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

EDUCATIONAL AND PROFESSIONAL PROGRAM

Professional/Scientific

INTELLIGENT INFORMATION AND MEASUREMENT TECHNOLOGIES
Name of the EP

of the second (master'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 Master's Degree in Information and Measurement Technologies
назва кваліфікації

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:
Oleksandr POLYARUS
Doctor of Technical Sciences, Professor of the Department
Metrology and Life Safety
_____, guarantor of the subdivision
signature

Oleksandr KOVAL
Ph.D., Associate Professor of the Department of Metrology and
life safety,
_____
signature

Dmytro PETRUKOVICH
Ph.D., 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	Master's Degree Qualification – Master of Information and Measurement Technologies
Official name of the educational program	Intelligent Information and Measurement Technologies
Type of diploma and scope of educational program	Master's degree, single, 90 ECTS credits, term of study 1 year 4 months
Availability of accreditation	Certificate No7412, accredited until July 1, 2029
Cycle/Level	HPK of Ukraine – Level 7, FQ-EHEA – Second Cycle, EQF-LLL – Level 7
Prerequisites	Availability of a 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 the ability to further independent learning in the field of information and measurement technologies. The achievement of this goal is based on providing opportunities for research activities in solving practical problems in the field of application of intelligent information and measurement technologies to engineering and design activities in symbiosis with a systematic approach to the provision of fundamental and holistic knowledge.	
3 – Characteristics of the educational program	
Subject area (field of knowledge, specialty)	*Object*: means of information and measuring equipment; methods of measurement, control, testing and diagnostics; metrological support of scientific, industrial, social, medical, biological, environmental and other activities, traceability and comparability of

	results; normative documentation related to measurements and their application, technical, software, mathematical, information support of information and measuring equipment, principles of construction of measuring instruments techniques and their use, principles and methods of reproduction of reference values, reference materials. *Learning objectives*: training of specialists capable of complex solutions of complex problems, development of information and measuring equipment; development and practical implementation of standardization systems, conformity assessment; development, revision and harmonization of normative documents on standardization, conformity assessment, metrological support and quality management systems in the performance of organizational and technical work, applied research in the field of metrology and metrological Activity. *Theoretical content of the subject area*. Concepts and principles of metrology and information-measuring equipment, construction of measuring equipment, automation of experimental research, principles of standardization and conformity assessment, metrological activity. *Methods, techniques and technologies*. Methods of measurements, methods of their construction, information technologies in the creation of software for measuring instruments and software for processing results, measurements, information technologies of experimental research. *Tools and equipment*: 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.
Orientation of the educational program	The educational and professional program has an applied orientation with an emphasis on intelligent measuring information technologies.
The main focus of the educational program and specialization	Higher education in the field of knowledge 17 "Electronics, Automation and Electronic Communications", specialty 175 "Information and Measurement Technologies". 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

	measuring information technologies in the machine-building industry (in road transport, in road construction machines, etc.), in road construction and other fields of activity.
Features of the program	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. The peculiarity of the program is ensured by an expanded 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 master's degree in specialty 175 "Information and Measurement Technologies" is prepared for the following positions: 21 – Professionals in the field of physical, mathematical and technical sciences 214 – Professionals in architecture and engineering 2149.2 – Controller Engineer 2149.2 – Metrology Engineer 2144.2 – Engineer for high-voltage testing and measurement of power equipment
Further education	Opportunity to study under the program for postgraduate students of the third level of higher education in the educational and scientific program.
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 works, presentations, reports, tests, course (project) works, speeches at scientific and technical conferences.
6 – Program Competencies	
Integral Competence	Ability to solve complex specialized tasks and problems in the field of information and measurement technologies, which involves research and/or innovation and is characterized by uncertainty of conditions and requirements.
General Competencies (GC)	GC1. Knowledge and understanding of the subject area and understanding of professional activities

