MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
RSE with EMR "M.AUEZOV SOUTH KAZAKHSTAN STATE UNIVERSITY" MES RK

AUEZOV
UNIVERSITY
1943

EDUCATION PROGRAMME

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THE MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
M. Auezov SOUTH KAZAKHSTAN STATE UNIVERSITY

«APPROVED BY»
The Rector
d.h.s., academician Kozhamzharova D.P.
«___» _____ 20____ y.

EDUCATION PROGRAMME

6B07513 - Metrology

Registrationnumber	- 6B075 00034
Code and classification of the field of education	6B07 - Engineering, manufacturing and construction industries
Code and classification of training areas	6B075 - Standardization, certification and metrology (by industry)
Group of educational programs	B076 - Standardization, Certification and Metrology (by industry)
Typeof EP	Current EP
ISCE level	6
NQF level	6
SQF of education level	6
Language of learning	Kazakh, Russian, English
Typical duration of study	4 years
Form of study	Full time, Distance learning
The complexity of the EP, not less	241 credits
Distinctive features of EP	-
University Partner (JEP)	-
University Partner (TDEP)	-
Social Partner (DE)	-

Shymkent, 2020

Drafters:

Name	Position	Sign
Tulekbaeva A.K.	Ph.D., Associate Professor	
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Eskaraev B.A.	Head department of Technical Regulation and Metrology Committee for the city of Shymkent	

EP was considered by the Methodological Commission of the Faculty of Geology and Oil and Gas»
protocol № 7 from 18 02 2020 y.

Chairman of MC (Committee) _____ Dosmakanbetov A.A.
Sign

Considered and recommended for approval at the meeting of Educational and Methodical Council of M. Auezov SKSU.
protocol № 10 from 26 02 2020 y.

Approved by the decision of the Academic Council of the University
protocol № 10 from 28 02 2020 y.

CONTENT

Introduction

1. Scope

Designed for the implementation of bachelors training by educational program (hereinafter - EP) code "6B07513 - Metrology in RSE on right of economic management " M. Auezov South Kazakhstan State University" of RK MES.

2. Regulatory documents

Education Act of the Republic of Kazakhstan (as amended and supplemented on 07/04/2018);

Standard rules for the operation of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by order of the Minister of Education and Science of the Republic of Kazakhstan from October 30, 2018 No. 595 (registered with the Ministry of Justice of the Republic of Kazakhstan on October 31, 2018 No. 17657);

State obligatory standards of higher and postgraduate education, approved by order of the Minister of Education and Science of the Republic of Kazakhstan, October 31, 2018 No. 604;

The rules for the organization of educational process on credit technology education, approved by order of the Minister of Education and Science of the Republic of Kazakhstan on April 20, 2011 No. 152 as amended and supplemented of October 12, 2018 No. 563

The rules of organizing and conducting professional practice and the rules for defining organizations as bases of practice, approved by the order of the MES of the Republic of Kazakhstan dated January 29, 2016 No. 107 (as amended and supplemented on September 29, 2018 No. 521).

Comprehensive plan for improving the system of technical regulation and metrology until 2020, approved by the Decree of the Government of the Republic of Kazakhstan dated June 10, 2014 No. 635

Professional standard "Metrology" (Appendix 1 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" dated 10.22.2018 No. 283);

Professional standard: “Ensuring the uniformity of measurements” (Appendix No. 3 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” dated December 30, 2019 No. 270)

Professional standard “Metrological support and control of processes in mechanical engineering” (Appendix No. 43 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” dated December 30, 2019, No. 269);

3. Educational programs concept

The goal of the educational program is coordinated with the mission of the university and is aimed at preparing the intellectual elite of the country with advanced entrepreneurial skills, fluent in three languages, demonstrating conceptual, analytical and logical thinking skills, creative approach in professional activities, able to work in national and international teams. lifelong learning strategy.

The educational program is harmonized with the 6th level of the National Qualifications Framework of the Republic of Kazakhstan, Sectoral qualification framework “Services in the field of technical regulation”, with Dublin descriptors, 1st cycle of the Qualification Framework of the European Higher Education Area. (A Framework for Qualification of the European Higher Education Area), also with Level 6 of the European Qualification Framework for Lifelong Education (The European Qualification Framework for Lifelong Learning).

The educational program is focused on professional and social order through the formation of professional competencies related to the necessary types of research, practical and entrepreneurial activities, adjusted to meet the requirements of stakeholders.

The uniqueness of EP 6B07513 - Metrology is determined by the fact that metrology is an international instrument in the field of ensuring the uniformity of measurements in all sectors of the country's economy, and specialists possessing advanced knowledge and competences in the field of metrological support of production, testing and measurement are in demand in any enterprise and organization.

The educational program is aimed at achieving learning outcomes through the organization of the educational process using the principles of the Bologna process, student centered learning, accessibility and inclusion.

Program learning outcomes are achieved through the following training events:

- classroom lessons: lectures, seminars, practical and laboratory classes - are held in the light of innovative learning technologies, the use of the latest achievements of science, technology, measuring and testing equipment, information systems;

- extracurricular activities: independent work of the student, including under the guidance of a teacher, individual counseling;

- carrying out professional practices, implementation of term papers and dissertations (projects).

- carrying out professional practices at enterprises and organizations of all forms of ownership and activities that have in their composition metrological services that provide control and monitoring of the status of measuring instruments, test equipment, ensuring the accuracy and traceability of measurements, developing, updating regulatory documentation in the field of metrology, performance of NIRS, course and theses (projects).

The university has taken measures to maintain academic integrity and academic freedom, protection from any kind of intolerance and discrimination against students.

The quality of the OP is ensured by the involvement of stakeholders in its development and evaluation, systematic monitoring and review of its content.

4. Entry Requirements

Established according to the Model Rules for admission to studies in educational organizations that implement educational programs of higher and postgraduate education by order MES RK №600 on 10.31.2018

1. EDUCATION PROGRAMME PASSPORT

1.1 The purpose and objectives of education program by specialty

EP objectives: Training specialists who are able to independently select and apply organizational, applied and scientific foundations of metrology for various industries, evaluate and analyze the current state of metrological support for production, testing and measurement based on knowledge of the provisions and requirements of the measurement integrity system, normative documents in the field of metrology.

EP tasks:

- the formation of socially responsible behavior in society, an understanding of the significance of professional, ethical norms and rules, adherence to these norms;
- providing skills and skills for lifelong learning that will allow them to successfully adapt to changing conditions throughout their professional careers;
- ensuring the conditions for acquiring a high intellectual level of development, mastering competent and developed speech, a culture of thinking and the skills of the scientific organization of labor in the field of metrology and metrological support of production, testing and measurement;
- formation of graduates' competitiveness in the field of metrology and metrological support of production, testing and measurement, to ensure the possibility of their quickest employment in or continuing education at subsequent levels of education.
- fulfillment of the social order of the society for the development and formation of popular personnel in the field of metrology in the labor market
- possession of key, subject and professional competences for the subsequent successful professional activity in the field of metrology
- formation of students' readiness to organize and conduct experimental research activities in the field of metrology

1.2 List of qualifications and positions

A graduate in OP 6B07513 - Metrology is awarded an academic degree “Bachelor of Engineering and Technology in the specialty 6B07513 - Metrology.

Bachelors in OP 6B07513-Metrology can occupy primary positions - specialist in metrology, engineer in metrology, engineer metrologist of the machine-building process, approved by order of the Minister of Labor and of social protection of the population of the Republic of Kazakhstan dated May 21, 2012 No. 201-ө-m.

