification, methods of product quality analysis, scope of work, procedure and rules for engineering inspection of buildings and structures for various purposes; Be able to: participate in the development of new and revision of existing regulatory documents in construction; in the preparation and conduct of certification in construction; in the organization of a quality control system in construction; plan work on verification and calibration of measuring instruments and certification of test equipment. Possess skills: skills of processing and analysis of measurement results,
				To know: basic concepts related to measurement objects; basic concepts related to measuring instruments; patterns of measurement result formation; organizational, scientific and methodological foundations of metrological support; Be able to: evaluate the accuracy of the results obtained and minimize possible measurement errors. Possess skills: The formation of a modern engineer is impossible without mastering the methods of quality control of manufacturing, installation and erection of building structures, buildings and structures.
8		Economics of quality, standardization and certification	7	Know: methods of estimating the cost of quality of products and services, the cost of metrological support Be able to: analyze the main indicators of the economic efficiency of quality assurance; Possess the skills: have an idea of the costs in the quality management system; apply methods for determining the costs and cost of work in the field of quality management, standardization and certification, accreditation, conformity assessment.
		Fundamentals of quality in standardization and certification		Know: technological features of building materials; Be able to: the location of the main points in the technological process, which require constant and periodic monitoring of changes in the properties of raw materials, semi-finished products and finished products. Possess the skills: to determine the nomenclature of measured and controlled parameters of products and technological processes, to establish optimal standards of measurement accuracy and control reliability, to choose measurement and control tools
9		Technology of production of building materials/Equipment for the production of building materials	7	To know: to carry out work to ensure quality control of finished products; to use raw materials rationally Be able to: solve various engineering problems; evaluate the properties of wall materials and structures; conduct tests of raw materials;

				Possess the skills: to determine the technologies of wall materials and structures designed to create modern enclosing structures of buildings and structures that meet modern standards.
				To know: the choice of a design scheme, limit states, a system of reliability coefficients, calculation and construction of building structures. Be able to: apply modern progressive technologies, especially with the complex use of man-made raw materials, cost-effective and conducive to solving environmental problems, taking into account the requirements of safety and environmental protection. Possess the skills to control, regulate and manage processes based on existing regulatory and technical documentation
10		Computer technologies in construction/ Technologies in construction	7	To know: basic numerical methods used in solving problems of underground and urban construction; existing software products and information technologies for designing construction objects. Be able to: process the information obtained in the course of research using mathematical and statistical methods, analyze and comprehend it taking into account the tasks of research. Possess skills: the ability to independently acquire new knowledge and skills with the help of information technology and use them in their practical activities, expand and deepen their scientific worldview
				To know: industrial methods of construction of buildings and structures; the basics of in-line execution, the methodology of technological design and the content of projects for the production of construction and installation works; modern technologies for the construction of buildings and structures. Be able to: use the acquired knowledge in practice when performing design work, production planning, work on the construction site and conducting research on the technology of construction production. Possess the skills of: creative engineering and technical thinking, the ability to analyze and evaluate emerging complex production situations, make decisions taking into account the main principles and materials of construction and technological research, prospects for the development of construction production technology.
11		Processes and devices for the production of building materials/ Production of building materials	7	Know: solve various engineering problems; evaluate the properties of wall materials and structures; Be able to: carry out tests of raw materials; perform work to ensure quality control of finished products; rationally use raw materials Possess the skills of: possession of measuring instruments and measurement techniques during quality control in construction

				Know: the nomenclature of building materials and their properties; features of their structure, raw materials; the essence of the operation and processes of processing raw materials; production technology of various building materials, their cost, etc.; Be able to: correctly determine the features of building materials; justify the choice of materials and products in design solutions for the specified conditions of their operation; ensure the quality of materials; predict the reliability and durability of materials in structures; Possess the skills: material science basics of obtaining building materials with the required properties;
12		Technical regulations for the safety of buildings and structures, building materials and products/ Safety of building materials and products	8	Know: manufacturing technologies, control methods and properties of modern wall materials and products, in accordance with the requirements of the current GOST Be able to: solve various tasks; evaluate the properties of wall materials and structures; conduct tests of raw materials; Possess the skills of: conducting conformity assessment of products, processes and services, conducting conformity assessment of quality systems and productions; knowledge of the system of mandatory and voluntary certification, legislative and regulatory documents
				To know: the basics of construction design, engineering preparation of the construction site in the conditions of new construction and reconstruction; technical regulations for the construction, repair and reconstruction of buildings and structures, acceptance and quality control of work; Be able to: use reference and regulatory literature, design and carry out technological support of construction and installation processes, perform specialized surveys of buildings and structures, field and laboratory tests of building materials, products and structures; Possess the skills of: developing programs for specialized surveys of buildings and structures, compiling lists of defects and damage to structures, solving a set of tasks for quality control of construction and installation works.

Table 2. Sequence of mastering disciplines of social and professional interaction

Course	Providing disciplines	Competencies	Expected result
1	2	3	4
General education disciplines			
1	History of Kazakhstan	Social and ethical competencies	To know: -main sources and historical research; -about the most important events of the XX and the beginning of the XXI centuries; - about the development of Kazakhstan in the period of civil confrontation and in the conditions of the Soviet system; -about the important stages of the formation of sovereign and independent Kazakhstan basic terms of historical science; Be able to: -correlate common phenomena and individual historical facts; - independently work with sources and historiography, prepare abstracts, essays and presentations; analyze and be able to evaluate significant historical events; - explain their cause-and-effect relationships; -think logically, discuss freely and defend your own opinion; -explain the meaning and significance of the main historical concepts. Possess skills: -work with sources, historiography and materials of periodicals and Internet; -writing essays, reports and essays; -preparation and presentations; -compilation of comparative tables; -performing test and situational tasks; -public speaking, conducting discussions and polemics.
1,2	Foreign language	Competencies in the field of languages	To know: -the volume of professional vocabulary required for professional communication in a foreign language; Be able to: - work with special literature in a foreign language; Possess skills: -professional oral and written communication in a foreign language.
1,2	Kazakh (Russian) language	Competencies in the field of languages	To know: -the use of the Russian (Kazakh) language, both in everyday and professional communication; Be able to:

