Institute of Energy and Mechanical Engineering named after A. Burkitbayev
Department of Standardization, Certification and Metrology

EDUCATIONAL PROGRAM
7M07503 Quality control and diagnostic methods and systems (by industry)

Code and classification of the field of education: 7M07 Engineering, manufacturing and construction branches
Code and classification of training directions: 7M075 Standardization, certification and metrology (by branches)
Group of educational programs: M130 Standardization, certification and metrology (by branches)
Level based on NQF: 7
Level based on IQF: 7
Study period: 2 years
Number of credits: 120

Almaty 2025

Educational program was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

Protocol # 12 dated « 22 » 04 2024.

was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council

Protocol # 6 dated « 19 » 04 2024 .

Educational program was developed by Academic committee based on direction «7M075 Standardization, certification and metrology (by industry)»

Full name	Academic degree/ Academic title	Position	Workplace	Signature
Chairperson of Academic Committee:				
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List of abbreviations and designations

EP - educational program
NQF - national qualification framework
IQF - industry qualification framework
LO - learning outcomes
BD - basic disciplines
MD - major disciplines
UC - university component
CO - course optional
SDG – Sustainable Development Goals

1. Description of educational program

The master's educational program “Quality control and diagnostic methods and systems (by branch)” is an area of study directly related to business practice, training specialists in the field of planning, preparing and conducting internalaudits of the quality management system, standardization, certification. It is an educational program in the scientific and pedagogical direction of training and is designed for 2 years of study. The study lasts four semesters, culminating in a Master of Engineering degree, which imparts in-depth knowledge and develops advanced skills for use in a changing and competitive environment.

This EP prepares undergraduates to perform duties in the field of management and develop, implement and operate modern models of quality management systems, solve problems of improving the quality of products and services, as well as consulting and auditing existing quality management systems.It allows you to acquire quality control skills, analyze the causes of defects and develop recommendations for reducing illiquid products and developing business plans to reduce costs and increase productivity.

2. Purpose and objectives of educational program

Purpose of EP: Training of highly qualified professionals in the field of analyzing and improving the quality of work of enterprises and organizations, regardless of industry and organizational form. Additionally, the program focuses on enhancing management systems based on the principles and approaches of quality management through scientific research. This contributes to increased management efficiency, competitiveness, innovation implementation, and the achievement of Sustainable Development Goal 9 through business process optimization.

Tasks of EP:

1. To develop the student’s competencies in managing material and information flows in the production of products and provision of services in the conditions of total quality management;
2. To develop the student’s competence to carry out the actions necessary for the effective operation of the quality management system;
3. To develop in students teamwork skills, production and ethical responsibility, the ability to work and communicate with various specialists and the need to improve their knowledge and skills;
4. To develop in the student the ability to carry out control and testing during the production process;
5. To develop the student’s ability to carry out activities to improve the quality of products and services.
6. Develop students' competencies in applying modern methods of diagnostics and quality analysis of products, as well as in using advanced tools and technologies for monitoring and improving quality across various industries

3. Requirements for evaluating the educational program learning outcomes

At the final stage of master's preparation, it is envisaged to complete and defend a master's thesis.

The academic disciplines in which a master's thesis is to be defended are determined by the current state compulsory standards of higher professional education.

The master's thesis is the result of independent research under the guidance of a supervisor.

The defense of the master's thesis takes place at a meeting of the State Attestation Commission.

The final state certification of students is carried out in accordance with the Rules for ongoing monitoring of academic performance, intermediate and final state certification of students in educational organizations.

Persons who have fully completed the curriculum for the educational and professional program of higher basic education with the completion of at least 120 academic credits of theoretical training and a final master's thesis, who have successfully defended a master's thesis, are issued a diploma of higher education with the assignment of qualifications and the award of the academic degree "Master of Technical Sciences".

The graduate is also given a diploma supplement, which includes final examination and test grades in the disciplines studied, an assessment for the defense of the master's thesis, indicating the topic of the master's thesis.

4. Passport of educational program

4.1. General information

№	Field name	Comments
1	Code and classification of the field of education	7M07 Engineering, manufacturing and construction branches
2	Code and classification of training directions	7M075 Standardization, certification and metrology (by branches)
3	Educational program group	M130 Standardization, certification and metrology(by industry)
4	Educational program name	7M07503 - Quality control and diagnostic methods and systems (by industry)
5	Short description of educational program	The master's educational program “7M07503 - Quality control and diagnostic methods and systems (by industry)” is an area of study directly related to business practice, training specialists in the field of standardization, certification and metrology, as well as in the field of analyzing and improving the quality of work of enterprises and organizations of any industry.