1.3 Qualification characteristics of the educational program graduate

1.3.1 Scope of professional activity

The scope of professional activity is the establishment, implementation and monitoring of standards, rules and requirements for products (services), process and system, their development, production, application and metrological support aimed at high quality and safety of products and services, high economic efficiency for the manufacturer and consumer, ensuring accuracy and control of the main processes in mechanical engineering, providing professional services in the framework of the activities of a calibration or calibration laboratory in accordance with the field of their accreditation, development and metrological certification of MT, development and metrological examination of regulatory documents in the field of metrology.

1.3.2 Objects of professional activity

The objects of professional activity of graduates are products (services) and technological processes, equipment of enterprises and testing laboratories, calibration, calibration laboratories,

methods and means of measurement, testing and control, regulatory documentation, systems for metrological support of scientific, industrial, social and environmental activities.

1.3.3 Subjects of professional activity

Subjects of professional activity of a bachelor in OP 6B07513 - Metrology, are normative and regulatory and technical documentation in the field of metrology, production and technical documents, measuring instruments, tests and controls, metrological support and process control in mechanical engineering, metrological support, ensuring the production of competitive products (services).

1.3.4 Types of professional activity

The bachelor of specialty 6B07513 - "Metrology" can perform the following types of professional activity:

- organizational and managerial;
- production and technology;
- design;
- experimental research.

2. EP learning outcomes

LO1 Communicate freely in a professional environment and society in Kazakh, Russian and English.

LO2 Demonstrate natural science, mathematical, social, socio-economic and engineering knowledge in professional activities, theoretical and experimental research, regulatory documents in the field of metrology and elements of economic analysis of metrological support of production, testing and measurement.

LO 3 Possess information and computational literacy, the ability to generalize, analyze and perceive measurement information, set goals and choose ways to achieve it by using modern information technologies in the design of measuring and testing equipment using mathematical modeling methods, technical and metrological quality control of products, verification and calibration tools, processes and systems.

LO4 Plan work in the field of metrological support of production in accordance with the legislation on ensuring the uniformity of measurements, modern achievements of instrument making, IS manufacturers market, conduct technical monitoring of the state of measuring equipment and equipment, determine the need for working personnel and measurement standards, implement methodological guidance on their selection, provide the departments of enterprises with necessary regulatory documentation in the field of metrology , keep production and regulatory documentation up to date

LO5 Ability to perform work on the calibration / calibration of measuring instruments, metrological provision of instruments and automation equipment, plan equipment upgrades, perform special measurements in the course of technological processes, when conducting experiments on tests of manufactured products, and when checking process equipment for compliance with established accuracy standards.

LO6 Regularly monitor the status of the MI and equipment, its installation and use, systematize and process the data needed to prepare reports on the implementation of plans for the metrological support of new production facilities, analyze obsolete, unserviceable measuring instruments and equipment

LO7 To have the skills to carry out accurate measurements to determine the actual values of the monitored parameters, technical reading, sorting and classification of regulatory documents, legal acts in the field of engineering and related fields, to conduct metrological control over the use of IS, MT, reference materials, operational accounting of measuring instruments, tests and monitoring, working standards, reference materials

LO8 Analyze the causes of MI failures during operation, violations of technological regimes, product rejection, non-productive costs of raw materials, materials, energy and other production losses related to the state of measuring, control and testing instruments.

LO9 To conduct metrological and technical control over the observance of the rules, norms for ensuring the uniformity of measurements, the state and application of measuring instruments; monitor and update the reference database, calibration equipment, measuring instruments; organize work on the calibration and calibration of measuring instruments, certification of test equipment; work with the GSI RK registry, web services in the field of technical regulation and metrology of the CIS countries, TS / EurAsEC.

LO10 Apply the provisions and requirements of legislative and regulatory documents of the system for ensuring the uniformity of measurements when choosing equipment and measuring instruments, developing internal documents for metrological support of production, measurements, tests and control

LO11 Use research, entrepreneurial and work skills in the overall quality management system of products, processes and work.

LO12 Work effectively individually and as a member of the team, correctly defend one's point of view, correct one's actions and use various methods and methods of metrology to improve metrological support of production, testing and control.

3 COMPETENCES OF EP GRADUATE

3.1 Successful completion of training in EP contribute to the formation of the following competences of a graduate:

–core competencies (CC)

–professioanal competencies (PC).

Core competencies:

(CC1) in the field of *native language*

- the ability to express and understand concepts, thoughts, feelings, facts and opinions in the field of professional activities in written and oral forms (listening, speaking, reading and writing), as well as interact linguistically and creatively in a variety of social and cultural contexts: during study, at work, at home and at leisure

(CC2)in the field of *foreign languages*

-ability to master basic communication skills in a foreign language - understanding, expressing and interpreting concepts, facts and opinions in the professional field, both verbally and in writing (listening, speaking, reading, writing) in the appropriate range of social and cultural contexts, proficiency mediation and intercultural skills;

(CC3)*fundamental mathematical, scientific and technical training*

-the ability and willingness to apply educational potential, experience and personal qualities acquired during the study of mathematical, natural science, technical disciplines at the university, to determine ways of monitoring and evaluating the solution of professional problems, the development of mathematical and natural science thinking;

(CC4)*computer*

-the ability to confidently and critically use modern information and digital technologies for work, leisure and communications, mastering the skills of using, restoring, evaluating, storing, producing, presenting and exchanging information through a computer, communicating and participating in collaborating networks using the Internet for professional activities;

(CC5)*social*

- the ability to own social and ethical values based on public opinion, traditions, customs, norms and to be guided by them in their professional activities; know the cultures

of the peoples of Kazakhstan and abide by their traditions; observe the basics of the legal system and legislation of Kazakhstan, including in the field of metrology, know the trends in the social development of society; be able to adequately navigate in various social situations; be able to find compromises, relate your opinion with the opinion of the team; own business ethics, ethical and legal standards of conduct; strive for professional and personal growth; work in a team, correctly defend their point of view, propose new solutions; demonstrate tolerance towards other individuals;

(CC6)*economic, managerial and entrepreneurial*

- the ability to know and understand the goals and methods of state regulation of the economy, the role of the public sector in the economy; master the basics of economic knowledge; possess the skills of critical thinking, interpretation, creativity analysis, drawing conclusions, evaluation; manage projects to achieve professional tasks in the field of metrology, manage personnel, demonstrate entrepreneurial skills.

(CC7)*training*

- the ability to apply legislative, regulatory and methodological documents of the system for ensuring the uniformity of measurements for conducting technical and metrological monitoring of the state and application of measuring instruments, testing and measuring equipment, their timely verification, calibration, certification, develop and update the regulations, orders and instructions of the organization governing the work on metrological assurance, the skills of accurate measurements to determine the actual values of control parameters, operational accounting of measuring instruments, testing and control, working standards, reference materials, identifying the causes of violation of technological regimes, production waste, unproductive costs of raw materials, materials, energy and other production losses related to the state of measuring, monitoring and testing instruments, work with the GSI RK registry, web services in the field of metrology, necessary for professional daily activities and continuing education in the magistracy;

(CC8)*cultural training*

- the ability to know and understand the traditions and culture of the peoples of Kazakhstan, is tolerant to the traditions and culture of other nations of the world, aware of the attitudes of tolerant behavior; not subject to prejudice, has high spiritual qualities, formed as an intelligent person

(CC9)*additional competencies*

- ability to master the skills of critical thinking, interpretation, creativity analysis, drawing conclusions, evaluation; have creativity and an active lifestyle; make professional decisions under conditions of uncertainty and risk.