			-work with professional and technical literature, analyze professional and technical tests, carry out two-way translation; Possess skills: --knowledge and skills of management, planning, organization and forecasting of the labor market; principles and methods of labor market management, requirements for the formation and use of labor resources, their professional training and retraining;
1	Information and communication technologies	Information and communication competencies	To know: -- economic and political factors of the development of information and communication technologies; -features of various operating systems, architecture. Be able to: - identify the main trends in the field of information and communication technologies; use information resources to search and store information; -work with spreadsheets, perform data consolidation, build graphs; -apply methods and means of information protection. Possess skills: -database structure development; -designing and creating presentations, receiving data from the server; -creating video files; -work with smartmart applications; -work with services on the e-government website.
2	Philosophy	Social and ethical competencies	To know: -main stages, directions, teachings and problems of philosophy; Be able to: - to think philosophically competently, which is manifested in the ability to independently think through the most important philosophical topics; Possess skills: -conceptual and categorical apparatus of philosophy, skills of analytical reading of philosophical texts, critical thinking.
1	Sociology	Competence of general education	To know: - patterns and stages of the historical process, the main historical facts, dates, events and names of world and domestic historical figures; - the main events and processes of national history in the context of world history Be able to: - critically perceive, analyze and evaluate historical information, factors and mechanisms of historical changes;

			- analyze civil and ideological positions in society, form and improve their views and beliefs, transfer philosophical worldview to the field of material and practical activities; - use various philosophical methods to analyze trends in the development of modern society, philosophical and legal analysis Own: - skills of a holistic approach to the analysis of society's problems; - methods of philosophical, historical and cultural studies, techniques and methods of analyzing the problems of society; - causal relationships in the development of Kazakhstan society; the place of a person in the historical process and the political organization of society; skills of respectful and careful attitude to the historical heritage
1	Political Science	Competence of general education	To know: - the main stages of the development of political knowledge in the history of civilization; - schools and directions of modern political science; - political life of society; - the political system and its institutions; - the essence of political processes in the country and the world. Be able to: - analyze the features of political systems and the functioning of political institutions; - to critically evaluate the theoretical approaches of political science; - to identify the interrelationships and patterns of the political process; - to compare political systems, institutions and actors in an inter-country and subnational context, based on the knowledge gained and the methods mastered. Own: - Have the skills (gain experience) of working with primary sources on the topics of the course; analysis of regulatory legal acts and other documents; search, processing and analysis of information; solving problems related to the assessment of the political course; working in groups, project activities, business games; public speaking; academic writing. Have the skills to express their thoughts and opinions in interpersonal and business communication in a foreign language; the skills to extract the necessary information from the original text in a foreign language.
1	Cultural studies	Competence of general education	To know: - basic theories of culture, basic concepts of cultural studies; the main directions of the methodology of modern cultural analysis;

			- the history of the formation of world culture and civilization, theoretical features of basic cultural concepts, various interpretations of culture and civilization in world and domestic literature; - actual problems of the development of modern culture; - the idea of culture as a socio-historical phenomenon; - regularities of the development of world cultures, as well as the typology of the classification of cultures; -basic knowledge about the history of the most important cultures of mankind; - about the ways of acquiring, storing and transmitting the basic values of culture - about the diversity and self-worth of various cultures, - forms and types of culture, patterns of their functioning and development, the main cultural and historical regions - the history of Kazakh culture, its place in the system of world culture and civilization Be able to: - be able to identify the features of this culture, the dominant values in it; - explain the specifics of intercultural communication; - be able to conduct independent professional activity in a dynamically changing multicultural society; - be able to navigate the cultural environment of modern society; - be able to explain the phenomenon of culture, its role in human life; - be able to navigate cultural issues, independently understand the issues of the influence of cultural factors on the behavior of individuals; - Possess: - practical skills in the preservation and enhancement of national and world cultural heritage; - practical skills of practical use of knowledge and skills in taking into account the specifics of cultural behavior of various individuals and collectives in the modern conditions of the formation of civil society in the Republic of Kazakhstan.
1	Psychology	Competence of general education	To know: the meaning and place of psychology in the system of sciences; the main directions of personality development in modern psychology; personal values and meanings in professional self-determination; the relationship and mutual influence of the psyche and body; techniques and techniques of effective communication. Be able to: interpret basic psychological theories, concepts; use methods and mechanisms of emotion regulation in everyday life; identify patterns of behavior in a conflict situation and conduct self-diagnosis.

			Possess: definitions of individual psychological characteristics of personality, value-semantic concepts in professional self-determination of personality; recognition of psychological impact and effective communication.
1	Fundamentals of economic and legal knowledge	Competence of general education	The discipline forms an idea of the state and law, legislation and the operation of legal norms, legal relations and legal responsibility, knowledge in the field of market economy, financial literacy and entrepreneurship. It also studies the patterns of corruption, mechanisms and methods of combating it, the main elements of modern market infrastructure, the formation of skills to create your own business.
1	Fundamentals of scientific and environmental knowledge	Competence of general education	KnowTo know: forms and methods of pre-scientific, scientific and extra-scientific cognition, modern approaches to socio-humanitarian knowledge and their commensurability; basic epistemological models, the nature of transformations of the concept of rationality; fundamentals of ecology and safe human life in the environment, environmental factors and their impact on living organisms, methods for identifying, eliminating the influence of harmful factors on human and environment, and providing comfortable conditions for human life and activity; Be able to: formulate and solve problems that arise in the course of research and require in-depth professional knowledge; modify existing and develop new methods based on the tasks of a specific study; choose methods of protection from hazards in relation to the field of their professional activities and choose ways to ensure comfortable living conditions; Possess the skills of: conducting independent research and scientific and pedagogical activities that require extensive education in the appropriate direction; the ability to apply methodological and methodological knowledge in conducting scientific research; skills to ensure the safety of life in professional activities, living conditions and in emergency situations.
Basic disciplines			
1	Mathematics	Competencies of natural sciences	Know: The course of higher mathematics in the scope of this program; Be able to: apply modern mathematical methods to solve applied problems; Possess skills: to use the achievements of fundamental science for the successful study of general theoretical and special technical disciplines, the development of mathematical thinking and logic. When choosing mathematical modeling methods for solving specific technical problems.
1	Physics	Competencies of natural sciences	To know: -basic laws of classical and modern physics and physical phenomena; - methods of physical research; - the influence of physics as a science on the development of technology; -the relationship of physics with other sciences and its role in solving scientific and technical problems of the specialty; Be able to:

			-use modern physical phenomena and laws in practice and invert the results of a physical experiment; - build a model of a physical phenomenon with an indication of the application boundary; Own skills: - solving specific physics problems; - conducting a physical experiment and evaluating the results obtained; Be competent: - in matters of setting and solving physical problems in professional activity; in the modern view of the surrounding world and the state of the scientific and technical process.
2	Standardization and certification	Professional competencies	To know: -the essence and content of standardization and certification, the technology of standards development, the system of supervision over compliance with mandatory requirements of regulatory documents on standardization; -legislative and regulatory documents, methodological materials on certification, rules and procedure for conformity assessment of products and services, mandatory and voluntary certification systems, conformity assessment schemes, rules for conformity assessment tests; Be able to: - use the information base on standardization, national and international standards, regulatory and technical documents in the field of certification; -to apply in practice the rules for the development of standards and the introduction of amendments and cancellations of standards; -apply methods of quality control of products and processes when carrying out work on conformity assessment; -apply methods of product quality control; - apply computer technologies for planning and carrying out standardization and conformity assessment work; Possess skills: -work with regulatory documentation on standardization and certification; -revision of existing standards and other certification documents; -implementation of systematic verification of normative documentation on standardization and certification; -study and systematization of advanced domestic and foreign experiences in the field of standardization and certification; Be professionally competent: In the legal and legislative field of standardization and certification; In the field of organization of standardization activities, in the development of regulatory documentation for its application; in the main provisions of the state certification system of the

			Republic of Kazakhstan, schemes and systems for conformity assessment, conditions for compliance, rules and procedure for conformity assessment.
2	Professional Kazakh (Russian) language	Competencies in the field of languages	To know: - basic terms and concepts of professional activity in Kazakh (Russian) language; - rules of ethics of business and professional communication; Be able to: -work with professional and technical literature, analyze professional and technical texts, carry out two-way translation; -determine the linguistic means of organizing the text and use them when generating your own statements on the topic; Own skills: - understanding the content of general and professional texts; --scientific and technical translation and oral communication in monological and dialogical forms in the specialty; -making plans converting a plan into an oral retelling, a written retelling – a summary of the content; abstract description of the content, writing an annotation to the text. Be professionally competent: In solving real communicative tasks in specific situations of professional activity.
2	Professionally-oriented foreign language	Competencies in the field of languages	To know: - the specifics of oral and written speech in the fields of professional, scientific, socio-political communication; -national and cultural features of the construction of the organization of the text in a foreign language within the framework of professionally-obsusled situations; -stylistic features of the vocabulary of a foreign language in the field of professional communication; Be able to: -to carry out professional activities in linguistic, sociolinguistic, information-analytical and communicative aspects; - - to build their verbal and nonverbal behavior in the areas of professional and scientific socio-political communication; to apply a variety of language and speech means adequately to social factors, communication situations, the status of the interlocutor and his communicative dimensions; Own skills: - perception and understanding by ear of the appropriate level of messages of a business, informational and vocational nature; -introductory and learning reading of business and scientific and technical documentation, providing for the extraction of information from what has been read and its use in speech.

			Possess professional and communicative competencies: - communicative competence, ability and willingness of the student to realize communicative intentions; -professional-oriented competence, professional knowledge in all aspects of speech and communication activities related to the technology of future professional activity.
2	General measurement theory	Professional competencies	To know: -terms and definitions of the system ensuring the uniformity of measurements, the international system of SI units; - general laws and rules of measurement; - methods and means of measurement; -the international system of units of quantities and the basics of the theory of dimension. Be able to: -determine measurement errors and the laws of their distribution; - methods of processing measurement results; -build mathematical models of measurement objects; -to estimate the errors of the functions of approximate parameter values; -to carry out summation of error components, both deterministic and random. Possess skills: - - methodologies for calculating measurement errors, processing measurement results; --the belief about the crucial role of measurements in human cognition of nature; -have an idea of the principles of constructing equations of measurement processes of various physical quantities.
2	Product identification and labeling / Basics of Product Coding	Professional competencies	To know: -types, forms and means of commodity information; -the main regulatory and legal documents in accordance with the direction and profile of training; -requirements for the information of marketable products; -accompanying documents, carriers and composition of marking, groups of information signs; Be able to: -to give a conclusion on the conformity (non-conformity) of product information for any group of goods; -organize the search and use regulatory documents in the field of information about goods in professional activities; -analyze complaints and claims to goods, prepare conclusions based on the results of their consideration; - apply the standards of the organization in the practice of trade; - assess the compliance of product information with the requirements of regulatory documentation. Possess skills:

			- knowledge of the requirements for product information; -use of information obtained from the Internet; - methodology of search and use of existing technical regulations, standards, codes of rules; -work with complaints and claims; - the basics of the implementation of the organization's standards in the practice of trade; - methods of operational accounting of information data in commercial activities; -work with labeling of goods of different product groups; methods of classification and coding of goods, methods and means of determining the indicators of the assortment and quality of goods and ways to preserve the quality of goods.
			To know: -legislation in the field of identification and coding; -regulatory legal acts and methodological materials; -types of state classifiers. Be able to: -apply computer technologies for identification and coding; -navigate the structure of barcodes; -perform calculation of barcode control numbers. Possess skills: -work on the organization of coding in developed countries; -international organizations for unification and coding; -processing of coding results, product coding, technology and organization; -methods and means of assessing the compliance of product information with the requirements of regulatory documentation; -methods of classification and coding of goods, methods and means of determining the indicators of the assortment and quality of goods and ways to preserve the quality of goods; -methods and means of natural science disciplines for assessing consumer properties of goods; -rational methods and methods of storage, transportation and sale of goods.
3	Quality audit / Audit of the quality management system of products and services	Professional competencies	To know: -the main provisions of regulatory documents; --basic concepts related to quality audit; -objectives, principles, types of quality audit and their features; -qualification requirements of experts (auditors); -procedures for planning, preparing, and conducting quality audits; -algorithm for preparing and conducting a quality audit. Be able to: -work with standards; -develop questionnaires in preparation for the audit;

