

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
KHARKIV NATIONAL AUTOMOBILE AND HIGHWAY UNIVERSITY

EDUCATIONAL AND PROFESSIONAL PROGRAM

Professional/Scientific

INFORMATION AND MEASUREMENT TECHNOLOGIES

Name of the EP

of the first (bachelor's) level of higher education

Name of education level

specialty 175 Information and Measurement Technologies

Code and name of specialty

Fields of Knowledge 17 Electronics, Automation and Electronic Communications

Code and name of the field of knowledge

Qualification Bachelor of Information and Measurement Technologies

Qualification Name

APPROVED

ACADEMIC COUNCIL OF KHNADU

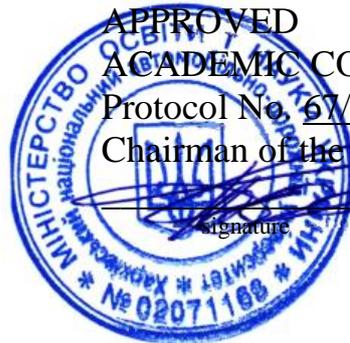
Protocol No. 67/24 dated "04" July 2024

Chairman of the Academic Council

Victor BOGOMOLOV

signature

Name and surname



The educational program will be put into effect
in 2024.

Order No. 87 dated "05" July 2024

Rector

Victor BOGOMOLOV

signature

Name and surname



Kharkiv 2024

PREFACE

1. Developed by the project team:

Andrii KOVAL

Ph.D., Associate Professor,
Associate Professor of the Department
of Metrology and Life safety


signature, guarantor EP

Oleksandr KOVAL

Ph.D, Associate Professor,
Associate Professor of the Department
metrology and life safety,


підпис

Nataliia DIDENKO

Ph.D., Associate Professor,
Associate Professor of the Department
of Metrology and life safety,


signature

Marina CHMUZH,

private research and production
"MICROTECH" enterprises,


signature

Alina BABAYEVA,

Chairman of the Student Council of KhNAHU,
Applicant by specialty

175 "Information and Measurement Technologies"


signature

2. Recommended by the Methodological Commission of the Faculty of
Mechanics

Protocol No. 10 dated 26.06.2024

3. Approved by the Methodological Council

Protocol No. 9 dated 02 07 2024

4. Reviewers:

Ihor ZAKHAROV, Head of the Department of Information and Measurement
Technologies, Doctor of Technical Sciences, Professor, Kharkiv National
University of Radio Electronics.

Volodymyr SKLYAROV, Scientific Secretary, Doctor of Technical Sciences,
Director of the National Scientific Center "Institute of Metrology".

1. PROFILE OF THE EDUCATIONAL PROGRAM

1 - General Information	
Full name of the higher education institution and the department responsible for the implementation of EP	Kharkiv National Automobile and Highway University Department of Metrology and Life Safety
Higher education degree and title of qualification in the original language	Higher Education Degree – Bachelor's Degree Qualification – Bachelor of Information and Measurement Technologies
Official name of the educational program	Information and Measurement Technologies
Type of diploma and scope of educational program	Bachelor's degree, single, 240 ECTS credits (on the basis of PZSO)
Availability of accreditation	Certificate No. 9040, accredited until July 1, 2029
Cycle/Level	HPK of Ukraine – Level 6, FQ-EHEA – First Cycle, EQF-LLL – Level 6
Prerequisites	Complete general secondary education or a junior bachelor's degree
Language(s) of instruction	State
Validity of the educational program	5 years
Internet address of permanent placement of the description of the educational program	https://www.khadi.kharkov.ua/education/katalog-osvitnikh-program/152-informaciino-vimirjuvalni-tekhnologiji/
2 – The purpose of the educational program	
The purpose of the educational program is to combine a high level of professional training with the formation of the student's necessary scientific worldview and ability to solve complex practical problems in the field of information and measurement technologies, to design and develop measuring equipment and information and measurement systems that meet modern requirements and standards, by combining theoretical training with practical activities.	
3 – Characteristics of the educational program	
Subject area (field of knowledge, specialty)	<i>Object:</i> technical, software, mathematical, information support of information and measuring equipment, principles of construction of measuring equipment and