3.2 Matrix of correlation of EP learning outcomes in general with modules formed by competencies

	LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12
CC1		+				+				+		
CC 2			+	+		+		+				+
CC 3		+	+						+			
CC 4			+		+			+				
CC 5	+								+		+	+
CC 6	+			+			+	+				+
CC 7					+	+	+	+	+	+		
CC 8	+			+	+					+		
PC 1						+	+				+	+
PC 2		+				+				+		
PC 3			+	+		+		+				+

4. SUMMARY TABLE REFLECTING THE VOLUME ASSIMILATED CREDITS OF EDUCATION PROGRAM MODULES

Course of Study	Semester	The number of mastered modules	The number of studied disciplines			Number of KZ credits				Total hours	Total KZ credits	The number of	
			OC	HSC	EC	Theoretical training	Educational practice	Industrial practice	Final examination			exam	diff. offset
1	1	5	3	4	1	810	60				870	31	5
	2	5	5	2	1	840	60	30			930	30	6
2	3	6	2	2	3	870	60				930	30	5
	4	6	2	3	3	840	60		90		990	30	5
3	5	5	1	2	4	900					900	30	6
	6	3		1	1	720			180		900	30	1
4	7	3		4		600					600	20	4
	8	3		1	3	600					600	20	3
	9	1								600	600	20	0
Total		37	13	19	16	6210	240	30	270	600	7320	241	35

5. Information about the disciplines

Module name	CYCLE	HSC/EC	Component Name	Brief course description (in 30-50 word)	Number of credits	Formed LO (codes)
Module of the social science	GED	OC	Contemporary History of Kazakhstan	It allows to classify the conceptual foundations of national history, interpret the origins, the continuity of the Kazakh statehood and current problems of the history of modern Kazakhstan. Exposure to the analysis of the activities of the national intelligentsia in shaping the ideology of the liberation movement and the stages of the socio-economic modernization of Kazakhstan. Characterize the creation of a democratic state of law.	5	LO1, LO2, LO12
	GED	OC	Philosophy	The basics of the emergence of philosophy are examined, the features of the emergence of a culture of thinking are revealed, the concepts of "philosophy", "worldview", the essence and content of the concepts of "being," "consciousness" are revealed. The relationship between the concepts of "knowledge" and "creativity" is considered, the essence and content of the category of the philosophy of freedom are revealed, the skills of identifying the essence of the philosophical problem, critical thinking, research skills of philosophical aspects, problems of practice and cognition are developed.	5	LO1, LO2, LO12
Module of socio-political knowledge	GED	OC	Social and Political Studies	Studied the theory of sociology, social structure and stratification of society, explained the role and the place of politics in society, the basic stages of formation and development of political science, including youth policy, the role of politics in the system of social life, the essence of the state, reveals state relationship and civil society . Develop skills in sociological research, analysis of socio-political information.	4	LO2, LO4, LO12
	GED	HSC/	Ecology and	Acquaintance with the basics of safe human interaction	5	PO2,

		EC	Fundamentals of Life Safety	with the environment (industrial, household, urban) and the basics of protection against negative factors in dangerous and extremely dangerous situations. Knowledge of the legislation of the Republic of Kazakhstan in the field of emergency situations; application of knowledge gained in solving problems guaranteeing the preservation of human health and efficiency in extreme situations		PO3, PO5, PO11
	GED	HSC/ EC	Fundamentals of Economics and Law	Examines the role of the state in market development, competition, demand, supply. Instills skills for calculating costs, income, turnover indicators and capital turnover. Allows you to critically explore the markets of factors of production, factor income. Forms knowledge by right. It instills the skills of analyzing the legality of events, the ability to refer to regulatory acts. Raises the level of legal consciousness, legal culture.		PO1, PO2, PO6,PO12
	GED	OC	Cultural Studies and Psychology	Understanding the socio-ethical values of society as a product of integration processes in the systems of basic knowledge of the disciplines of the socio-cultural-psychological module; analyze the features of psychological institutions in the context of their role in the modernization of Kazakhstani society; formulate programs for solving conflict situations in society, including in professional sodium; be able to correctly express and defend their own opinion of social importance	4	PO1, PO2, PO8,PO12
Module of communicative mobility	GED	OC	Kazakh (Russian) language	Development of cognitive and communicative activities in the Russian (Kazakh) language in the areas of interpersonal, social, intercultural communication. Instilling the skills of discussing ethical, cultural, socially significant norms in discussions, ability to work in a team, teamwork, flexibility, creativity. Development of practical skills for interpreting text information, explaining their stylistic, genre specificity in various areas of communication.	10	LO1, LO2, LO4, LO9, LO10

	GED	OC	Foreign Language	Compliance with the A1 level on the pan-European competence scale is cognitive and communicative competences. Compliance with the A2 level on the European scale of competences - cognitive, socio-cultural and communicative competences. Compliance with the B1 level on the pan-European competence scale is linguo-culturological, socio-cult urological, cognitive, communicative competences. Compliance with level B2 of the European scale of competences - linguistic-cultural, socio-cultural, cognitive, communicative competences.	10	LO1, LO2, LO4, LO9, LO10
	GED	OC	Physical Training	Know the impact of health systems of physical education on health promotion, prevention of occupational diseases and bad habits, be able to overcome artificial and natural obstacles using various means of movement, organize the day regimen in accordance with the criteria of a healthy lifestyle, skills in the use of physical culture to increase resistance to various conditions of the external environment, organization and conduct of individual, collective and family holidays	8	LO2,LO12
	BD	HSC	Professional Kazakh (Russian) Language	The ability to use professional knowledge and skills in practice, to receive and evaluate information in the professional field from foreign literature, the ability to communicate competently in Kazakh and Russian languages, to use skills in dispute, discussion and controversy, master the basics of speech in professional culture, possess the skills of perception, understanding, and multidimensional analysis of speech and writing, use language means to achieve communicative goals in a particular situation of communication, build a strategy of oral and written communication in accordance with the socio-cultural characteristics of the language being studied	3	LO1, LO2, LO4, LO9, LO10, LO12

	ChD	EC	Kazakh Alphabet Based on Latin Graphics	Formation of Kazakh sounds taking into account the peculiarities of their pronunciation, the study of the phonetic features of Kazakh words and phrases based on the Latin script. The development of literacy skills based on the Latin alphabet. The ability to read texts in the Kazakh language using Latin graphics.	3	LO1, LO2, LO10, LO12
	ChD	EC	Culture of Speech and Communication in the Kazakh Language	Knowledge of the norms of the literary Kazakh language. Formation of a culture of speech in the Kazakh language, the development of oral and written speech through the use of phrase logical turns, proverbs and sayings. Skills of application of the Kazakh language in interpersonal and professional communications.		LO1, LO2, LO10, LO12
	BD	HSC	Professionally Oriented Foreign Language	Know the specifics of oral and written speech in the fields of professional, scientific, communication, construction and organization of text in a foreign language in the framework of professionally determined situations, the vocabulary of a foreign language in the field of instrumentation; be able to carry out professional activities in the linguistic, information-analytical and communicative aspects, apply a variety of language and speech means adequately; perceive and understand by ear the appropriate level of communications of a business, vocational nature.	3	LO1, LO2, LO4, LO9, LO10, LO12
	GED	OC	Information and Communication Technologies (in English)	Knowledge of computer systems, software. Development of skills in the use of information resources for searching and storing information, working with spreadsheets, working with databases. The use of methods and means of information protection; design and creation of websites, multimedia presentations. Skills of using e-government and e-books, various cloud mobile technologists, SMART technology management.		LO3, LO6, LO9
Fundamentals of Engineering and Technical Sciences	BD	HSC	Higher Mathematics	The elements of linear algebra and analytic geometry are considered. Develop the ability to calculate the limit function. The acquisition of knowledge of the differential	4	LO2, LO3, LO6, LO9