6	Purpose of EP	Training of highly qualified professionals in the field of analyzing and improving the quality of work of enterprises and organizations, regardless of industry and organizational form. Additionally, the program focuses on enhancing management systems based on the principles and approaches of quality management through scientific research. This contributes to increased management efficiency, competitiveness, innovation implementation, and the achievement of Sustainable Development Goal 9 through business process optimization.
7	Type of EP	Innovational
8	The level based on NQF	7
9	The level based on IQF	7
10	Distinctive features of EP	No
11	List of competencies of educational program	*General Competencies:* • Proficiency in English for: searching for scientific and technical information; working with scientific and technical literature; oral and written communication with a native speaker on professional topics and in real life situations. • Possession of critical systems thinking, transdisciplinarity and cross-functionality. • Possession of ICT competencies, ability to develop software using algorithmic languages. • Possession of skills: independent learning; deepening your knowledge; be open to new information; systems thinking and personal judgment. • The ability to be tolerant of another nationality,race, religion, culture; ability to conduct intercultural dialogue. • Possession of communication skills, ability to collaborate and work in a team. • Ability to work in conditions of high uncertaintyand rapidly changing task conditions; work with consumer requests. • Possession of a broad social, political and professional outlook; • Ability to use data from various sources and specialized literature, analyze and critically evaluate historical facts and events. • Knowledge of the basics of entrepreneurship and business economics, readiness for social mobility.. *Professional competencies:* • Possession of skills in analyzing the causes of nonconformities; • Possesses the skills of generating management decisions in the field of quality management in technical systems; • Has the skills to independently solve problems inthe field of quality management based on the latest achievements of science and technology; • Has the skills to develop criteria for evaluating quality management systems; • Has the skills to determine the forms and methodsof legal protection and defense of rights to the results of

		intellectual activity; • Has the skills to develop and improve processes in relation to quality management tasks; • Has the skills to reduce risks in quality assurance systems; • Has the skills to implement changes in quality assurance systems to maintain quality; Possesses leadership skills in creating methodological and regulatory documents in the fieldof quality management.
12	Education outcomes of educational program	EO1 – To understand organizing and coordinating the development of quality management system documents necessary for its functioning. EO2 – To apply management skills in creating methodological and regulatory documents in the field of quality management. EO3 – To analyze the process of developing measures to select the necessary means of forming optimal standards for ensuring the accuracy of the measured parameters of products (services). EO4 – To create and develop action plans to identify the necessary quality parameters of the designed product (service). EO5 – Assess the process of organizing and conducting internal audits of the quality management system operating within an organization, as well as the organization of external quality system audits for suppliers. This contributes to compliance with established standards, process efficiency improvement, risk minimization, enhanced partner collaboration, and the achievement of Sustainable Development Goal 9 through the implementation of best quality management practices. EO6 – To understand the theoretical and methodological basics of product certification and quality management systems. EO7 – To analyze modern methods of processing experimental data, to develop methods for the physical and technical assessment of objects in accordance with their industries.
13	Education form	Full-time
14	Period of training	2 years
15	Amount of credits	120
16	Languages of instruction	Kazakh, Russian, English
17	Academic degree awarded	Master of Technical Sciences
18	Developer(s) and authors	Aymagambetova R. head of department, “Kazstandard”;
		Tatybayev M., Deputy Director of the A. Burkitbaev Institute of Energy and Mechanical Engineering.
		Omarova Z. Assoc. prof. of the department SS&M
		Moldabekova A., master’s student, 1 year

4.2. Relationship between the achievability of the formed learning outcomes based on educational program and academic disciplines