	<p>their use, principles and methods of reproduction of reference values, reference materials.</p> <p><i>Learning objectives:</i> Training of specialists capable of complex solutions to complex problems of development and use of measuring equipment, use of information technology for processing measurement results and automation of metrological activities in the performance of organizational and technical work, applied research in the field of metrology and metrological activity.</p> <p><i>Theoretical content of the subject area.</i> Concepts and principles of metrology and information-measuring equipment, construction of measuring equipment, metrological activity.</p> <p><i>Methods, techniques and technologies.</i> Methods of measurements, methods of their construction, information technologies in the creation of software for measuring instruments and software for processing measurement results.</p> <p><i>Tools and equipment:</i> modern measuring instruments, tools and equipment for the manufacture and adjustment of measuring instruments, when conducting their tests and laboratory studies and when performing work related to metrological activities.</p>
Orientation of the educational program	The educational and professional program has an applied orientation with an emphasis on information and measurement technologies.
The main focus of the educational program and specialization	<p>Higher education in the field of knowledge 17 "Electronics, Automation and Electronic Communications", specialty 175 "Information and Measurement Technologies".</p> <p>In-depth theoretical and practical knowledge of metrology and information-measuring equipment with an emphasis on the formation of knowledge and skills in research and practical implementation of intelligent information-measuring technologies in the machine-building industry (in road transport, in road construction machines, etc.), in road construction and other fields of activity.</p>
Features of the program	<p>Combination of theoretical training with practical training in the educational program and bringing the acquired knowledge and skills in line with the current level of development of the industry, the needs of the labor market and production tasks.</p> <p>The peculiarity of the program is ensured by an expanded</p>

	set of program learning outcomes: the integration of professional training with innovative activities in the machine-building industry, modern information technologies.
4 – Graduates' suitability for employment and further education	
Employability	Positions according to the Classifier of Professions of Ukraine. According to the Classifier of Professions DK 003: 2010, a bachelor in the specialty 175 "Information and Measuring Technologies" is prepared for the following positions: 31 – Technical specialists in the field of applied sciences and technology; 311 – Technical specialists in the field of physical sciences and engineering; 3115 – Technician of automated systems of trajectory measurements; 3119 – Metrology Technician; 3119 – Standardization Technician; 3152 – Product Quality Control Inspector.
Further education	Opportunity to study under the program of the second (master's) level of higher education in an educational-scientific or educational-professional program. Acquisition of additional qualifications in the system of postgraduate education.
5 – Teaching & Assessment	
Teaching & Learning	Student-centered, problem-oriented, professionally oriented, communicative, interdisciplinary approaches to learning and self-learning are used.
Evaluation	Oral and written exams, testing, essays, project work, presentations, reports, tests, course (project) works, a comprehensive exam in the specialty.
6 – Program Competencies	
Integral Competence	Ability to solve complex specialized tasks and practical problems of metrology and information-measuring equipment, which are characterized by complexity and uncertainty of conditions, which involves the use of theories and methods of metrology, methods of building automation and instrumentation.
General Competencies (GC)	GC1. Ability to apply professional knowledge and skills in practical situations. GC2. Ability to communicate in the state language both orally and in writing.

	<p>GC3. Ability to communicate in a foreign language</p> <p>GC4. Skills in the use of information and communication technologies</p> <p>GC5. Ability to search, process and analyze information from various sources</p> <p>GC6. Skills to carry out safe activities</p> <p>GC7. Striving for environmental conservation</p> <p>GC8. Ability to learn and master modern knowledge.</p> <p>GC9. Ability to be critical and self-critical</p> <p>GC10. Ability to evaluate and ensure the quality of work performed.</p> <p>GC11. Ability to exercise their rights and responsibilities as a member of society, to realize the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine.</p> <p>GC12. The ability to preserve and multiply moral, cultural, scientific values and achievements of society based on an understanding of the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, equipment and technology, to use various types and forms of physical activity for active recreation and a healthy lifestyle.</p> <p>GC13 Ability to work autonomously or in a team, to take initiative and organize one's activities.</p> <p>GC14. Ability to make decisions and act in compliance with the principle of inadmissibility of corruption and any other manifestations of dishonesty</p>
<p>Professional competencies of the specialty (FC)</p>	<p>FC1. Ability to analyze the components of error by their essential features, operate with the components of error/uncertainty in accordance with measurement models.</p> <p>FC2. Ability to design information and measurement equipment and describe the principle of their operation</p> <p>FC3. Ability, based on a measurement task, to explain and describe the principles of constructing computing components of measuring equipment</p> <p>FC4. Ability to use modern engineering and mathematical packages to create models of instruments and measurement systems.</p> <p>FC5. Ability to apply standard calculation methods in the design of modules, parts and assemblies of measuring equipment and their computing components and modules.</p>