				and integral calculus of a function of one variable. Knowledge of the concepts of functions of several variables. Argumentation of the optimal solution of differential equations. Skills of finding multiple integrals. Acquisition of theoretical knowledge on the theory of numerical, functional and power series and their convergence.		
	BD	HSC	Physics	Basic knowledge of kinematics, dynamics, solid mechanics, molecular physics and thermodynamics. Be able to have certain skills in electricity and magnetism, geometric and wave optics. The ability to solve problems in quantum optics, atomic physics and atomic nucleus physics. The ability to analyze on the problems of modern physics, as well as new standards of physical quantities	4	LO2, LO3, LO6, LO9
	BD	HSC	Applied Mechanics	The basic provisions of general mechanics are studied, the principle of the formation of mechanisms and their classification, the criteria for the performance of machine parts are explained. Methods of structural, kinematic and dynamic analyzes for studying the motion of a mechanical system are considered. The skills of calculating structures by analytical and numerical methods, using methods of constructing design schemes to analyze, model and solve production problems are developing.	4	LO2, LO3, LO6, LO9
	BD	HSC	Engineering Computer Graphic	Knowledge and understanding of the rules for performing drawings with graphical information of various types and contents, the basics of graphical information representation, methods of graphical modeling of geometric objects, skills in developing and designing design documentation, analyzing graphical models of phenomena and processes.	3	LO2, LO3, LO9
	BD	HSC	Chemistry	Learns the basic concepts and laws of chemistry. The structure of matter, the general laws governing the course of chemical processes, chemical processes in solutions.	4	LO2, LO5, LO7, LO11

				Chemical bonding, energy and kinetics of chemical processes, chemical equilibrium. Classes of chemical compounds and types of reactions. Basics of chemical thermodynamics and kinetics: thermo chemistry; chemical equilibrium. Electrolyte solutions. Hydrolysis of salts. Electrochemical processes.		
Measurement and evaluation of product quality	BD	HSC	Metrology	Knowledge of the history and current state of metrology in the country and abroad, types of measurements, methods and means of ensuring their unity, understanding how to achieve the required accuracy based on an analysis of the provisions and requirements of legislative and regulatory documents on metrology of best practices in metrology, IT skills, IO, SI, verification / calibration of SI, updating and development of ND in the field of metrological support of production, testing, measurement and control.	3	LO2, LO4, LO8, LO10
	BD	HSC	General Theory of Measurements	Knowledge of various physical quantities, the international system of SI units, measurement methods, types of measurement errors, understanding of the distribution laws, analyze measurement schemes, factors affecting measurement results, skills of processing measurement results, establishing mathematical models, measured values and measuring instruments.	4	LO5, LO6, LO8, LO11
	BD	HSC	Qualimetry	Knowledge of legislative and regulatory acts, a system of supervision and control of product quality, basic and design features and product characteristics, understanding of the relationship of qualimetry with standardization and certification, ability to be able to apply the composition of product quality indicators in forecasting and planning product quality improvement, methods of analyzing data on the quality of products, the skills of finding the causes of marriage, determining weight coefficients, determining reference and rejection values of indicators, find Ia absolute values of properties and performance evaluation	4	LO5, LO6, LO8, LO9

				of the complex quality.		
Control and management of product and process quality	BD	HSC	Test and control Product Safety	Knowledge and understanding of the tasks of testing in the product quality assurance system, the current level of development of technological, mathematical, methodological, metrological and information support testing, certification and quality testing systems, the ability to use the methods and technology of testing, analyze the product control and testing system, planning skills processing of test results, making decisions about the quality of products based on test results	7	LO5, PO6, LO8, LO9
	BD	HSC	Training Practice	Acquisition of primary professional skills in the field of metrology on the basis of familiarization with metrological equipment for measuring linear-angular values, electrical and thermal values, the structure of the system for ensuring the uniformity of measurements of the Republic of Kazakhstan, the provisions and requirements of the legislative and regulatory documents in the field of metrology, working with ND in the field of metrology teamwork	1	LO2, LO4, LO12
	BD	HSC	Quality Systems	Knowledge of international ISO standards for various management systems, understanding of the methodological principles of building a general management system of an enterprise based on selected quality systems taking into account business processes of an enterprise, ability to plan work on the implementation of quality systems, skills to develop methods, processes and resources necessary for general quality management integrating quality systems into a common management structure.	5	LO4, LO7, LO9
	BD	EC	Quality Audit	Knowledge and understanding of the fundamentals of quality audit according to MS ISO 10011, application of integrated audit planning methods, methods of their conduct, analysis of identified nonconformities, skills in evaluating audit results, developing recommendations for	5	LO4, LO7, LO9,LO10

				improving quality management work		
	BD	EC	Certification of Quality Systems	Knowledge and understanding of the theoretical and applied principles of quality system certification, ISO international standards for various quality systems, skills for planning and conducting certification of IC, analysis of certification results for IC for identified inconsistencies in systems, ability to develop corrective and preventive actions, recommendations for improving quality systems certification		LO4, LO7, LO9,LO10
	BD	EC	Practical Training for Students I	Consolidation of theoretical knowledge in the field of metrological support of production, testing and measurement, familiarization with the technology of production of enterprises of various industries, the organization of work on the metrological control of technological parameters of production, technical characteristics, design features, purpose and principles of works SI, IO, technology of their repair, applied ND in the field of MO, the ability to work in a team and under the guidance of	3	LO2, LO4,LO6, LO10, LO12
	BD	EC	Measuring Control of Rationing Accuracy	Knowledge and understanding of the fundamentals of measuring control on rationing the accuracy of measuring instruments, measuring equipment, the ability to determine the actual values of monitored parameters, analyze the quality of measurements, skills to perform special measurements in the course of technological processes, when conducting experiments on testing products, when checking process equipment for compliance with established accuracy standards .	5	LO2, LO4, LO7, LO8, LO10
	BD	EC	Rationing Accuracy of Linear- Angular Measurements	Knowledge of linear and angular values, types and means of their measurements, understanding of the principles of ensuring the uniformity of measurements of deviations from straightness and flatness, methods of calculating tolerances and landings, the scope of various measuring	5	LO2, LO4, LO7, LO8, LO10

				and measuring instruments and devices, metrological characteristics of measuring instruments, types of measurement errors, analyze conditions performing measurements, skills in calculating the parameters of tolerances and landings, deciphering the norms of accuracy, indicated on the drawings of machine parts; choose and apply measuring instruments and devices		
System of ensuring unity of measurements	BD	EC	Management and Quality Control of Metrological Activities	Knowledge at the level of understanding the objects of control of metrological activities, the ability to plan the work of metrological activities in the field of metrological support of production, testing and measurements to ensure the uniformity of measurements, high quality and safety of products, analyze the features of the organization and conduct of verification and calibration of measuring instruments, instrumentation, maintenance skills, settings , installation and commissioning of the SI, maintaining the RTD regulating the accuracy of measurements and devices	5	LO5, LO6, LO7, LO9
	BD	EC	Content and Language Integrated Learning	Knowledge and understanding of the role and place of the English language in the international system for ensuring the uniformity of measurements, ability to work with the regulatory framework of international organizations for metrology, testing, accreditation, reading skills of English-language versions of ISO / IEC international standards in the field of metrology, their translation using cover methods, analyze RTD on metrology, to update the documentation	5	LO2, LO4, LO8, LO12
	ChD	EC	Workshop Technical Metrologist	Knowledge of technical characteristics, design features, purpose and principles of application of SI and technology of their repair, fundamentals of production technology, methods of measurement, the order of preparation and rules for the design of technical documentation, the ability to plan and implement new SI, equipment, monitoring of the state of SI, equipment, installation and use, skills in	4	LO5, LO6, LO8, LO11