№	Discipline name	Short description of discipline	Number of credits	Generated educatin outcomes (codes)						
				EO1	EO2	EO3	EO4	EO5	EO6	EO7
Cycle of basic disciplines University component										
1	Foreign language (professional)	The course is aimed at studying the main problems of scientific knowledge in the context of its historical development and philosophical understanding, the evolution of scientific theories, principles and methods of scientific research in the historical construction of scientific paintings of the world. The discipline will help to master the skills of developing critical and constructive scientific thinking based on research on the history and philosophy of science. At the end of the course, undergraduates will learn to analyze the ideological and methodological problems of science and engineering and technical activities in building Kazakhstan's science and the prospects for its development.	3	v						
2	History and philosophy of science	Purpose: to explore the history and philosophy of science as a system of concepts of global and Kazakh science. Content: the subject of philosophy of science, dynamics of science, the main stages of the historical development of science, features of classical science, non-classical and post-non-classical science, philosophy of mathematics, physics, engineering and technology, specifics of engineering sciences, ethics of science, social and moral responsibility of a scientist and engineer.	3		v					
3	Higher school pedagogy	The course is aimed at mastering the methodological and theoretical foundations of higher education pedagogy. The discipline will help to master the skills of modern pedagogical technologies, technologies of pedagogical design, organization and control in higher education, skills of communicative competence. At the end of the course, undergraduates learn how to organize and conduct various forms of organizing training, apply active teaching methods, and select the content of training sessions. Organize the educational process on the basis of credit technology of education.	3					v		
4	Psychology of management	The course is aimed at mastering the tools for effective employee management, based on knowledge of the psychological mechanisms of the manager's activity. Discipline will help you master the skills of making decisions, creating a favorable psychological climate, motivating employees, setting goals, building a team and communicating with employees. At the end of the course, undergraduates will learn how to resolve managerial conflicts, create their own image, analyze situations in the field of managerial activity, as well as negotiate, be stress-resistant and effective leaders.	3		v					
Cycle of basic disciplines Component of choice										
		Purpose: To train specialists in copyright protection for effective safeguarding of intellectual property and prevention of infringements. Content: Study of the legal aspects of copyright								

№	Discipline name	Short description of discipline	Number of credits	Generated educatin outcomes (codes)						
				EO1	EO2	EO3	EO4	EO5	EO6	EO7
5	Copyright protection	protection, procedures for obtaining patents for inventions, utility models, and industrial designs. Analysis of the patentability criteria for industrial property objects and development of intellectual property protection strategies across various industries.	5				v			
6	Intellectual property and research	The purpose of this course is to provide undergraduates with the knowledge and skills necessary to understand, protect and manage intellectual property (IP) in the context of scientific research and innovation. The course is aimed at training specialists who can effectively work with IP, protect the results of scientific research and apply them in practice.	5		v		v			
7	Commercialization of innovative technologies	Purpose: To prepare specialists in the commercialization of innovative technologies for successful market implementation and scaling of technological developments. Content: Study of the commercialization system in Kazakhstan, focusing on the National Agency for Technological Development. Examination of methods for developing and implementing new technologies. Exploration of contemporary trends in the advancement and improvement of manufacturing technologies.	5		v					
8	Scientific research of management within the framework of quality management	Purpose: To master the of scientific research in the field of management dedicated to managing quality. Content: Study methodological approaches to scientific research in management, analyze current trends and methodologies in managing quality, develop and execute scientific research projects in the field of quality management, and evaluate and apply findings to enhance the efficiency of organizational processes in managing quality.	5		v				v	
9	Trends in Sustainable Development Strategy	Purpose: To train master's students in sustainable development strategies to achieve a balance between economic growth, social responsibility, and environmental protection. Content: Master's students will study the fundamental principles of sustainable development, methods for developing and implementing strategies aimed at harmonizing environmental, economic, and social factors. Special attention will be given to evaluating the effectiveness of such strategies, analyzing international standards, and implementing best global practices. The course also includes the study of real-world examples of successful sustainable development projects, an analysis of challenges and solutions, as well as the development of students' own initiatives within the framework of sustainable development.	5	v			v			
10	Economic aspects of quality	Purpose: To develop an understanding of the economic aspects of quality management aimed at enhancing production process efficiency and ensuring organizational competitiveness. Content: Fundamental theoretical concepts and practical approaches to quality management, encompassing methodologies for assessing and managing the economic dimensions of product and service quality, cost analysis related to quality, formulation of economically viable strategies for quality enhancement, and illustrations of successful implementations of quality management systems across diverse economic sectors.	5	v						
Cycle of profile disciplines University component										
	Quality systems audit: sustainable development and	Purpose: To train specialists in conducting audits of quality systems to ensure their compliance with standards and continuous improvement of production processes. Content: Fundamentals of the stability of the quality of products and services and satisfaction of stakeholders,						v	v	