	GC2. Ability to communicate in a foreign language GC3. Skills in the use of information and communication technologies GC4. Ability to conduct research at the appropriate level GC5. Ability to search, process, analyze information from various sources GC6. Ability to identify, pose, and solve problems GC7. Ability to make informed decisions GC8. Ability to work in an international context GC9. Ability to develop and manage projects GC10. Ability to evaluate and ensure the quality of work performed. GC11. Ability to make decisions and act in compliance with the principle of inadmissibility of corruption and any other manifestations of dishonesty.
Professional competencies of the specialty (FC)	FC1. Ability to select and apply suitable mathematical methods, computer technologies, as well as approaches to standardization and certification to solve problems in the field of metrology and information-measuring equipment FC2. Practical skills in solving complex tasks and problems of metrology, information and measuring equipment, standardization in assessing product quality FC3. Knowledge and understanding of scientific facts, concepts, theories, principles, and methods of experimental computer science FC4. Ability to apply a systematic approach to solving scientific and technical problems of metrology and information-measuring equipment FC5. Ability to solve complex professional tasks and problems based on an understanding of the technical aspects of ensuring product quality control ФК6. Здатність застосовувати розуміння метрології як науки про вимірювання при роботі з технічною літературою та іншими джерелами інформації FC7. Ability to apply an integrated approach to solving experimental problems using information and measuring equipment and applied software FC8. Ability to demonstrate knowledge and understanding of mathematical principles and methods necessary for the creation of virtual measuring instruments and information-measuring equipment

	FC9. Ability to develop software, hardware and metrological support for computerized information and measurement systems FC10. Ability to take into account commercial and economic contexts in metrological activities FC11. Ability to take into account the requirements for metrological activities in the field of technical regulation, due to the need to ensure sustainable development FC12. Ability to manage projects and Start-Ups and evaluate their results FC13. Ability to comply with legal and ethical standards on intellectual property issues
7 – Programmatic Learning Outcomes	
PLO1. Know and understand modern methods of scientific research, organization and planning of experiments, computerized methods of research and processing of measurement results PLO2. Know and understand the basic concepts of measurement theory, apply in practice and in computer modeling of objects and phenomena PLO3. Understand the interdisciplinary connections and contexts of the specialty PLO4. Be able to perform analysis of engineering products, processes and systems according to established criteria; select and apply the most suitable analytical, computational and experimental methods for conducting research; interpret research results PLO5. Be able to formulate and solve problems in the field of metrology related to the procedures of object observation, measurement, control, diagnosis and forecasting, taking into account the importance of social constraints (society, health and safety, environmental protection, economy, industry) PLO6. Be able to develop normative and technical documents and metrological standards for engineering products, processes and systems PLO7. Be able to develop and design engineering products, processes and systems of metrological orientation, select and apply methods of computerized experimental research PLO8. Possess modern methods and techniques of design and research, as well as analysis of the results obtained PLO9. Мати навички організації і проведення технічних випробувань інженерних продуктів PLO10. Analyze and evaluate the impact of information and measurement equipment and metrological activities on the environment and human safety PLO11. Understand the methodological and philosophical aspects of modern science and their place in the process of scientific research PLO12. Freely present and discuss scientific results in the state language and English or one of the languages of the European Union countries in oral and written forms, as well as conduct a scientific discussion PLO13. Apply hardware and software of modern information technologies to solve problems in the field of metrology and information-measuring equipment	

PLO14. Understand the basics of patenting and have intellectual property protection skills	
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 work and practical experience. In the process of organizing the educational process, professionals with experience in research, management, innovation, creative and professional work, and, if necessary, foreign lecturers are involved
Material and technical support	Classrooms, modern computer tools and software, multimedia classrooms, equipped laboratories allow to fully ensure the educational process throughout the entire cycle of training for the educational program and meet the requirements of the Licensing Conditions (Resolution of the Cabinet of Ministers of Ukraine No. 1187 of 30.12.2015 "On Approval of the Licensing Conditions for the Implementation of Educational Activities of Educational Institutions" in edition of 24.03.2021, No. 365)
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 methodical 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. There is access to scientometric databases, including Scopus and WoS. The electronic repository of the scientific library of KhNAHU contains more than 6 thousand titles of scientific papers: http://library.khadi.kharkov.ua/elektronni-resursi/elektronnii-katalog.
9 – Academic mobility	
National Credit Mobility	On the basis of bilateral agreements between KhNAHU and technical universities of Ukraine
International Credit Mobility	On the basis of bilateral agreements between KhNAHU and technical universities of foreign countries