				measurement, preparation of equipment for technical and metrological services, maintenance of technical documentation, regulating the accuracy of measurements and devices.		
	ChD	EC	Workshop of the technical executor of the dosimetrist	Knowledge of laws and other regulatory legal acts of the Republic of Kazakhstan, methodological and regulatory documents on radiation safety, dosimetry measurement methods, principles of operation, design and rules for technical operation of instruments and equipment, ability to prepare equipment for testing, dosimetry and radiometric measurements , setting up, adjusting, adjusting and checking equipment (instruments, equipment), monitoring its good condition, taking readings instruments, to conduct operational logs, report		LO5, LO6, LO8, LO11
	ChD	EC	Practical Training for Students II	Acquaintance with the technical and metrological control of technological processes of production of various industries, testing of products, performing special measurements in the course of technological processes, when conducting experiments to test products, checking process equipment for compliance with established standards of accuracy, skills in drafting applications for the purchase of SI, parts consumables.	6	LO4, LO6, LO8, LO9, LO12
Metrology and quality of products and services	ChD	EC	Interchangeability and Technical Measurements	Knowledge of the basics of interchangeability, goals, objectives, its types, basic measurement tools, rules for their choice and methods of use, understanding of the tolerance and fit system, processing accuracy, qualifications, accuracy classes, ability to do the simplest calculations using tolerance tables, skills to use drawings with data on the accuracy of the size, shape and location of surfaces and to fulfill the prescribed requirements in the process of manufacturing and assembly	4	LO2, LO4, LO12
	ChD	EC	Interchangeability in Mechanical	Knowledge and understanding of interchangeability in engineering, its role and importance in organizing the		LO2, LO4, LO12

			Engineering	production of new machines and products, understanding methods of ensuring interchangeability, measurement, control, as applied to modern engineering products, the ability to ensure interchangeability of parts and assembly units with a given accuracy, skills in designing products with applying the principles of interchangeability		
	ChD	EC	Technological Measurements and Instrument	Tehnologiyalyқ protsesterdi baқylau priborlarynyң fizikalyқ negizin zhane өlsheu әdisterin, priborlardyң Memlekettik zhүyesin құru printsipterin, zhylutehnikalyқ baқylau priborlary zhane қashyқtyқtan өlsheu zhүyelerin bilu, қatelikter teoriyasy zhane өlsheu nәtizhelerin өңdeudiң matematikalyқ әdisterin tүsinu, kәsiporynda қoldanylatyn tehnologiyalyқ protsestiң parametrlerin өlsheu әdisteri changed priborlaryn tүsindiru, bir zhane cop retti Retti balylamen zhorgiziletin tekhnologlyқ өlsheuler, priborydyң kөrsetuin baptau, tekserugu dayindau darғdysy	4	LO4, LO7, LO9, LO10
	ChD	EC	Linear and Angular Measurements	Knowledge and understanding of linear and angular units of measurement, ability to apply the requirements for measuring tools for reliability, simplicity, speed, resistance to external influences, analyze the results of linear-angular measurements to calculate the allowable errors, skills for checking SI linear-angular values		LO4, LO7, LO9, LO10
	ChD	EC	Metrological Reliability of Measuring Instruments	Knowledge of the fundamentals of metrological reliability of SI, understanding of metrological characteristics of SI to prevent sudden failures associated with MX changes, analyze changes in MX SI during operation, calculation skills of metrological reliability of SI basic on failure rates, probability of failure-free operation, time to failure	5	LO2, LO4, LO6, LO10, LO12
	ChD	EC	Accuracy of Measuring Devices	Knowledge and understanding of measurement accuracy, types of errors, ability to assess the accuracy of measurement results, error limits, analyze measurement results according to known accuracy class and upper limit (range) of instrument measurements, skills to perform		LO2, LO4, LO6, LO10, LO12

				special measurements for compliance with established accuracy standards		
	ChD	EC	Methods and Means of Measurement and Control	Knowledge and understanding of the principles and methods of measurement of physical quantities, basic technical and metrological characteristics of SR; ability to apply methods and SI of physical quantities in the course of solving measurement problems, analyze the structure of measurement errors of physical quantities, have skills in conducting metrological monitoring of the state and application of standards, SI, test equipment, selection of SI and measurement methods, perform accurate measurements to determine the actual values of the monitored parameters.	5	PO2, PO4, PO8, PO10
	ChD	EC	Measuring Equipment	Knowledge and understanding of measuring equipment as a branch of science and technology that studies methods and means of obtaining empirically information on the quantities characterizing the properties and conditions of objects of research and production processes, the ability to choose technical means for various types of measurements, analyze normalized metrological characteristics that reproduce and / or storing a unit of physical quantity, the size of which is assumed to be unchanged (within the limits of the established measurement error) during a known engine. ervala time, skills measuring characteristics of random processes, measurement information input to the computer		LO2, LO4, LO8, LO10
	ChD	EC	Rationing and use of Metrological Characteristics of Measuring Instruments	Knowledge and understanding of rationing methods for metrological characteristics of measuring instruments, measurement range, accuracy class, measurement errors, ability to evaluate measurement errors, interchangeability of measurement instruments, analyze types of errors for comparing measurement instruments in MX, skills in selecting measurement instruments based on MX, included	5	LO3, LO5, LO6, LO8

				in measuring equipment		
	ChD	EC	Accuracy Class of Measuring Instruments	Knowledge and understanding of the assignment of an accuracy class of SI depending on its basic error established in ND on SI, the ability to read the notation of an accuracy class on SI, analyze the accuracy class of SI in ND and on SI to establish the limit of the permissible basis of error in%, calculation skills of expression limit of permissible basic error in the form of relative error		LO3, LO5, LO6, LO8
	BD	EC	Fundamentals of Measurement Technology of Technical Systems	Knowledge and understanding of the basic tenets of metrology, the concept of measurement quality, the ability to classify types and measurement methods, types of errors, form measurement models, analyze measurement information to make decisions about the suitability of a vehicle for further operation or the need for preventive (maintenance) effects, skills to calculate various types measurement errors, error rationing and amendment of measurement results, detection and elimination of certain types of errors, Botko measurement results and the sum of errors	5	LO4, LO6, LO8, LO9, LO12
	BD	EC	Fundamentals of Metrology and Electrical Measurements	Knowledge of electrical quantities - voltage, resistance, current, power, units of measurement, standards of voltage units, direct current, resistance to direct current, inductance and capacitance, list of SI electrical quantities - measuring devices, circuits and special devices, structures and principle of operation electrical measuring instruments of various systems, the ability to select the type of measuring instrument depending on the type and size (range of values) of the measured value, as well as the required accuracy measured I analyzed the results of measurements, the causes of errors, skills finding (experimental methods) values of an electrical quantity, expressed in appropriate units, with specification.		LO4, LO6, LO8, LO9, LO12
	BD	EC	Methods for	Knowledge and understanding of basic methods for	5	LO3, LO5,

			Processing Measurement Results	processing measurement results, ability to process direct measurement results with multiple observations, indirect measurements, aggregate measurements, analyze measurement errors, and skills for calculating absolute, relative, and reduced error		LO6, LO8
	BD	EC	Processing of Measurement Results by Statistical Methods	Knowledge of statistical methods for processing measurement results, understanding basic concepts - standard error, confidence intervals, population, sampling, confidence probability, expectation, ability to assess systematic and random measurement errors, analyze the parameters of statistical error distributions, confidence intervals for any confidence probability at arbitrary number of measurements; skills to independently choose the optimal number measured to use nonlinear (logarithmic) scales freely and reasonably when plotting graphs, calculate confidence intervals using Student's t-score, Gauss or Poisson distribution		LO2, LO4, LO9, LO10
Legal and regulatory framework of the system ensuring the uniformity of measurements	BD	EC	Metrological Certification of Measuring Instruments and Test Equipment	Knowledge and understanding of goals, objectives, types of metrological certification of SR and IO, ability to plan MA SI according to ST RK 2.30 and IO according to GOST 24555, analyze the results of studies of certified SI of each MX, normalized accuracy characteristics during certification of IO to determine the suitability of SI / IO to operation . Skills of drawing up the certification schedule of the SI and IO, protocols of the results of certification, certificates (certificates) of certification	5	LO2, LO4, LO6, LO10, LO12
	BD	EC	Verification and Calibration of Measuring Instruments	Knowledge of the objectives, verification tasks of the SI, calibration of the SI, the role of test / calibration of the SI in ensuring the uniformity of measurements, understanding the differences between calibration and calibration of the SI, choice of verification / calibration methods, features of the MX SI standardization, methods of selection of working standards for verification / calibration of the SI,		LO2, LO4, LO6, LO10, LO12