№	Discipline name	Short description of discipline	Number of credits	Generated educatin outcomes (codes)						
				EO1	EO2	EO3	EO4	EO5	EO6	EO7
11	production efficiency	primarily consumers. The quality system is evaluated for compliance with the requirements of the standard or the internal regulations of the organization. As a result, evidence is obtained in the form of information related to the audit criteria.	5							
12	Quality Management: Standards, Innovation and Sustainable Development	Purpose: To provide with knowledge and skills in the theory and practice of quality management, conceptual approaches, and methodological foundations of quality management. Content: Study of the fundamental principles and methods of standardization and certification. Examination of the processes involved in the development and implementation of standards within organizations. Analysis of international and national quality standards. Practical sessions on preparing and conducting certification audits. Development of quality management strategies based on standards and certification requirements.	5					v	v	
13	Methods and means of mechanical control	Purpose: To train undergraduates in methods and means of mechanical control to ensure high quality of production processes. Content: The study of basic methods of mechanical control, including measurement of dimensions and shapes, methods of non-destructive testing, strength and durability of materials. Practical exercises on the use of measuring instruments, equipment for quality control and interpretation of results. Development of data analysis and decision-making skills based on control results.	5		v					v
14	Quality assurance	Purpose: To prepare professionals equipped with knowledge and skills in quality assurance to enhance the efficiency of production processes. Content: Study of principles and methods of quality assurance, including quality management systems, ISO standards, methods for quality control and analysis of production. Practical sessions focusing on the application of quality assurance tools and techniques, error analysis, and process improvement. Development of strategies and action plans to improve quality and customer satisfaction.	5		v	v			v	
15	Modern strategic analysis	Purpose: To develop students' deep understanding of modern methods and tools of strategic analysis for successful application in the management of organizations. Content: The study of the main approaches to strategic analysis, including SWOT analysis, competitive environment analysis, stakeholder analysis and other modern tools. Analysis of current trends and methods of strategic planning. Conducting practical classes and case studies on the development and implementation of strategic solutions in various business areas.	5				v			
16	Special interchangeability issues	Purpose: To expand enlightened understanding of the specific aspects of interchangeability and their significance across various industries and applications. Content: Study of fundamental concepts and principles of interchangeability. Analysis of special cases and issues related to interchangeability in technical systems and products. Exploration of methods and technologies for ensuring interchangeability. Practical assignments and case studies to examine the impact of interchangeability on product quality and reliability.	5			v				
17	Quality management in production and technological systems	Purpose: To provide students with an understanding of the fundamental principles and methods of quality management in production, and to develop skills in analyzing, planning, and controlling quality within manufacturing processes. Content: Key concepts of quality management, methods for improving production processes, and practical approaches to ensuring product quality. Exploration of modern technologies and tools for effective quality management in production and technological systems.	4				v			v

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№	Discipline name	Short description of discipline	Number of credits	Generated educatin outcomes (codes)						
				EO1	EO2	EO3	EO4	EO5	EO6	EO7
18	Management of risks, processes, personnel in the quality system	Purpose: To study the basics of system analysis, modeling and risk management of systems and processes, to gain practical skills in their application, to study the theoretical foundations of the development and implementation of risk management systems. Content: Training of specialists capable of effectively managing risks, processes and personnel in the quality system to ensure stability and improve the effectiveness of the organization.	5				v			
Cycle of profile disciplines Component of choice										
19	Lean manufacturing	Purpose: To study the of lean manufacturing for optimizing production processes and reducing costs. Content: lean design; application of principles for creating a lean production flow and tools aimed at identifying, neutralizing, and preventing specific types of waste during the transformation of production into lean.	5	v						v
20	Methods and means of visual diagnostics	Purposal: Studying methods and tools of visual diagnostics for effective detection and analysis of problem areas in various fields. Content: Modern approaches in data visualization, visual analytics, data display systems, study of data models and structures, visual logic.	5	v						v
21	Product quality control methods	Purposal: Studying quality control methods to ensure compliance with standards and requirements, as well as to enhance consumer satisfaction. Content: This course provides masters with essential knowledge and skills for effective quality control in various industrial sectors, emphasizing the importance of accuracy, reliability, and adherence to standards in manufacturing processes.	5	v						
22	Quality Management System	Purpose: Learning the fundamentals and principles of quality management systems to ensure continuous process improvement and enhance customer satisfaction. Content: Study of the key components of a quality management system (QMS), including ISO 9001 standards. Analysis of standard requirements and their implementation in organizations. Development of quality policy and strategy. Practical sessions on developing procedures and instructions, conducting internal audits of the QMS. Examination of methods for assessing customer satisfaction and managing changes in the QMS.	5						v	