MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

**INTERNATIONAL HUMANITARIAN
UNIVERSITY**

«ACCEPTED»
Academic Council
International Humanitarian
University
Protocol No. 1
from « 29 » 08 2023

Put into effect by the Rector's order
International Humanitarian University
from 28. №

Rector K. V. Gromovenko

EDUCATIONAL AND PROFESSIONAL PROGRAM
«COMPUTER ENGINEERING»

Field of knowledge - 12 Information technology

Specialty – 123 Computer engineering

Educational degree - Master's degree

Odesa – 2023
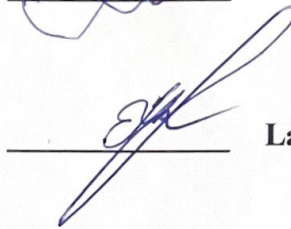
LETTER OF APPROVAL

of the Educational and professional program "Computer Engineering"
in the specialty 123 Computer Engineering
for the second (master's) level of higher education

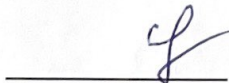|		
First Vice-Rector	_____	**Vasyl LEFTEROV**
Head of Educational Department	_____	**Larysa RAYCHEVA**
Dean of the Faculty cybersecurity, software engineering and computer science	_____	**Iryna Strelkovskaya**
Head of the Department of Computer Engineering and Innovative Technologies	_____	**Volodymyr HURA**
Guarantor of the program	_____	**Volodymyr HURA**

education (Order of the Ministry of Education and Science of Ukraine No. 330 of 18.03.2021).

Guarantor of the educational and professional program
Candidate of Technical Sciences,
Associate Professor of the
Department of Computer Engineering and innovative technologies
of the International Humanitarian
University   V.I. Hura

PREAMBLE

The educational and professional program at the second (master's) level of higher education in the specialty 123 "Computer Engineering" contains the amount of 90 ECTS credits required to obtain the appropriate degree of higher education; list of competencies of the graduate; normative content of training of higher education applicants, formulated in terms of learning outcomes; forms of certification of applicants for higher education; requirements for the existence of a system of internal quality assurance of higher education.

II. Educational and professional program profile

1. General information

Full name of the higher educational institution and structural unit	International Humanitarian University Department of Computer Engineering and Innovative Technologies
Level of higher education	Second (master's) level
Higher Education Degree	Master
Field of expertise	12 «Information technology»
Speciality	123 «Computer engineering»
Educational qualifications	Master in Computer Engineering
Qualification in diploma	Higher Education – Master's Degree Specialty - 123 Computer engineering
The volume of the educational program, the term of study	90 ECTS credits, term of study 1 year 4 months
Loop/level	LDC of Ukraine – level 7, FQ-EHEA – second cycle, EQF LLL – Level 7
Prerequisites	Availability of a bachelor's degree (or educational qualification level of a specialist)
Language(s) of instruction	English
Internet address of the permanent placement of the description of the educational program	mgu.edu.ua

2. The purpose of the educational and professional program

The purpose of training is to acquire theoretical and practical knowledge and skills, skills and other competencies for successful professional activity in the field of creating software and hardware systems for information processing and management, creating and using new software for the development and operation of computer systems and networks.

3. Characteristics of the educational and professional program	
Subject area	Field of knowledge: 12 «Information technologies» Specialty: 123 «Computer engineering»
Domain description	**The objects of professional activity of masters are:** - software and hardware of computers and computer systems, local, global computer networks and the Internet, cyber-physical systems, Internet of things, IT-infrastructures, interfaces and protocols of interaction of their components. - processes, technologies, methods, methods, tools and systems for research, computer-aided and automatic design; adjustment, production and operation of software and hardware, project documentation, standards, procedures and means to support their life cycle management. - methods of representation, receipt, storage, transmission, processing and protection of information in a computer, mathematical models of computational processes, computing technologies, including high-performance, parallel, distributed, mobile, web-based and cloud, green (energy-efficient), secure, autonomous, adaptive, intelligent, smart, etc., architecture and organization of the functioning of relevant software and hardware. **The objectives of training are** to train specialists capable of solving complex research and innovative problems in the field of computer engineering. **The theoretical content of the subject area** consists of concepts , concepts, principles of research, design, production, use and maintenance of computers and computer systems, computer networks, cyber-physical systems, Internet of things, IT-infrastructures. **Methods, techniques** and technologies: methods of research of processes in computer systems and networks, methods of computer-aided design and production of software and hardware of computer systems and networks, and their components, methods of mathematical and computer modeling, information technologies, programming technologies . **Tools** and equipment: software, tools and computer equipment, instrumentation, software and hardware automation and automation systems for design, production, operation, control, monitoring, network, mobile, cloud technologies, etc.
Orientation of the educational program	*Educational and professional* The master's educational and professional training program is designed for students who aspire to become highly qualified specialists in the field of software development and maintenance and own a knowledge system in the field of computer systems. The program is based on well-known provisions and results of modern scientific research in the field of computer engineering and focuses on current specializations within which the professional and scientific career of future specialists is possible. The main advantage of the master's degree program is the orientation towards the formation of the broadest scientific and technical worldview of