	<p>FC6. Ability to perform technical operations during testing, verification, calibration and other operations of metrological activity.</p> <p>FC7. Ability to provide metrological support of technological processes and certification tests.</p> <p>FC8. Ability to carry out technical measures to ensure metrological traceability, correctness, repeatability and reproducibility of measurement and test results in accordance with international standards.</p> <p>FC9. Ability to carry out adjustment and experimental testing of certain types of devices in laboratory conditions and at facilities.</p> <p>FC10. Ability to develop a regulatory and methodological framework for quality assurance and technical regulation and to develop a scientific and technical framework for quality management systems and certification tests.</p> <p>FC11. Ability to process the results of direct, indirect, aggregate and compatible measurements and plan the measurement procedure based on the purpose of the measurement and process the measurement results.</p> <p>FC12. Ability to design and conduct analysis of electrical circuits.</p> <p>FC13. Ability to apply programming technologies for measuring equipment.</p> <p>FC14. Ability to measure the parameters of automotive and road equipment and process their results.</p>
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7 – Programmatic Learning Outcomes

- PLO 1. Be able to find reasonable solutions in the preparation of structural, functional and schematic diagrams of information and measuring equipment.
- PLO 2. Know and understand the basic concepts of metrology, measurement theory, mathematical and computer modeling, modern methods of processing and evaluating the accuracy of a measurement experiment.
- PLO 3. Understand the broad interdisciplinary context of the specialty, its place in the theory of cognition and evaluation of objects and phenomena.
- PLO 4. Be able to choose, based on the technical task, a standardized method for evaluating and measuring the characteristic properties of products and parameters of technological processes.
- PLO 5. Be able to use the principles and methods of reproduction of reference values in the construction of reference measuring instruments (standard samples, standard transducers, standard measuring instruments).
- PLO 6. Be able to use information technology in the development of software for processing measurement information.
- PLO 7. Be able to explain and describe the principles of constructing computing subsystems and modules used in solving measurement problems.

- PLO 8. Be able to organize and carry out measurements, technical control and tests.
- PLO 9. Understand the applied methods and methods of analysis, design and research, as well as the limitations of their use.
- PLO 10. Be able to establish a rational nomenclature of metrological characteristics of measuring instruments to obtain measurement results with a given accuracy.
- PLO 11. Know the standards for metrology, measuring instruments and metrological quality assurance of products.
- PLO 12. Know and understand modern theoretical and experimental research methods with the assessment of the accuracy of the results obtained.
- PLO 13. Know and be able to apply modern information technologies to solve problems in the field of metrology and information-measuring equipment.
- PLO 14. Be able to organize the procedure for measuring, calibrating, testing when working in a group or individually.
- PLO 15. Know and understand the subject area, its history and place in the sustainable development of engineering and technology, in the general system of knowledge about nature and society.
- PLO 16. Be able to take into account social, environmental, ethical, economic aspects, requirements of labor protection, industrial sanitation and fire safety when forming technical solutions. Be able to use different types and forms of physical activity for active recreation and a healthy lifestyle.
- PLO 17. Be able to use fundamental concepts and categories of state-building in production and social activities to substantiate their own worldview positions and political beliefs, taking into account the socio-political history of Ukraine, legal principles and ethical norms.
- PLO 18. Be fluent in the terminology base of the specialty, understand the scientific and technical documentation of the state metrological system of Ukraine, international and interstate recommendations and guidelines for the specialty.
- PLO 19. Be able to create models of measuring equipment using modern engineering and mathematical packages.
- PLO 20. Apply information and measurement technologies to process measurement results and determine the metrological characteristics of measuring instruments.
- PLO 21. Be able to program measuring equipment and elements of measuring information systems.
- PLO 22. Be able to measure and process the results of measurements of the parameters of automotive and road equipment
- PLO 23. Freely communicate in the state and foreign languages orally and in writing to discuss professional problems and results of activities in the field of metrology and information and measurement technologies.