Training of foreign applicants for higher education	This educational and professional program provides for the training of foreign applicants for higher education

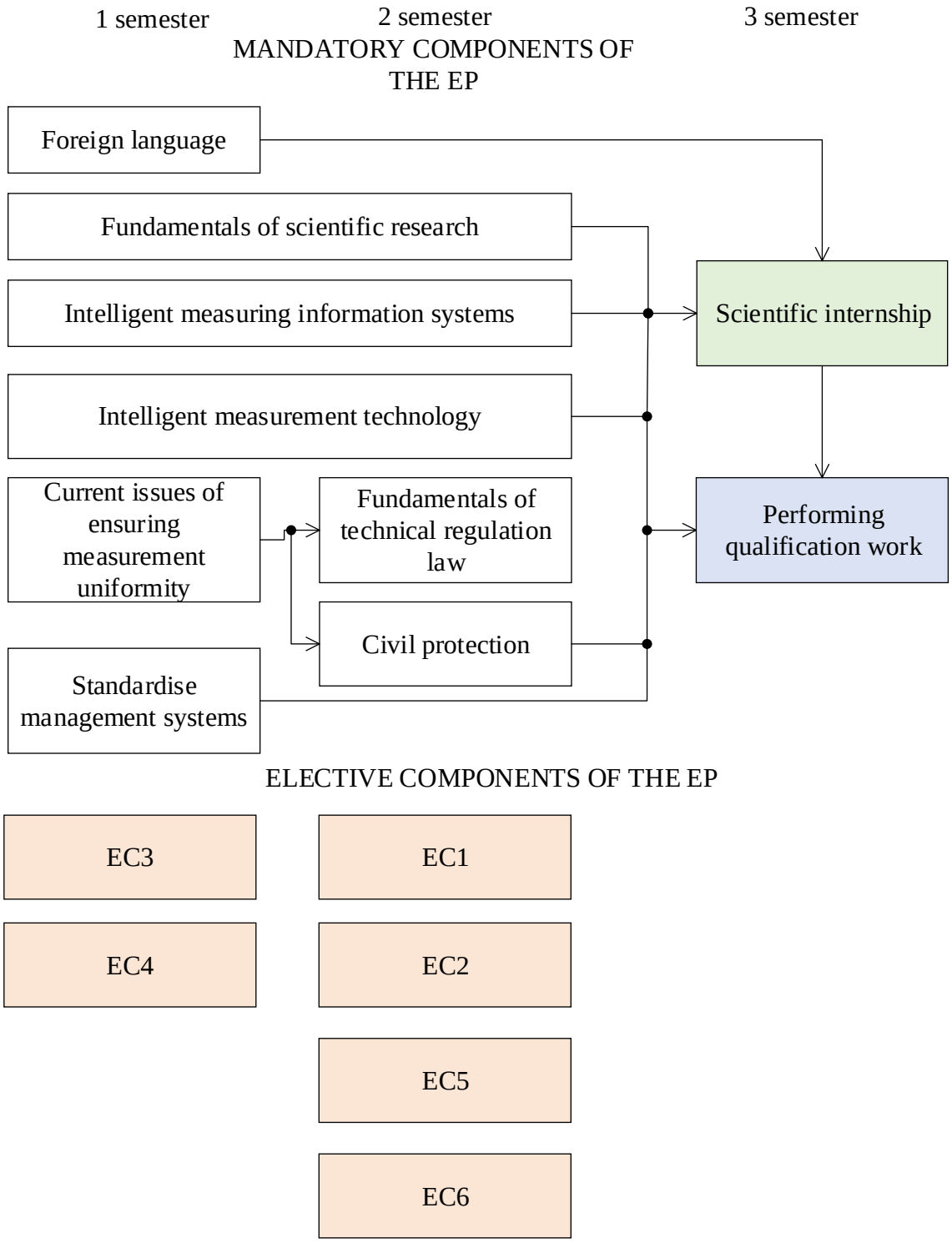
2. LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAM AND THEIR LOGICAL SEQUENCE