				the ability to apply the requirements of the national standards of the Republic of Kazakhstan to the organization and procedure for verification of measuring equipment, calibration of measuring equipment, selection of verification schemes, analyze the results of verification / calibration of MI, skills in maintaining primary records for verification, issue protocols and verification certificates, keep electronic records of data and transfer them to the State Scientific Metrology Center of the Republic of Kazakhstan		
	ChD	EC	Measurement Techniques	Knowledge and understanding of the design goals of MVI, measurement objects, requirements of ND GSOEI for structural elements of MVI, ability to choose measurement methods for MVI that must ensure testability taking into account the requirements for accuracy of parameters and their instrumental accessibility at the facility, analyze the total measurement error established by MVI for its subsequent certification, development skills, examination and approval of MVI, determination of sampling error and sample preparation, measurement conditions, operator errors	4	LO3, LO4, LO8, LO9
	ChD	EC	Development and Metrological Certification of Measurement Procedures	Knowledge of the list of MT used in the fields of distribution of the State Metrological Control and Supervision, subjects of the SSEUM who have the right to MBM certification, understanding of the rules of metrological certification of MT and its scope, ability to choose a method of certification, analyze the object of measurement to determine the purpose of MT and conformity to the measured the magnitude of the measurement task, the skills to develop the technical specifications for the development of MT, the metrological examination and evaluation of the completeness and clarity of the requirements for the		LO3, LO4, LO8, LO9

				equipment oviyam measurements of experimental studies and/or evaluating the characteristics of the estimated accuracy of measurement, recording certified MT registry SSEUM .		
	ChD	EC	Regulatory and Methodological Support of Metrological Activity	Knowledge of the regulatory and methodological framework of metrological activities at enterprises, depending on the type of activity, understanding of the requirements of the Law of the Republic of Kazakhstan "On ensuring the uniformity of measurements" to the metrological services, their responsibilities for metrological support of production, testing, control, ability to conduct production and technical regulations and regulations with current requirements, work with the GSI RK registry, web services in the field of technical regulation and metrology and the EEC, the RTD fund, the skills of developing, accounting and storing RTD, ac customization and changes in the documentation	5	LO3, LO6, LO8, LO9
	ChD	EC	Technology Development of Regulatory Documents in the Field of Measurement Uniformity	Knowledge and understanding of the main provisions and requirements of national standards of the Republic of Kazakhstan in the field of development, approval and introduction of regulatory documents on metrology, ability to analyze changes in the legal framework in the field of metrology on the development of ND, skills in applying scientific methods of metrology in the development of ND, accounting and introduction in the register of the Republic of Kazakhstan.		LO3, LO6, LO8, LO9
	ChD	EC	International Metrology Organization	Knowledge of the history, goals, objectives of international metrology organizations - IOMB, IOLM, understanding the provisions of the Metric Convention on unifying national systems of units of measurement and establishing common physical standards of length and mass, improving the world metric measurement system, analyzing the comparison system of national standards with international standards of	5	LO3, LO6, LO8, LO9

				various units of measurement , the ability to apply the requirements of the IOLM to ensure uniformity of definition of types, samples and systems of measuring devices, harmonization I am comparing methods, working with IOMB and IOLM sites to obtain the necessary information on the improvement and comparison of national and international standards, the development of new international standards, the improvement of the metric measurement system		
	ChD	EC	Regional metrology organizations	Knowledge of the history, goals, objectives of regional metrology organizations - Metrological Organization of Central and Eastern Europe (COOMET), European Metrology Organization (EUROMET), West European Calibration Association (EAL), West European Metrological Association (WELMET), understanding the characteristics of regional metrology systems, creating standards, analyzing the activities of regional metrology organizations, skills in working with their sites to obtain the necessary information on coordinating activities of national legal metrology services of EU countries and to eliminate barriers to trade within the European Union, recognition of national certificates for calibration of		LO3, LO6, LO8, LO9
	ChD	EC	Technical Basis of Metrology	Knowledge of the technical base of the metrological support of production, testing, measurement and control, understanding the essence of the transfer of SI units, technical systems and devices with measuring functions from the standards of units of quantities and reference materials skills of comparison of technical means with state standards of units of quantities, storage, verification (comparison) and application of standards of units of quantities, standard samples s and calibration tools	4	LO3, LO6, LO8, LO10
	ChD	EC	Reference Base of Measurement	Knowledge of the SSEUM RK reference base, understanding the role of state standards in international		LO3, LO6, LO8,

			Assurance System	recognition of test and measurement results of domestic IL, PL, CL, elimination of technical barriers to trade, ability to make comparisons used in production, when testing products of workers with state standards, analyze development of the reference base of the Republic of Kazakhstan, research skills in the development of new types of measuring instruments, working standards, measures, reference materials.		LO10
	ChD	EC	Reliability and the Effectiveness of the Technique	Know and understand the general patterns in the design, manufacture, acceptance and operation of products to maximize their effectiveness, identify the laws of failure and restore the product, create the basics of reliability calculation, prediction of failures, determine methods of collecting, recording and analyzing statistical information, predict behavior product in a variety of conditions of application, test planning, control.	6	LO3, LO5, LO6,LO9
	ChD	EC	Technical Measurement and Control	Knowledge and understanding of the goals and objectives of technical measurements in production, when testing products for quality control and safety of technological processes, products, measurements, tests, the ability to conduct a selection of technical measurements depending on the tasks of metrological assurance, analyze the causes of violation of technological regimes, production waste, non-productive costs of raw materials, materials, energy and other production losses related to the state of measuring, control and testing instruments, have the skills to carry out I monitor compliance with the correctness of the measurement parameters of technological processes and the introduction of new measuring equipment		LO3, LO5, LO6,LO9
	ChD	EC	Metrological Insuring of Production	Knowledge and understanding of the main directions of development of metrological support of production, the role of the Ministry of Defense in improving the quality and safety of products, the technical base of MIP, methods	5	LO2, LO4, LO8, LO12

				of ensuring the unity and accuracy of measurements, the ability to analyze the state of MIP, planning MIP, skills of working on MI development, production, testing and operation products, control and updating of the reference database, calibration and calibration equipment, enterprise SI, preparation of reports on the implementation of the MIP plans		
	ChD	EC	Applied Metrology	Knowledge and understanding of the role of applied metrology in ensuring the uniformity of measurements, goals and objectives in the SSEUM, the ability to assess the accuracy of control operations and model typical control systems, analyze standard reference data and reference materials as an integral part of applied metrology, analyze the physico-chemical properties of materials for the creation of new standard samples, the skills of practical metrological activity: verification and calibration of SR, development, standardization and certification of MM, metrological ekspertiza technical documentation, analysis of the measurements in the enterprise		LO2, LO4, LO8, LO12
	ChD	EC	Statistical Methods for Quality Control of Products and Processes	Knowledge and understanding of the basic tools of statistical control, analysis and regulation of technological processes, the ability to choose statistical methods of quality management of products and processes, analyze identified defects, deviations and inconsistencies of statistical control results, skills of organizing technical, technological control and control of finished products, constructing a histogram, maps Shuharata, Pareto diagrams, cause and effect diagrams, development of control leaflets	5	LO3, LO6, LO8, LO9
	ChD	EC	Statistical Methods Quality Improvement	Knowledge and understanding of methods for distributing qualitative and quantitative attributes of products, processes, the ability to carry out selective characteristics		LO3, LO6, LO8, LO9