			-to develop audit documentation; - to draw up protocols on the results of the audit; - to evaluate actions based on the results of the audit. Possess skills: -fundamentals of industrial relations during quality audits. -product quality management and quality management -modern methods and principles of forming a quality management system
			Know: -the essence, goals and objectives of quality audit; - quality system audits; - audit principles; - stages of the audit; - audits of quality management systems; -the essence and objectives of internal control, the content of the main regulations related to internal control. Be able to: - to carry out the audit procedure of the quality system, collection of audit evidence; - use statistical methods for conducting audits; - build an audit sample and evaluate its results; - conduct internal audit; - analyze and summarize the audit results; - - to formalize the results of the audit; Possess skills: -application of analytical procedures and methods of selection of documentation and records during inspections; - the methodology of the auditor's work; - quality management systems; -development of accounting documentation, corrective and preventive actions; - planning of an audit, formation of a schedule and a working group of auditors;
2	Engineering Graphics/ Engineering Graphics and Descriptive Geometry	Professional competencies	To know: -standards of the Unified System of Constructive Documentation (ESCD) and the requirement for ESCD; -laws, methods and techniques of projection drawing; -rules of registration and reading of design and technological documentation; -rules for the execution of drawings, technical drawings, sketches, geometric constructions; -technique and principles of dimensioning; laws of linear perspective and basic methods of constructing space on a plane, methods of constructing shadows; -stages and procedures of architectural and construction design; -technique and sequence of project execution;

			-requirements of the state standards of the Unified System of Design Documentation (ESKD) and the Unified System of Technological Documentation (ESTD); Be able to: - use AutoCAD computer graphics; solve geometric modeling problems: simple spatial problems and solve geometric modeling problems of any complexity; -use regulatory documents, catalogs and other documentation; -solve geometric problems based on images of spatial forms; -solve simple compositional problems when constructing three-dimensional objects; - to carry out working drawings, sketches of details and architectural and construction drawings using the technique of manual graphics; -perform orthogonal, axonometric and perspective projections; correctly express graphically technical thought; -carry out self-monitoring of the implementation of the graphic part of the project; - clearly and logically present the ideas and content of your project; - to evaluate the results of their work at each stage and adjust their activities; to discuss problems, to defend their position in a reasoned manner; - use state standards, reference and technical literature; - Possess skills: - solving problems of geometric modeling: simple and complex spatial problems, by means of engineering graphics; - rules and techniques of working with drawing tools, special engineering and construction terminology; - independent construction of an algorithm for solving specific graphical problems; -construction of spatial forms; -design and execution of drawings; -methods of research activity; -the ability to plan, organize and perform work in the allotted time;
2	Electrical engineering/Fundamentals of electrical engineering theory	Professional competencies	To know: -basic laws of electrical engineering, methods of analysis of electrical circuits; -basic laws of electrical engineering for electric and magnetic circuits; -methods of measuring electrical and magnetic quantities, principles of operation of the main electrical machines and devices, their operating and starting characteristics; - parameters of modern semiconductor devices: amplifiers, generators, secondary power supplies, digital converters; Be able to: - - determine measurement errors and the laws of their distribution, methods of processing measurement results;

			-read electrical and electronic circuits, primary converters and actuators; -identify the simplest malfunctions, make specifications; Possess skills: --methods for calculating measurement errors, processing measurement results; application of fundamental laws of electrical engineering to calculations, the principle of operation of semiconductor devices, electrical machines and apparatuses;
2	Technology of structural materials/ Technological machines and equipment	Professional competencies	To know: methods of obtaining and developing new structural materials and methods of their processing; methods of creating rational concentration quality level programs based on modern technologies; modern technological processes for processing structural materials. Be able to: assign and choose a rational technology for the manufacture of machine parts; make a choice of methods for obtaining structural materials, technology for the manufacture of blanks, machining technology; Possess skills: skills of designing and manufacturing technological parts and structures; methods of analysis and search of materials for the production of this type of products.
			Know: crystallization of metals and alloys; mechanical properties of materials; heat treatment of metals and their types; importance of chemical heat treatment of steel; properties of non-ferrous metals and alloys. Be able to: analyze microscopic carbon steel; analyze microscopic cast iron; thermally (cultivation and softening) process carbon steel; investigate aluminum alloys and microstructures of bacteria; analyze microstructures of copper and copper alloys. Possess the skills of: mechanical properties of materials; properties and methods of structural and tool materials, structures and their hardenings.
2	Theoretical mechanics/General mechanics	Professional competencies	To know: - physical fundamentals of mechanics; - basic concepts and axioms of theoretical mechanics, methods of modification of force systems, equilibrium conditions of a solid body, methods for determining the velocity and acceleration of point motion, the main types of solid physical movements, complex displacement of points, the main problems of the dynamics of a mathematical point, the dynamics of a mechanical system to know the general theorem; Be able to: - solve problems of theoretical mechanics; - use ways to transform systems of forces; - determine the speed and acceleration of point movement; Possess skills: - use the studied materials in all areas; - solve problems related to the movement of material points; - methods of constructing mathematical models for solving problems of mechanics;