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
1	2	3	4
Required components of the EP			
EC 1	Foreign Language	3,00	Passed
EC 2	Fundamentals of Scientific Research	6,00	Exam, Exam
EC 3	Civil protection	3,00	Passed
EC 4	Actual Problems of Ensuring the Uniformity of Measurements	4,00	Exam, CW
EC 5	Intelligent Measurement Information Systems	7,00	Exam, credit, CW
EC 6	Standardization of management systems	3,00	Passed
EC 7	Fundamentals of Technical Regulation Legislation	4,00	Exam
EC 8	Smart Metering Technologies	6,00	Exam, credit, CP
EC 9	Pre-diploma practice	3,00	Passed
EC 10	Performance of qualification work	27,00	Protection
Total Required Components:		**66,00**	
Elective components of EP			
EC 1	Elective Discipline 1	4,00	Passed
EC 2	Elective Discipline 2	4,00	Passed
EC 3	Elective discipline 3	4,00	Passed
EC 4	Elective Discipline 4	4,00	Passed
EC 5	Elective discipline 5	4,00	Passed
EC 6	Elective Discipline 6	4,00	Passed
Total Sample Components:		**24,00**	
THE TOTAL AMOUNT OF THE EDUCATIONAL PROGRAM		**90,00**	

2.2 The university-wide catalog of elective disciplines, from which the applicant can choose any, is posted on the official website of the university at the link https://www.khadi.kharkov.ua/education/katalog-vibirkovikh-disciplin/katalog-vibirkovikh-disciplin-dlja-np-2023/magistr/

3 STRUCTURAL AND LOGICAL DIAGRAM OF THE EP



4. FORM OF ATTESTATION OF HIGHER EDUCATION APPLICANTS

Certification of graduates of the educational program in the specialty 175 "Information and Measurement Technologies" is carried out in the form of defense of the qualification master's thesis and ends with the issuance of a standard document on awarding a master's degree with the qualification: "Master 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.

The master'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 THE EDUCATIONAL PROGRAM

	EC1	EC2	EC3	EC4	EC5	EC6	EC7	EC8	EC9	EC10
GC 1				+	+	+	+	+	+	+
GC 2	+									
GC 3					+			+	+	+
GC 4		+			+					+
GC 5	+	+	+	+		+	+			+
GC 6		+	+		+			+		+
GC 7			+		+	+	+	+	+	+
GC 8		+				+	+			
GC 9				+		+				+
GC 10				+			+		+	
GC 11							+			+
FC1				+				+		
FC 2				+		+	+		+	+
FC 3		+	+		+			+	+	+
FC 4		+			+					+
FC 5				+			+	+	+	+
FC 6		+		+		+	+		+	+
FC 7					+		+		+	+
FC 8					+			+		+
FC 9					+					+
FC 10			+			+		+		
FC 11						+	+		+	+
FC 12				+		+				
FC 13		+							+	

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

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13	PLO14
EC1												+		
EC 2	+		+					+			+			+
EC 3			+		+					+				
EC 4	+	+		+	+						+			
EC 5	+	+					+	+					+	
EC 6			+			+			+					+
EC 7	+			+		+			+					+
EC 8			+				+		+				+	
EC 9	+	+	+	+	+	+	+	+	+				+	
EC 10	+	+		+	+		+	+					+	

7. MATRIX OF CORRESPONDENCE OF PROGRAM LEARNING OUTCOMES (PRN) AND COMPETENCIES

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13	PLO14
GC 1	+	+	+	+	+		+	+	+	+				
GC 2												+		
GC 3												+	+	
GC 4	+		+		+			+						
GC 5														+
GC 6	+	+	+		+		+		+	+	+			+
GC 7			+		+			+		+				
GC 8									+			+		
GC 9				+	+	+	+		+	+				
GC 10					+	+	+		+	+				
GC 11														+
FC 1	+	+	+	+	+	+	+	+						
FC 2								+	+	+				
FC 3		+											+	
FC 4			+	+		+					+			
FC 5														
FC 6														
FC 7					+		+	+						
FC 8	+													
FC 9					+	+			+					
FC 10										+				
FC 11										+				
FC 12			+			+	+	+						
FC 13														+

Guarantor of the educational and professional program
Doctor of Technical Sciences, Professor,
Professor of the Department
Department of Metrology and Life Safety O. V. Polyarus