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 branch)"

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 2024

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:				
Aimagambetova Raushan	Master's degree	Head of the Department of Strategic Development and Sciences, «KazStandard»	Republican State Enterprise "KazStandard"	
Teaching staff:				
Yerezhep Darkhan	Candidate of technical sciences, PhD	Head of Department of Standardization, certification and metrology department	NJSC "KazNRTU after K.I. Satpayev", +7 777 346 8621	
Karazhanova Dariga	Candidate of Pedagogical Sciences	Associate professor of Standardization, certification and metrology department	KazNRTU named after K.I.Satpayev	
Students				
Baibol Aidyn		1st year master's student	KazNRTU	

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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

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 internal audits 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 analysis and improvement of the enterprises’ work quality and organizations of any industry and organizational forms and improvement of their management systems based on the principles and approaches of the quality management system using scientific research method.

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.

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 branches)
4	Educational program name	Quality control and diagnostic methods and systems (by branch)
5	Short 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 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 analysis and improvement of the enterprises’ work quality and organizations of any industry and organizational forms and improvement of their management systems based on the principles and approaches of the quality management system using scientific research method.
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	*General competencies:*

	program	• 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 uncertainty and 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 in the 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 methods of 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 field of 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 – To evaluate the process of organizing internal audits of the quality management system operating in the organization, as well as organizing external audits of quality systems at suppliers. 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”;
		Yerezhep D., head of the department SS&M
		Karazhanova D. Assoc. prof. of the department SS&M
		Baibol 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 purpose of the discipline is to acquire and improve competencies in accordance with trade standards of foreign education, capable of competing in the labor market, because through a foreign language, the future master gains access to academic knowledge, new technologies and modern information, allowing the use of a foreign language as a means of communication in the intercultural, professional and scientific activities of the future master.	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	Purpose: to learn how to solve scientific and pedagogical problems, taking into account new technologies in the field of higher education. Content: methodological and theoretical foundations of higher school pedagogy, modern pedagogical technologies, planning and organization of learning and upbringing processes, the use of communicative technologies of subject-subject interaction between a teacher and a student in the educational process of a university, human resource management in higher educational institutions.	3					**v**		
4	Psychology of management	Purpose: to acquire skills in making strategic and managerial decisions, taking into account the psychological characteristics of the individual and the team. Content: the modern role and content of psychological aspects in management activities, methods for improving psychological literacy, the composition and structure of management activities, both at the local and foreign levels, the psychological feature of modern managers.	3		**v**					
Cycle of basic disciplines Component of choice										
5	Copyright protection	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 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	Sustainable development strategies	Purpose: To train graduate students in sustainable development strategies to achieve a balance between economic growth, social responsibility, and environmental protection. Content: Graduate students will study the concepts and principles of sustainable development, the development and implementation of sustainable development strategies, the evaluation of their effectiveness, and international standards and best practices. Cases and examples of successful sustainable development strategies are included.	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										
11	Audit of quality system	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, 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					v	v	
12	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,	5			v		v		v

		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.								
13	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**	
14	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**			
15	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**				
16	Standardization and certification as quality management tools	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**	
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**
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**	

5. Curriculum of educational program

KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATPAYEV

SATBAYEV UNIVERSITY

APPROVED
Chairman of the Management Board-
Rector of KazNRTU named after K.Satpayev
M.M. Begentaev
«28» 04 2024 y.

CURRICULUM
of Educational Program on enrollment for 2024-2025 academic year

Educational program 7M07503 - Quality control and diagnostic methods and systems (by branch)

Group of educational programs M130 – Standardization, certification and metrology (by branch)

Form of study: full-time | Duration of study: 2 years | Academic degree: Master of Engineering and Technology

Discipline code	Name of disciplines	Cycle	Total amount in credits	Total hours	Classroom amount lec/lab/pr	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on courses and semesters			
								I course		2 course	
								1 semester	2 semester	3 semester	4 semester
CYCLE OF BASIC DISCIPLINES (BD)											
M-1. Module of basic training (university component)											
LNG213	Foreign language (professional)	BD UC	5	150	0/0/3	105	E	3			
HUM214	Management Psychology	BD UC	3	90	1/0/1	60	E	3			
HUM212	History and philosophy of science	BD UC	3	90	1/0/1	60	E		3		
HUM213	Higher school pedagogy	BD UC	3	90	1/0/1	60	E		3		
component of choice											
ISO248	Economic aspects of quality	BD CCH	5	150	2/0/1	105	E	5			
MNG782	Sustainable development strategies										
ISO250	Commercialization of innovative technologies	BD CCH	5	150	2/0/1	105	E	5			
ISO251	Copyright protection										
MNG781	Intellectual Property and Research	BD CCH	5	150	2/0/1	105	E			5	
ISO252	Fundamentals of Scientific Research										
CYCLE OF PROFILE DISCIPLINES (PD)											
M-2. Module of professional activity (university component, component of choice)											
ISO253	Quality Management System	PD CCH	5	150	2/0/1	105	E	5			
ISO254	Lean Manufacturing Fundamentals										
ISO264	Quality management in production ar	PD UC	4	120	2/0/1	75	E				4
ISO255	Methods and means of visual diagnostics	PD CCH	5	150	2/0/1	105	E			5	
ISO256	Product quality control methods										
ISO257	Quality Assurance Fundamentals	PD UC	5	150	2/0/1	105	E	5			
ISO258	Standardization and certification as quality management tools	PD UC	5	150	2/0/1	105	E		5		
ISO259	Special interchangeability issues	PD UC	5	150	2/0/1	105	E		5		
ISO260	Methods and means of mechanical control	PD UC	5	150	2/0/1	105	E			5	

ISO262	Modern strategic analysis	PD UC	5	150	2/0/1	105	E		5		
ISO263	Quality audit	PD UC	5	150	2/0/1	105	E			5	
M-3. Practice-oriented module											
AAP273	Pedagogical practice	BD UC	8							8	
AAP256	Research practice	PD UC	4								4
M-4. Experimental research module											
AAP268	Master's student's research work, incl	RWMS UC	4					4			
AAP268	Master's student's research work, including internship and master's thesis	RWMS UC	4						4		
AAP251	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	2							2	
AAP255	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	14								14
M-5. Module of final attestation											
ECA212	Preparation and defense of a master's thesis	FA	8								8
	Total based on UNIVERSITY:							30	30	30	30
								60		60	

Number of credits for the entire period of study

Cycle code	Cycles of disciplines	Credits			
			university component (UC)	component of choice (CCH)	Total
BD	Cycle of basic disciplines		20	15	35
PD	Cycle of profile disciplines		43	10	53
	Total for theoretical training:		*63*	*25*	*88*
	RWMS				*24*
FA	Final attestation	8			8
	TOTAL:	**8**	**63**	**25**	**120**

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol № 12 22.04 **2024 y.**

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev. Protocol № 6 19.04 **2024 y.**

Decision of the Academic Council of the Institute EMC **. Protocol №** 4 **от "** 19 **"** 01 **20**24**y.**

Board Member - Vice-Rector for Academic Affairs — **Uskenbayeva R.**

Director of Institute of Energy and Mechanical Engineering named after A. Burkitbayev — **Yelemesov K.**

Head of Department of Standardization, — **Yerezhep D.**

Specialty Council representative from employers — **Aymagambetova R.**