			solutions to practical problems;
3	Unified documentation system/Unification and standardization of management documents	Professional competencies	To know: -basic requirements, regularities of document education, terminology of documentation; - methods of classification, unification and standardization of documents, the composition of unified documentation systems; - rules for drawing up and processing documents using modern technology; documentation terminology; - legislative and regulatory legal acts and regulatory and methodological materials for documenting management activities; - ways and means of documentation; - classification of documentary information; - characteristics and composition of unified documentation systems - Be able to: - correctly draw up documents and execute them in accordance with state standards; - unify, design forms of documents; - to make a nomenclature of cases and document storage; - to draw up documents using language variants depending on the purpose of the content and type of document; - unify the texts of documents; - to draw up documents in accordance with the requirements of regulatory acts and state standards; - register the accounting of documents; - use unified forms of documents; Possess skills: -compilation, registration, processing, accounting, registration, control, storage, systematization, preparation of documents for archival storage, destruction of documents. application of the requirements of regulatory acts and state standards in the preparation and execution of documents; - development of unified forms of documents and report card forms of documents; -skills of using new information technologies when creating management documents, developing document templates; application of criteria and principles for determining the scientific– historical and practical value of documents;
			To know: -accreditation of the US bodies of organizational and administrative documentation; Be able to: -analyze the accreditation documentation, prepare for on-site examination and conduct it, perform an audit;

			Possess skills: -negotiation and evaluation methods, analyze accreditation documentation, prepare for on-site expertise and conduct it, perform an audit.
3	Building structures / Construction materials in construction	Professional competencies	To know: the methodology for calculating building structures by limiting conditions; the methodology for choosing the material for structural elements and their connections; the principles of designing building structures. Be able to: perform calculations of building structures made of reinforced concrete, steel and aluminum, wood. Possess the skills: methods of designing building structures with the help of existing regulatory documents and applied computer programs
			Purpose: to provide students with in-depth information about the main structural building materials, about the quality indicators of building materials and their production technology. To prepare a future specialist for the ability to make the optimal decision when choosing materials for the manufacture of structures and their production technology, to teach methods of analyzing the technical and economic efficiency of technological processes in the manufacture of building structures Contents: Fundamentals of technology of natural stone materials; fundamentals of technology of ceramic materials; fundamentals of technology of binding materials; fundamentals of technology and production of concrete products; fundamentals of technology and production of silicate products. Expected result: Know: Technological processes in the production of building materials and structures made of them. Regulatory requirements for processes and materials. Working conditions of materials and structures in structures. Be able to: develop a technical specification for the technology of manufacturing structures made of concrete and reinforced concrete. Possess the skills to conduct comprehensive research using standard and certification tests, the ability to use in practice modern ideas about the influence of micro- and nano-structures on the properties of materials, their interaction with the environment, fields, energy particles and radiation
3	Patenting/Patent and scientific and technical documentation	Professional competencies	To know: - basic provisions and definitions of patent law; - regulatory legal acts on patenting; - basic concepts used in the field of patenting; - the main objectives, principles and criteria of patenting; - rules for registration of patent documentation; - the structure of the national patenting system and the competence of the bodies included in this structure;

			- rights of authors-patent holders; - international and regional organizations for patenting; Be able to: - apply legislative and regulatory legal acts, methodological materials on patenting; - analyze equipment objects; - from the totality of the essential features of the developed object, to make a description and a formula of the invention, to identify and prove its protectability, as well as to draw up the documents of the patent application; - apply principles and criteria in the field of patenting; - protect their patent developments as objects of intellectual property; Possess skills: - basic concepts in the field of patenting; - the ability to create new technological processes based on a systematic approach to the objects under study, the development of technological equipment and product designs; - organization of work on patenting; correct registration of patent documentation;
3	Regulatory framework for standardization and certification/Regulatory framework for standardization and certification	Professional competencies	To know: general theoretical principles of standardization, certification and metrology; the main provisions of the state system of standardization and certification; standardization methods; certification schemes and systems, rules and procedures for certification; organizational, scientific and methodological foundations of metrology, legal foundations for ensuring the uniformity of measurements; Be able to: use methods of forecasting and optimization, unification and aggregation of systems of preferred numbers in the development of standards; verify (calibrate) measuring instruments; control the quality of measurements, plan measurements, verify and calibrate measuring instruments; Possess the skills: possess the skills of control and verification; regulatory framework of metrology, standardization and certification; theory of evaluation of the quality of measurement results and their mathematical measurements
			To know: general theoretical principles of standardization, certification and metrology; the main provisions of the state system of standardization and certification; standardization methods; certification schemes and systems, rules and procedures for certification; organizational, scientific and methodological foundations of metrology, legal foundations for ensuring the uniformity of measurements; Be able to: use methods of forecasting and optimization, unification and aggregation of systems of preferred numbers in the development of standards; verify (calibrate) measuring instruments; control the quality of measurements, plan measurements, verify and calibrate measuring instruments;

			Possess the skills: possess the skills of control and verification; regulatory framework of metrology, standardization and certification; theory of evaluation of the quality of measurement results and their mathematical measurements
3	Fundamentals of measurement in construction/ Measurements in construction	Professional competencies	To know: basic concepts related to measurement objects; basic concepts related to measuring instruments; patterns of measurement result formation; organizational, scientific and methodological foundations of metrological support; Be able to: evaluate the accuracy of the results obtained and minimize possible measurement errors. Possess skills: The formation of a modern engineer is impossible without mastering the methods of quality control of manufacturing, installation and erection of building structures, buildings and structures.
			To know: the organization and technology of product certification, methods of product quality analysis, scope of work, procedure and rules for engineering inspection of buildings and structures for various purposes; Be able to: participate in the development of new and revision of existing regulatory documents in construction; in the preparation and conduct of certification in construction; in the organization of a quality control system in construction; plan work on verification and calibration of measuring instruments and certification of test equipment. Possess skills: skills of processing and analyzing measurement results,
4	Economics of quality, standardization and certification/Fundamentals of quality in standardization and certification	Professional competencies	Know: methods of estimating the cost of quality of products and services, the cost of metrological support Be able to: analyze the main indicators of the economic efficiency of quality assurance; Possess the skills: have an idea of the costs in the quality management system; apply methods for determining the costs and cost of work in the field of quality management, standardization and certification, accreditation, conformity assessment.
			Know: technological features of building materials; Be able to: the location of the main points in the technological process, which require constant and periodic monitoring of changes in the properties of raw materials, semi-finished products and finished products. Possess the skills: to determine the nomenclature of measured and controlled parameters of products and technological processes, to establish optimal standards of measurement accuracy and control reliability, to choose measurement and control tools
4	Technology of production of building materials/equipment of production of building materials	Professional competencies	To know: to carry out work to ensure quality control of finished products; to use raw materials rationally Be able to: solve various engineering problems; evaluate the properties of wall materials and structures; conduct tests of raw materials;