8 – Resourcing of the program implementation

Staffing	All scientific and pedagogical workers who provide the educational and professional program by qualification correspond to the profile and direction of the disciplines taught, have the necessary experience of pedagogical
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	work and practical experience. In the process of organizing the educational process, professionals with experience in research, management, innovation, creative and professional work, if necessary, foreign lecturers are involved
Material and technical support	Material and technical support meets the licensing requirements for the provision of educational services in the field of higher education and is sufficient to ensure the quality of the educational process. All premises comply with building and sanitary standards, and there is an appropriate social infrastructure.
Informational, educational and methodological support	The official website of the http://www.khadi.kharkov.ua contains information about educational programs, educational, scientific and educational activities, structural units, admission rules, contacts. Materials of educational and methodological support of the educational program are presented in the Modular Environment of the Educational Process of KhNAHU: https://dl2022.khadi-kh.com/ . The necessary educational and methodological literature is available in the library. All resources of the scientific and technical library are available through the university's website: http://library.khadi.kharkov.ua The reading room is equipped with wireless Internet access. Access to scientometric databases, including Scopus and WoS, is available.
9 – Academic mobility	
National Credit Mobility	It provides for the possibility of national credit mobility in some educational components that ensure the acquisition of general or professional competencies.
International Credit Mobility	Academic mobility of higher education applicants is carried out through their participation in the exchange program for students, semester study, double diploma program and internship on the basis of bilateral cooperation agreements between KhNAHU and foreign partner institutions.
Training of foreign applicants for higher education	On the basis of agreements between KhNAHU and other higher education institutions, individuals or legal entities, applicants within the educational and professional program have the opportunity to participate in double degree programs, semester academic exchange, internships, etc.

2. LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAM AND THEIR LOGICAL SEQUENCE

2.1 List of EP components

Code	Components of the educational program (academic disciplines, course projects (works), practices, qualification work)	Number of credits	Form Summary. Control
Required components of the EP			
EC 1	Ukrainian language (for professional purposes)	3,00	Exam
EC 2	Foreign Language (for Professional Purposes)	17,00	Passed, exam
EC 3	History and Culture of Ukraine	3,00	Passed
EC 4	Philosophy	3,00	Exam
EC 5	Higher Mathematics	8,00	Passed, Exam
EC 6	Descriptive geometry, engineering and computer graphics	4,00	Exam, Залік
EC 7	Physics	8,00	Passed, Exam
EC 8	Ecology	3,00	Passed
EC 9	Occupational health and safety	3,00	Exam
EC 10	Mechanical engineering	3,00	Passed
EC 11	Fundamentals of Information Technology	4,00	Passed
EC 12	Algorithmization and programming	9,00	Exam
EC 13	Вступ до фаху	4,00	Passed
EC 14	Physical quantities and measurements	6,00	Exam
EC 15	Theory of Electrical Signals and Circuits	7,00	Exam
EC 16	Functional Devices of Measuring Information Systems	7,00	Exam
EC 17	Fundamentals of Metrology and Measuring Equipment	5,00	Exam, CW
EC 18	Introduction to Systems Theory	4,00	Exam
EC 19	Fundamentals of Qualimetry and Quality Management	4,00	Exam
EC 20	Measuring transducers	7,00	Passed, Exam, CW
EC 21	Methods for Determining the Metrological	7,00	Passed,