				of technological processes and their properties, testing statistical hypotheses, skills for conducting acceptance control by a qualitative attribute, drawing up a selective control plan for a quantitative characteristic, applying statistical methods in the quality control system products and processes		
Module acquisition of new professional competencies	BD	EC	Minor program	Acquisition of additional competencies in the field of standardization of metrological support of production, testing, measurement and control. Knowledge and understanding of the relationship between standardization, certification and metrology in the general system of product quality management, international requirements for the legislative and regulatory framework of standardization and certification to ensure the uniformity of measurements, the ability to plan for standardization of metrological support of production, testing, measurement and control, certification of SI, AI, skills of work with standards, updating of normative technical documentation	12	LO2, LO4, LO5, LO7, LO9, LO11, LO12
Module Final certification	ChD	EC	Predegree practice	Analyzing the metrological support of a specific production, selecting and justifying new SIs for monitoring the technological parameters of production, conducting state control over compliance with the requirements of metrological norms and rules of a specific production, conducting metrological examination of the enterprise's documentation, improving metrological activities within the overall management system areas of enterprise metrological activity, analysis and justification of testing specific first product, the analysis of systems of occupational safety and environment for their improvement, economic evaluation of the introduction of the new SI, improving MIP	8	PO2, PO4, PO5, PO7, PO9, PO11, PO12
	ChD	EC	Writing and defense of degree work	The final qualification work of the graduate of the educational program, confirming the competences acquired	12	LO2, LO4, LO5, LO7,

			(project) or preparing and a graded exam	in the process of training in the field of metrology, metrological support of production, testing, measurement and control, quality management in various industries. The diploma project is defended at an open meeting of the State Examination Commission		LO9, LO11, LO12
Mukhtar Studies	GED	EC	Mukhtar Studies	The life and work of M.O. Auezov is studied; analyzes the creative laboratory of the writer, his biography in context with the work; as the creator of Abayan science; researcher zhyr "Manas". Acquaintance with M.Auezov as a prominent public figure. The skills of analyzing the literary heritage of M. Auezov in world and eastern literature are being developed. Feelings of patriotism and love of country are instilled.		LO2, LO3
Abay Studies	GED	EC	Abay Studies	Knowledge of Abai's life and work, his role in enriching the national literary language, analyze M.Auezov's scientific and creative activities as the founder of a field of study in Kazakh literary studies - abay studies for understanding Abai's innovative poetry, skills in using Abai's creativity for spiritual self-development and cultural enrichment		LO1, LO2
Actual Problems and Modernization of Public Consciousness	GED	EC	Actual Problems and Modernization of Public Consciousness	Knowledge of the main directions of modernization of the public consciousness of Kazakhstani society, understanding of the principles of formation of national consciousness, education, competition, pragmatism, preservation of national identity in the new conditions of political reforms and modernization of the economy of our country, analyze the message for the development of their own spiritual self-consciousness, the acquisition of skills of rapid adaptation to the dynamically changing conditions of modernity for the preservation of their culture, their own national code		LO2, LO3

AGREEMENT SHEET

by Education Program 6B07513 -Metrology

Director of AID	Sign	Omashova G.Sh.
Director of ASD	Sign	Zhagnabay N.Zh.
Director of DSPK	Sign	Bazhirov T.S.

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Appendix 1

REVIEW

by Education Programme code 6B07513 «Metrology»,developed in M. Auezov SKSU

1. Brief description of the enterprise and its business profile

In 2016, the Ministry of Education and Science of the Republic of Kazakhstan divided the specialty 5B073200 - Standardization, Certification and Metrology (by industry), according to the new qualification reference book into two specialties, one in the direction Standardization and Certification (by industry), the second in the field of metrology. Currently, the preparation of bachelors in the educational program 6B07513 - Metrology, is planned to be held at the department of "Standardization and Certification", according to a new EP, which is submitted for review.

2. Relevance and relevance EP

The relevance of EP is due to the need for training in the field of metrology and metrological support of production for them to perform strategic programs of industrial and innovative development of the Republic of Kazakhstan, in which the system for ensuring the uniformity of measurements in the production process, testing and control plays a key role, since metrology is international instrument in the field of ensuring the uniformity of measurements in all sectors of the country's economy, ensuring the solution of technological problems th re-industrialization, innovative development of automation. Solving these problems is impossible without the participation of metrology, which provides the necessary accuracy and level of measurement.

The importance of measurement in modern society is great. Measurements are not only a source of scientific knowledge, but are invaluable for accounting material resources and planning, for domestic and foreign trade, to ensure product quality, interchangeability of components, parts and improve technology, to ensure the safety of human labor.

In connection with the accelerated industrial-innovative development of the republic, the entry of the EAEU, the WTO, the development of high-priority innovative areas aimed at strengthening the economy and improving the quality of life, such as: the transport sector, information technology, telecommunications, electronics and optics, the area of electromagnetic and ionizing radiation , energy sector, development of new energy sources, such as biodiesel fuel, hydrogen fuel, energy recovered from waste disposal, called for alternative sources - solar energy, wind power will increase the need for more reliable and accurate measurement results which provide such technical devices, such as measuring instruments, the nomenclature of which is increasing annually exponentially

Metrological activity in enterprises relates to the sphere regulated by the state, primarily in the field of mandatory calibration of measuring instruments that are subject to metrological supervision, the number of which reaches 150 million units and about 200 million measuring instruments must be calibrated.

The demand of the EP is related to the need to train specialists - metrologists, SI verification officers, because in recent years there was an acute problem of the lack of such specialists in industrial enterprises, which were mainly due to the lack of training of metrologists, practically in all universities of our country, because of the gap that occurred in 2016 after the separation of this specialty into a separate and lengthy procedure for obtaining a license for it.

These trends and dictate the demand for EP 6B07513 - Metrology for the early training of such specialists for industrial enterprises, both in the Southern region, and for enterprises in other areas of our country.

Learning outcomes and competencies, their relationship to the demands of the labor market

The educational program contains the results of training and competencies that allow graduates to:

- demonstrate knowledge and understanding in the field of metrological support of production, testing and control in accordance with national and international legislation on ensuring the uniformity of measurements

-apply knowledge and understanding at the professional level in the course of work on verification / calibration of measuring instruments, metrological provision of instruments and automation equipment, plan equipment upgrades, perform special measurements during technological processes, during experiments on testing of products, during technological testing equipment for compliance with established standards of accuracy.

-to evaluate ideas, formulate conclusions and solve problems in the field of accurate measurements to determine the actual values of monitored parameters, to conduct metrological monitoring of the use of SI, MVI, reference materials, operational accounting of measuring instruments, testing and control, working standards, reference materials

- work in a team, communicate information, ideas, problems and solutions on metrological support of production, testing, control and quality management of metrological activities, both to specialists and non-specialists

The learning outcomes and competencies are closely related to the demands of the labor market, since external examination and review of the EP goes through employers who review and review the EP when approving the program.

3. Availability of components that develop practical skills

The content of the EP is aimed at preparing intellectual capital that meets the needs of the individual and society, based on the principles of "lifelong education" and self-education, mobility, development of creative thinking and competence-based approach. The EP includes components that form professional competencies, develop practical skills - Technical measurements and control, Verification and calibration of measuring instruments, Practicum of a technical performer in technical metrology, Technology of development of normative documents in the field of measurement uniformity, Normative and methodological support of metrological activity, Standardization and the use of metrological characteristics of measuring instruments.

4. Content of the educational program (modules, disciplines)

The modular educational program contains modules that form skills and competences in the field of mathematical, natural, social and socio-economic sciences, modules of communicative mobility, giving competences to study the subject area in Kazakh, Russian and foreign languages, specialty modules, allowing to solve professional problems in metrological support of production, testing and control using modern information communication technologies, developed amb new and revise existing standards and other normative documents on metrology, to develop and implement modern quality management system of metrology in the workplace.