			Possess the skills: to determine the technologies of wall materials and structures designed to create modern enclosing structures of buildings and structures that meet modern standards.
			To know: the choice of a design scheme, limit states, a system of reliability coefficients, calculation and construction of building structures. Be able to: apply modern progressive technologies, especially with the complex use of man-made raw materials, cost-effective and conducive to solving environmental problems, taking into account the requirements of safety and environmental protection. Possess the skills to control, regulate and manage processes based on existing regulatory and technical documentation
4	Computer technologies in construction/ Technologies in construction	Professional competencies	To know: basic numerical methods used in solving problems of underground and urban construction; existing software products and information technologies for designing construction objects. Be able to: process the information obtained in the course of research using mathematical and statistical methods, analyze and comprehend it taking into account the tasks of research. Possess skills: the ability to independently acquire new knowledge and skills with the help of information technology and use them in their practical activities, expand and deepen their scientific worldview
			To know: industrial methods of construction of buildings and structures; the basics of in-line execution, the methodology of technological design and the content of projects for the production of construction and installation works; modern technologies for the construction of buildings and structures. Be able to: use the acquired knowledge in practice when performing design work, production planning, work on the construction site and conducting research on the technology of construction production. Possess the skills of: creative engineering and technical thinking, the ability to analyze and evaluate emerging complex production situations, make decisions taking into account the main principles and materials of construction and technological research, prospects for the development of construction production technology.
4	Processes and devices for the production of building materials/ Production of building materials	Professional competencies	Know: solve various engineering problems; evaluate the properties of wall materials and structures; Be able to: carry out tests of raw materials; perform work to ensure quality control of finished products; rationally use raw materials Possess the skills of: possession of measuring instruments and measurement techniques during quality control in construction
			Know: the nomenclature of building materials and their properties; features of their structure, raw materials; the essence of the operation and processes of processing raw materials; production technology of various building materials, their cost, etc.; Be able to: correctly determine the

			features of building materials; justify the choice of materials and products in design solutions for the specified conditions of their operation; ensure the quality of materials; predict the reliability and durability of materials in structures; Possess the skills: material science basics of obtaining building materials with the required properties;
4	Technical regulations for the safety of buildings and structures, building materials and products/ Safety of building materials and products	Professional competencies	Know: manufacturing technologies, control methods and properties of modern wall materials and products, in accordance with the requirements of the current GOST Be able to: solve various tasks; evaluate the properties of wall materials and structures; conduct tests of raw materials; Possess the skills of: conducting conformity assessment of products, processes and services, conducting conformity assessment of quality systems and productions; knowledge of the system of mandatory and voluntary certification, legislative and regulatory documents.
			To know: the basics of construction design, engineering preparation of the construction site in the conditions of new construction and reconstruction; technical regulations for the construction, repair and reconstruction of buildings and structures, acceptance and quality control of work; Be able to: use reference and regulatory literature, design and carry out technological support of construction and installation processes, perform specialized surveys of buildings and structures, field and laboratory tests of building materials, products and structures; Possess the skills of: developing programs for specialized surveys of buildings and structures, compiling lists of defects and damage to structures, solving a set of tasks for quality control of construction and installation works.
4	Technology of development of standards and regulatory documents/ Technology and construction of construction products	Professional competencies	To know: legal support, legal norms, to master the classification of normative documents and standards, principles and methods of building standards and normative documentation. Be able to: use legal norms, legislative acts, possess practical skills in developing, approving the examination of standards and other regulatory documentation
			Know: types of technical, regulatory, legal acts, rules for the development and application of technical codes of established practice. Be able to: distinguish between types of technical regulations. The procedure, rules for the development and application of technical regulations. Possess the skills: development of technical conditions. The procedure for approval and approval of technical specifications. Application, verification procedure, modification, revision and cancellation of technical conditions;
Profile disciplines			
2		Professional competencies	To know: -structures of the accreditation body;

	Accreditation of certification bodies and testing laboratories/Accreditation system in the Republic of Kazakhstan		- directions and basic principles of international cooperation in the field of standardization, conformity assessment, accreditation; – international, regional, foreign practice of conformity assessment; – general principles of building quality management systems in accordance with ISO 9000 standards; -basic forms of documents; - methods of accreditation and examination procedures; - legal protections of accreditation; Be able to: -apply the requirements of legislative acts and regulatory documents to accredited laboratories; – organize the work and compliance with the rules and procedures for accreditation of testing (measuring) laboratories (centers); – to conduct an examination of the documents submitted for accreditation, to assess the compliance of the accreditation area of the testing laboratory with the areas of accreditation of certification bodies with which the laboratory has an agreement to conduct certification tests, to issue an expert opinion; – organize control tests of specific products and evaluate the qualifications of testers for testing, processing and registration of test results, as well as the technical (declared) capabilities of the testing laboratory (center); – to assess compliance with the current legislation of the status of the organization applying for accreditation as a testing (measuring) laboratory; – to give recommendations on how to eliminate shortcomings in the work of the organization applying for accreditation; – to assess the compliance of the organization with the requirements for testing laboratories of a specific specialization, to issue a certificate of certification, if necessary , to issue a reasoned dissenting opinion; issue a set of accreditation documents, including an accreditation certificate; – organize and conduct inspection control of compliance with the requirements of an accredited testing (measuring) laboratory (center), compliance with the accreditation criteria, issue documents and a decision based on the results of inspection control. Possess skills: - computer technologies for planning and carrying out work on standardization, certification; - registration of documentation during the accreditation of testing (measuring) laboratories (centers); - processing of experimental data and evaluation of accuracy (uncertainty) of measurements, tests and reliability of control; -registration of test results and making appropriate decisions.