Code	Components of the educational program (academic disciplines, course projects (works), practices, qualification work)	Number of credits	Form Summary. Control
	Characteristics of Measuring Instruments		Exam, CW
EC 22	Simulation of measuring instruments on a computer	5,00	Exam
EC 23	Оцінка відповідності та законодавча метрологія	3,00	Exam
EC 24	Methods and Means of Measuring the Parameters of Automotive and Road Equipment	4,00	Passed
EC 25	Microprocessor measuring instruments	4,00	Exam, CP
EC 26	Проектування Design	4,00	Exam, CP
EC 27	Computerized Measurement Information Systems	6,00	Passed, Exam, CP
EC 28	Students' research work	3,00	Passed
EC 29	Verification and calibration of measuring instruments	4,00	Exam, CW
EC 30	Educational practice	4,00	Passed
EC 31	Educational practice	4,00	Passed
EC 32	Internship	4,00	Passed
EC 33	Pre-diploma practice	4,00	Passed
EC 34	Виконання кваліфікаційної роботи	12,00	Protect
Total Required Components:		180,00	
Selective components of EP*			
ED 1	Elective discipline 1	3,00	Passed
ED 2	Elective discipline 2	3,00	Passed
ED 3	Elective discipline 3	3,00	Passed
ED 4	Elective discipline 4	3,00	Passed
ED 5	Elective discipline 5	3,00	Passed
ED 6	Elective discipline 6	3,00	Passed
ED 7	Elective discipline 7	3,00	Passed
ED 8	Elective discipline 8	3,00	Passed
ED 9	Elective discipline 9	4,00	Passed
ED 10	Elective discipline 10	4,00	Passed
ED 11	Elective discipline 11	4,00	Passed
ED 12	Elective discipline 12	4,00	Passed

Code	Components of the educational program (academic disciplines, course projects (works), practices, qualification work)	Number of credits	Form Summary. Control
ED 13	Elective discipline 13	4,00	Passed
ED 14	Elective discipline 14	4,00	Passed
ED 15	Elective discipline 15	4,00	Passed
ED 16	Elective discipline 16	4,00	Passed
ED 17	Elective discipline 17	4,00	Passed
Total Sample Components:		60,00	
THE TOTAL AMOUNT OF THE EDUCATIONAL PROGRAM		240,00	

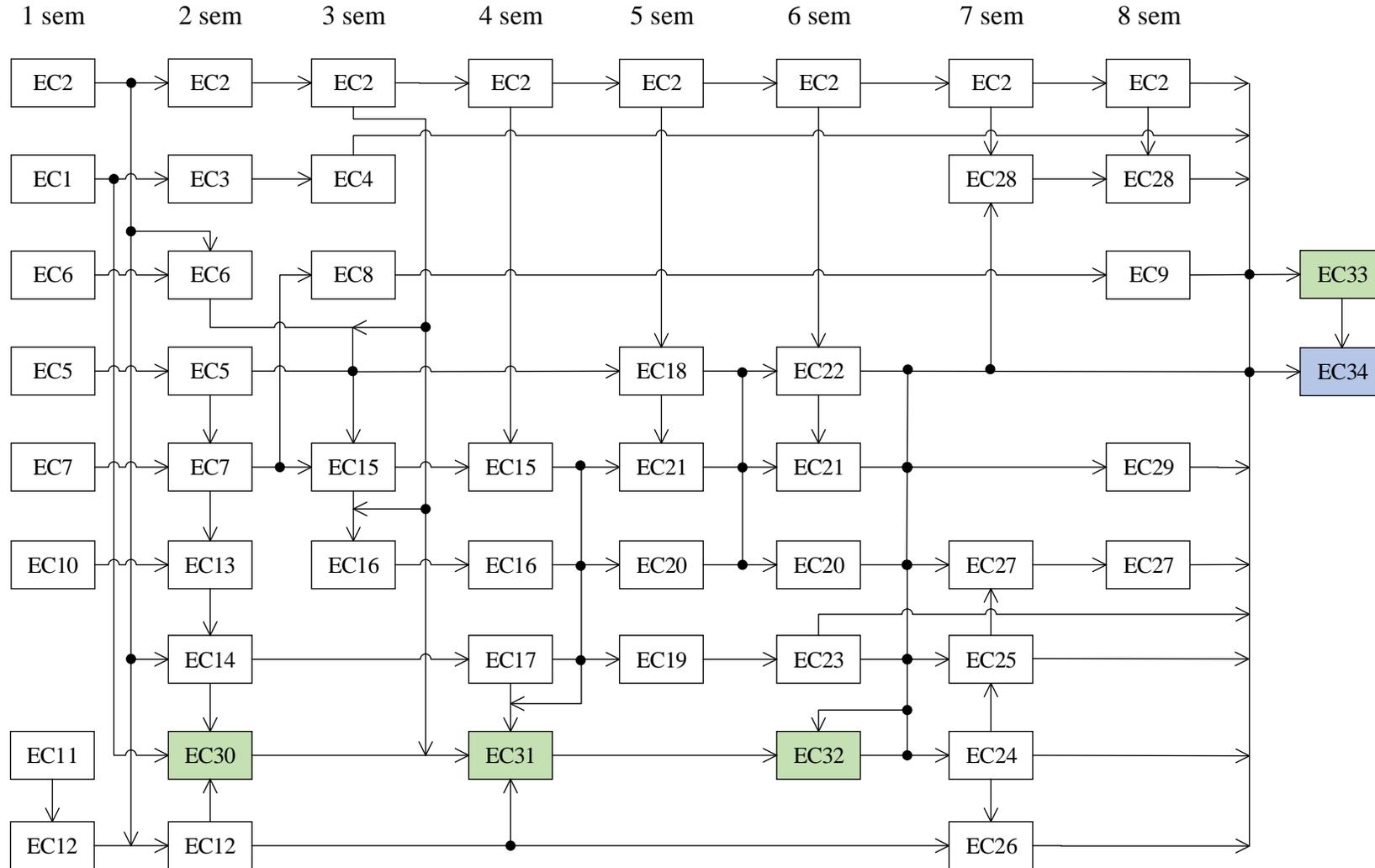
*It is allowed for the applicant to choose from the university catalog, including from other EPs in accordance with clause 2.2