5. The quality of information about the disciplines of the EP

Information on the disciplines of the EP modules contains a description of the components of each module, allowing students to get acquainted with the module name, the cycle that includes the discipline, its content, and the learning outcome codes.

6 Conclusion on OP

The educational program 6B07513 - "Metrology", is aimed at training personnel for industrial enterprises in the field of metrological support of production, testing and control, meeting the needs of society, based on the principles of "lifelong education" and self-education, mobility, development of creative thinking and competence-based approach to problem solving by types of their professional activities and allows students to give a broad education, which is necessary for understanding the influence of the system common measurement in the global and social context, to provide students with communication skills for their participation in the further development of the metrological component of production processes, testing and quality control, solid training in the field of metrology, which will allow them to successfully compete in the labor market in all relevant areas starting from the metrology technician, instrument technician, SI calibration specialist, SI inspector, metrology specialist to the metrology engineer in the region Aspects of ensuring uniformity of measurements.

Head department of Technical Regulation and Metrology Committee for the city of Shymkent Eskaraev B.A.

Appendix 2

Expert opinion

by Education Program code 6B07513-«Metrology»

1. The urgency of the OP is due to the need to train metrologists for industrial enterprises in the region who are able to independently select and apply the organizational, applied and scientific foundations of metrology for various industries, to evaluate and analyze the current state of metrological support for production, testing and measurement based on knowledge of the provisions and requirements systems for ensuring the uniformity of measurements, regulatory documents in the field of metrology, as well as those capable of formulating, etc. Niemann-effective solutions of productive tasks.

2. Compliance of the EP with the stated goals, consistent with the mission of the university, with the requests of employers and students

The EP corresponds to the goals set forth in it and is consistent with the mission of M.Auezov SKSU on personnel training for industrial enterprises of the region in the field of metrological support of production based on the use of science and technology, dynamic and advanced development of a system for ensuring the uniformity of measurements.

The presented objectives of the study program are formulated and concretized in context with the needs of students, as they are formed on the basis of Dublin descriptors and are expressed through competences: in the field of native language, foreign language, fundamental mathematical, natural science, technical, computer, educational, social (interpersonal, intercultural, civil), entrepreneurial, economic, cultural training, additional and professional competences in the field of metrological support of production, testing and control.

The employers' requests are specified in order to reflect the potential of the EP to provide students with solid training in the field of metrological support of production, testing and control, which will allow them to successfully compete in the labor market in all relevant areas, ranging from a metrology technician, instrumentalist, calibration specialist, verification SI, specialist in metrology to an engineer in metrology in the field of ensuring the uniformity of measurements. The director of the branch in the city of Shymkent and the Turkestan region of the RSE "Kazakhstan Institute of Standardization and Certification" took an active part in the development of the educational program.

3. Compliance with the National Qualifications Framework of the Republic of Kazakhstan

The national qualifications framework contains eight qualification levels, which corresponds to the European qualifications framework and educational levels defined by the Law of the Republic of Kazakhstan “On Education”. The educational program 6B07513- Metrology corresponds to the sixth level of qualifications of the NQF of the Republic of Kazakhstan and is necessarily coordinated with potential employers and students.

4. Reflection of the learning outcomes and competencies based on the Dublin descriptors in the professional qualification / industry framework

The curriculum contains learning outcomes and competencies based on Dublin descriptors, namely:

A. knowledge and understanding;

B. the use in practice of knowledge and understanding;

C. ability to make judgments and formulate conclusions;

D. communication skills;

E. Skills in the field of education, taking into account three levels of training (undergraduate, graduate and doctoral studies), as stipulated by the terminology of the Bologna process.

OP 6B07513 - Metrology, took into account the requirements of the Professional Standard "Metrology", approved by the Order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" dated 10.22.2018 No. 283, from which, in the EP, the names of the graduates' positions in the EP - Metrology are included.

5. Compliance with SES

The content of the educational program in terms of structure, content and volume corresponds to the SES approved by the PP of the Republic of Kazakhstan dated 23.08.2012. No. 1080, with changes and additions of May 13, 2016 No. 292.

The volume of the cycle of general education disciplines is 57 credits, 112 credits are allocated to the component of the cycle of basic disciplines, and 60 credits to the component of the cycle of the main disciplines. The volume of all types of practices is 18 credits. Additional types of training are also provided, in particular, physical education 8 credits. For the entire period of study, students master 244 credits of theoretical education. In SES higher education, approved by the Government of the Republic of Kazakhstan 50 23.08.2012 No. 1080, with amendments and additions dated May 13, 2016 No. 292, EP 6B07513 - Metrology set the labor intensity of the mandatory component equal to 117 credits, the component of choice - 114 credits, including by cycles:

- GED - university component 51 credit, optional component - 6;
- BD - university component of 52 credits, a component of choice - 60
- ChD - college component 14, the component of choice - 46.

Thus, the EP was developed in accordance with the Professional Standard "Metrology", regulatory documents of the MES RK, including the curriculum of disciplines, according to the rules of modular structuring, competence-based approach and taking into account the results of mastering the modules and the entire modular curriculum in credits KZ

Curricula are based on the principles of continuity, continuity and adaptability, contain a list of disciplines, number of credits, placement by semesters, types of classes and forms of control. All disciplines of the curriculum involve studying in semesters, taking into account the logical sequence based on prerequisites and post requisites. In the structure of the curriculum there are 3 cycles of disciplines, distributed between the obligatory and elective components.

Along with this, the volume of credits, SIW professional practice and coursework (projects) are reflected.

6. The structure and content of the EP, the application of the modular principle of their construction

In the educational program 6B07513 - Metrology, a modular learning system is implemented. It helps to solve the problems of systematization of knowledge, their best assimilation, and consists in dividing information into specific doses — modules causing the necessary controllability, flexibility and dynamism of the learning process. The module is not only a section of the educational program, but also a system based on the interaction of various techniques and methods of educational activity, ensuring the integration of this module into a complete system of education.

7. Availability in the EP of components for preparation for professional activities, developing key competencies, intellectual and academic skills, reflecting the changing requirements of society, including the implementation of the presidential program for mastering three languages: Kazakh, Russian and English

EP is aimed at obtaining professional and general educational competencies, such as: general education, social and ethical, economic and organizational and managerial, special and professional competences, develops students' readiness to change social, economic, professional roles, geographical and social mobility in conditions of growing dynamism change and uncertainty.

In the EP there are elements of the implementation of the presidential program for mastering three languages: Kazakh, Russian and English. The number of disciplines in English is 30%, in Kazakh - 50%, and in Russian - 20%.

8. The logical sequence of disciplines and the reflection of the basic requirements in the curricula and training programs

The sequence of modules / disciplines in the EP is logically justified, the principles of ensuring continuity, continuity, accessibility and consistency of the content of education in curricula and training programs are implemented.

9. Presence in programs of practical training for fixing the theoretical material expressed in the academic load in credits

In the EP there is a section “Providing professional practices: their types, main typical places of organization and conduct, assessment of results” which reflect the goals, objectives and results of professional practices for students of EP, the workload in the credits is given in the summary table reflecting the amount of credits practiced in the context of the modules of the educational program.

10. Qualifications obtained as a result of the development of EP

Qualifications obtained as a result of the development of EP - Bachelor of Engineering and Technology in EP 6B07513 - Metrology.

Chairman of the expert committee _____ c.t.s., associate professor Abzalova D.A.

Expert Panel Members:

1. Pechersky V.N. d.t.sc, Professor _____
2. Zhantasov M.K. c.t.s., associate professor _____
3. Kaldybaeva B.M. PhD, associate professor _____