			To know: -the procedure for the development of regulatory documents, approval, accreditation of certification bodies and testing centers; Be able to: -eliminate technical barriers to trade, which largely depends on accreditation; - solving problems on the problems of the certification and accreditation system of the Republic of Kazakhstan. Possess skills: knowledge about registration, registration and issuance of an accreditation certificate.
3	Quality control of building materials	Professional competencies	Know: product quality control and process management; quality control methods; fundamentals of probability theory and various methods of statistical analysis and organization of product quality management; Be able to: determine the quality of products; use the method of statistical comparison of histograms; check the accuracy of the technological process; use various methods of statistical control and product quality management at all stages of product movement, ensuring product quality that meets state standards and the lowest costs; Possess skills: applications of Pareto diagrams; The procedure for accreditation of certification bodies, testing, verification and calibration laboratories; evaluation of the quality of products and processes; an idea of the basic methods of statistical control and quality management of industrial products and consumer goods;
3	Quality systems	Professional competencies	To know: - the evolution of quality systems, the technology of development and implementation of quality systems at the enterprise, information support of the quality system, the principle of building quality management systems according to MS ISO 9000, the rules for testing conformity assessment, the rules for conducting confirmation of the quality system and production; - Be able to: -evaluate and analyze the existing quality system at the enterprise, develop and implement a quality system, plan internal audit, carry out corrective and preventive actions, and improve the system characteristics; Possess skills: -implementation of systematic verification of standards and other regulatory documents adopted at the enterprise; - control of the work on standardization of the enterprise division; study of systematization of advanced domestic and foreign experience in the field of development and implementation of quality systems;
3	Statistical methods of quality control of products and processes /Industrial	Professional competencies	To know: -quality control of products and process management;

	application of static methods of quality assurance		-quality control methods; -fundamentals of probability theory and various methods of statistical analysis and organization of product quality management; Be able to: - determine the quality of products; - use the method of statistical comparison of the histogram; - to check the accuracy of the technological process; - use various methods of statistical control and product quality management at all stages of product movement, ensuring product quality that meets state standards and the lowest costs; Possess skills: --applications of Pareto charts, scatter chart, Ishikawa chart, histograms; - the procedure for accreditation of certification bodies, testing, verification and calibration laboratories; - - product and process quality assessments; -an idea of the main methods of statistical control and quality management of industrial products and consumer goods;
3	Databases and Expert Systems / Database Basics	Professional competencies	To know: - database development structures and methods; - basic definitions of computer science, basic and composite data structures used in computer, technology; - fundamentals of the organization of modern computers and their general characteristics, trends in the development of computer devices and computer networks, principles of the organization of the use of computer technology; Be able to: - use the terminology of the subject, the type of database and the method of its execution, work in one of the database management systems and choose the criteria necessary to create expert systems; - to use modern software tools in their activities; Possess skills: -create databases and product quality assurance systems; -the main ways of analyzing and processing information using modern information technologies;
2	Fundamentals of calculation and construction of building structures / Fundamentals of calculation of building structures	Professional competencies	To know: the choice of a design scheme, limit states, a system of reliability coefficients, calculation and construction of building structures. Be able to: ensure that the completed design works comply with the applicable design regulations; use regulatory documents, catalogs and other documentation necessary for the design; Possess the skills to organize their own activities, choose standard methods and methods of performing professional tasks, evaluate their effectiveness and quality.

			To know: the basic requirements of the standards of the unified system of design and design documentation for construction for the design and compilation of architectural and construction drawings; Be able to: understand the design developments of adjacent parts of the project; perform all types of architectural and construction drawings at different stages of design. Possess skills: use information and communication technologies in professional activities.
3	Examination of the quality of goods /Examination of building materials	Professional competencies	To know: basic concepts of commodity science; objects, subjects and methods of commodity science; general classification of consumer goods, types, properties, assortment indicators; fundamental characteristics of goods; Be able to: recognize classification groups of goods; analyze stages and stages of the technological cycle of goods; Possess the skill: have an idea: about the importance of discipline for professional activity, about the consumer properties of food and non-food products, about the examination procedure, about standardization, the main directions of its development.
			Know: the procedure for developing, approving and approving documents for new construction and reconstruction of facilities; procedures for conducting economic, environmental and technical expertise of real estate; Be able to: perform separate sections of technical, environmental, economic expertise of buildings; draw up documentation on architectural and construction copyright and technical supervision; issue a license for the required type of activity; conduct an examination of the quality management system. Possess the skill: the procedure for the development, coordination and approval of documents for new construction and reconstruction of facilities; types of expertise, the rights of state non-departmental expertise; norms, documents and materials to be considered during environmental expertise
4	Design of construction materials production/Fundamentals of the production of building materials	Professional competencies	To know: basic physical and mechanical properties of building materials, their manufacturing technology, methods of increasing the efficiency of use; guidelines for metrological support; standards of construction production; fundamentals of metrology, standardization and certification in the field of production of building materials. Be able to: own and apply effective developments of leading research, design and engineering enterprises, analyze and select resource-saving technologies, waste-free production, comprehensively use local raw materials. Possess the following skills: general methodology of professional activity and development of professional creativity; possess the skills of handling modern technology, be able to use information technology in the field of professional activity;
			To know: types of building materials and products in accordance with the nomenclature, methods of designing new and optimizing the compositions of building materials used in production, used