2.2 The university-wide catalog of elective disciplines is posted on the official website of the university at the link:

[_https://www.khadi.kharkov.ua/education/katalog-vibirkovikh-disciplin/](https://www.khadi.kharkov.ua/education/katalog-vibirkovikh-disciplin/)

3 STRUCTURAL AND LOGICAL DIAGRAM OF THE OP

REQUIRED COMPONENTS OF THE EP*.



*Painted rectangles indicate the practices and performance of the qualification work

1 sem

2 sem

3 sem

4 sem

5 sem

6 sem

7 sem

8 sem

ELECTIVE COMPONENTS OF THE EP

ED1	ED2	ED3	ED4	ED15	ED17
ED5	ED8	ED11	ED13	ED16	
ED6	ED9	ED12	ED14		
ED7	ED10				

4. FORM OF ATTESTATION OF HIGHER EDUCATION APPLICANTS

Certification of graduates of the educational program "Information and Measurement Technologies" in the specialty 175 "Information and Measurement Technologies" is carried out in the form of public defense of the qualification work and ends with the issuance of a document of the established form on awarding him a bachelor's degree with the assignment of the educational qualification "Bachelor of Information and Measurement Technologies".

Certification is carried out openly and publicly. The qualification work should provide for the solution of a complex specialized problem or a practical problem, characterized by complexity and uncertainty of conditions, using the theories and methods of engineering.

Bachelor's thesis is subject to mandatory verification for academic plagiarism. There can be no academic plagiarism, falsification and cheating in the qualification work.

The qualification work must be published on the official website of the higher education institution or its structural unit, or in the repository of the higher education institution.

5. MATRIX OF CORRESPONDENCE OF PROGRAM COMPETENCIES TO THE COMPONENTS OF EDUCATIONAL APPLICATIONS

	GC1	GC2	GC3	GC4	GC5	GC6	GC7	GC8	GC9	GC10	GC11	GC12	GC13	FC1	FC2	FC3	FC4	FC5	FC6	FC7	FC8	FC9	FC10	FC11	FC12	FC13	FC14	
EC 1		+						+				+																
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EC 34	+	+		+	+	+		+				+	+	+	+		+	+						+				+

6. MATRIX FOR THE PROVISION OF PROGRAM LEARNING OUTCOMES BY THE COMPONENTS OF THE EDUCATIONAL PROGRAM

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14	PLO 15	PLO 16	PLO 17	PLO 18	PLO 19	PLO 20	PLO 21	PLO 22	PLO 23
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EC 17		+	+		+			+	+	+		+	+		+			+		+		+	

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14	PLO 15	PLO 16	PLO 17	PLO 18	PLO 19	PLO 20	PLO 21	PLO 22	PLO 23
GC 11			+												+	+	+						
GC 12			+					+			+				+	+	+						
GC 13																							
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FC 3	+	+		+									+										
FC 4	+			+		+			+	+			+						+				
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FC 8		+		+	+			+		+			+	+								+	
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FC 12	+						+																
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Guarantor of the educational and professional program

Ph.D., Associate Professor of the Department of Metrology and Life Safety



A.O. Koval