			in practice and the latest technologies for the manufacture of concrete and reinforced concrete, ceramic, finishing, insulation materials and products, technological operations, means of technological equipment for the production and installation of metal structures, international standards in the field of quality management Be able to: develop technological processes, perform technological calculations of production, draw up and carry out measures to adjust technological parameters of production, material compositions in order to ensure or improve product quality, develop technological maps Possess skills: methods of quality control of raw materials and products at all stages of production of building materials and structures, assessment and quality control of construction and installation works
4	Labor protection/ Labor activity	Professional competencies	Know: Knowledge of the basic methods of action in case of emergency Be able to: The ability to create safe working conditions Possess the skill: Legal and organizational issues of labor protection
4	International standardization and certification/ Standardization and certification in the Republic of Kazakhstan	Professional competencies	To know: general principles and basic scientific provisions of standardization and certification; basic concepts, terms and definitions related to standardization and certification; indicators of the level of product quality and the basics of its quality management; rules of certification; principles of certification; Be able to: learn how to work with educational and methodological and reference literature corresponding to the topics included in the program. learn how to choose a scheme for conducting national certification of products based on certification. Possess the skill: acquire practical skills in matters related to the development of national standards based on international ISO standards\ IEC in matters related to the system of national certification based on international certification.
			To know: the ability to use: legal support, legal norms, legislative acts and the legal nature of standards; classification of regulatory documents and standards, principles and methods of building standards and regulatory documentation, rules for using them; the procedure for developing, passing and approving standards and other regulatory documentation Be able to: systems of mandatory and voluntary certification, legislative and regulatory documents. Possess the skill: knowledge of the system of mandatory and voluntary certification, legislative and regulatory documents.

Table 3. List of modules for the educational program 6B07527- Standardization, certification and metrology in construction

Module No.	Name of the module	List of disciplines included in the module	Block	Term	Number of credits	Form of control	Total credits by module
M1	*Fundamentals of Economics and Ecology*	Fundamentals of economic and legal knowledge	UC GED	2	3	Exam	5
		Basics of scientific and environmental knowledge	UC GED	2	2	Exam	
M2	*Basics of bilingual training*	Foreign language	RC GED	1	5	Exam	20
		Foreign language	RC GED	2	5	Exam	
		Kazakh (Russian) language	RC GED	1	5	Exam	
		Kazakh (Russian) language	RC GED	2	5	Exam	
M3	*Functional literacy*	Information and communication technologies	RC GED	1	5	Exam	5
M4	*Natural disciplines*	Mathematics	UC BD	1	5	Exam	14
		Physics	UC BD	1	4	Exam	
		Electrical engineering /Fundamentals of electrical engineering theory	EC BD	4	5	Exam	
M5	*Chemistry, standardization and certification, product coding*	Chemistry	UC BD	2	3	Exam	11
		Standardization and certification	UC BD	3	5	Exam	
		Product identification and labeling/Basics of product coding	EC BD	3	3	Exam	
M6	*History of Kazakhstan*	History of Kazakhstan	RC GED	2	5	SE	13
		Sociology	RC GED	2	8	Exam	
		Political science	RC GED	2	2	Exam	
		Cultural studies	RC GED	1	1	Exam	
		Psychology	RC GED	1	1	Exam	
M7	*Graphics and materials science.*	Engineering graphics / Engineering graphics and descriptive geometry	EC BD	3	5	Exam	10
		Technology of structural materials / Technological machines and equipment	EC BD	3	5	Exam	
M8	*Professional languages and measurements*	Professional Kaz. (Russian) language	UC BD	5	3	Exam	10
		Professionally oriented foreign language	UC BD	5	3	Exam	

		Basics of measurement in construction / Measurement in construction	EC BD	6	4	Exam	
M9	*Quality audit and accreditation of certification bodies*	Quality audit / System audit of product and service quality	EC BD	5	4	Exam	9
		Accreditation of certification bodies and testing laboratories	UC PD	3	5	Exam	
M10	*Mechanics*	Theoretical mechanics / General mechanics	EC BD	5	5	Exam	5
M11	*Measuring system*	General theory of measurements	UC BD	4	5	Exam	8
		Fundamentals of calculation and design of building structures/Basics of calculation of building structures	EC BD	4	3	Exam	
M12	*Normative documents*	Unified documentation system / Unification and standardization of management products	EC BD	4	4	Exam	15
		Regulatory framework for standardization and certification / Norm for document control in standardization and certification	EC BD	5	5	Exam	
		Technical regulations for the safety of buildings and structures, construction materials and products / Safety of building materials and products	EC BD	7	6	Exam	
M13	*Philosophy*	Philosophy	RC GED	4	5	Exam	5
M14	*Technological processes and technologies*	Building structures / Structural materials in construction	EC BD	4	4	Exam	9
		Computer technologies in construction / Technologies in construction	EC BD	7	5	Exam	
M15	*Processes and devices and quality systems*	Processes and apparatus for the production of building materials / Production of building materials	EC BD	7	5	Exam	15
		Quality systems	UC PD	4	5	Exam	
		Quality control of building materials	UC PD	5	5	Exam	
M16	*Management control methods*	Databases and Expert Systems / Database Fundamentals	EC PD	2	5	Exam	11
		Statistical methods for monitoring the quality of products and processes / Industrial application of static methods ensuring	EC PD	6	6	Exam	

M17	*Documentation and packaging containers.*	Technology for the development of standards and normative documentation / Technology and design of construction products	EC PD	8	4	Exam	4
M18	*Fundamentals of Scientific Research*	Patent research / Patent and scientific and technical documentation	EC BD	6	4	Exam	9
		Economics of quality, standardization and certification / Fundamentals of quality in standardization and certification	EC BD	6	5	Exam	
M19	*Quality examination*	Expertise of product quality / Expertise of building materials	EC PD	6	7	Exam	7
M20	*Production of building materials*	Technology for the production of building materials / Equipment for the production of building materials	EC BD	8	4	Exam	14
		Design of production of building materials / Basics of production of building materials	EC PD	7	5	Exam	
		International standardization and certification / Standardization and certification in the Republic of Kazakhstan	EC PD	8	5	Exam	
M21	*Labor activity*	Occupational Safety/Work Activities	EC PD	7	5	Exam	5
M22	*Additional types of training*	Physical Culture	ATT	1, 2, 3, 4	8	differential credit	8
M23	*Practice*	Educational practice	UC BD	2	1	Report	20
		Industrial practice I, II, III	UC BD, UC PD	4,6,8	16	Report	
		Undergraduate practice	UC PD	8	3	Report	
M24	*final examination*	final examination	ATT	8	8	FE	8