	the future professional and focus on the needs of employers in the IT industry.
The main focus of the program	Educational and professional program. The emphasis of the program is made on the acquisition of knowledge, skills and competencies in the field of creating software and hardware (hardware, programmable, reconfigurable, system and applied software) information processing and control systems for universal and special purposes, including stationary, mobile, embedded, distributed, etc., local, globalcomputer networks, cyber-physical systems, Internet of things, IT-infrastructures, interfaces and protocols of interaction of their components; creation and use of new system software for the development and operation of computer systems and networks, as well as methods of information processing, mathematical models of computational processes, computing technologies (high-performance, parallel, distributed, mobile, web and cloud, green (energy-efficient), secure, autonomous, adaptive, intelligent, smart, etc.). Educational and professional, based on well-known scientific results of computer engineering, within which further professional career and further training in the field of information technology are possible. The emphasis is on the technology of development and maintenance of computer systems and networks and their software. Training of specialists capable of independently using and implementing computer engineering technologies, in particular the principles of operation and architecture of microprocessor technology, components of computer systems, construction and operation of computer systems and networks, methods and technologies for creating system and application programs within the framework of a functional, procedural and object-oriented approach for desktop, mobile, portable, embedded and cloud systems.
Academic rights of graduates	Graduates have the right to continue their studies at the third (educational and scientific) level of higher education and acquire additional qualifications in the adult education system.
4. Eligibility of graduates for employment and further study	
Eligibility for employment	Names of professions according to the National Classifier of Ukraine: Classifier of Professions (DK 003: 2010) 2 Professionals 21 Professionals in physical, mathematical and technical sciences 213 Professionals in Computing (Computerization) 2131.1 Computer Systems Professionals Researchers (Computing Systems) 2131.2 Developers of computing systems 2132.1 Programming Professionals Research Associates (Programming) 2132.2 Computer Software Developers 2139 Professionals in Other Computing (Computerization) 2139.2 Computer Application Engineer 312 Computer Technicians 3121 IT Officer
5. List of competencies of the graduate	
Integral competence	Ability to solve complex problems and problems in the field of computer engineering or in the learning process, which involves research and / or

	innovation and is characterized by uncertainty of conditions and requirements
General competencies	GC 1. Ability to adapt and act in a new situation. GC 2. Ability to abstract thinking, analysis and synthesis. GC 3. Ability to conduct research at the appropriate level. GC 4. Ability to search, process and analyze information from various sources. GC 5. Ability to generate new ideas (creativity). GC 6. Ability to identify, pose, and solve problems. GC 7. The ability to make informed decisions. GC 8. Ability to communicate in a foreign language.
Special (professional, subject) Competence	SC1. Ability to determine technical characteristics, design features, application and operation of software, software and hardware, computer systems and networks for various purposes. SC2. Ability to develop algorithmic and software, components of computer systems and networks, Internet applications, cyber-physical systems using modern methods and programming languages, as well as tools and systems for design automation. SC3. Ability to design computer systems and networks taking into account goals, constraints, technical, economic and legal aspects. SC4. Ability to build and research models of computer systems and networks. SC5. Ability to build architecture and create system and application software for computer systems and networks. SC6. The ability to use and implement new technologies, including smart, mobile, green and secure computing technologies, to participate in the modernization and reconstruction of computer systems and networks, various embedded and distributed applications, in particular in order to increase their efficiency. SC7. Ability to research, develop and select technologies for creating large and ultra-large systems. SC8. The ability to ensure the quality of information technology products and services throughout their life cycle. SC9. Ability to present the results of own research and / or development in the form of presentations, scientific and technical reports, articles and reports at scientific and technical conferences. SC10. Ability to identify, classify and describe the operation of software and hardware, computer systems, networks and their components; SC11. Ability to choose effective methods for solving complex problems of computer engineering, critically evaluate the results and argue the decisions made.
6. Program competencies	
Learning outcomes	LO 1. Apply general approaches of cognition, methods of mathematics, natural and engineering sciences to solving complex problems of computer engineering. LO 2. Find the necessary data, analyze and evaluate it.

LO 3. Build and explore models of computer systems and networks, assess their adequacy, determine the boundaries of applicability.

LO 4. Apply specialized conceptual knowledge, including modern scientific achievements in the field of computer engineering, necessary for professional activity, original thinking and research, critical reflection on information technology problems and at the interface of fields of knowledge.

LO 5. Develop and implement projects in the field of computer engineering and related interdisciplinary projects, taking into account engineering, social, economic, legal and other aspects.

LO 6. Analyze problems, identify and formulate specific problems that need to be solved, choose effective methods for solving them.

LO 7. Solve problems of analysis and synthesis of computer systems and networks.

LO 8. Apply knowledge of technical characteristics, design features, purpose and rules of operation of software and hardware of computer systems and networks to solve complex problems of computer engineering and related problems.

LO 9. Develop software for embedded and distributed applications, mobile and hybrid systems.

LO 10. Search for information in various sources to solve computer engineering problems, analyze and evaluate this information.

LO 11. Make effective decisions on the development, implementation and operation of computer systems and networks, analyze alternatives, assess risks and likely consequences of decisions.

LO 12. Communicate fluently orally and in writing in Ukrainian and one of the foreign languages (English, German, Italian, French, Spanish) when discussing professional issues, research and innovation in the field of information technology.

LO 13. It is clear and unambiguous to convey their own knowledge, conclusions and arguments on information technology issues and related intersectoral issues to specialists and non-specialists, in particular to students.

7. Resource support for program implementation	
Staffing	The implementation of the program is provided by highly qualified personnel who have significant experience in educational, methodological, research and practical work, are recognized professionals in the specialty. At least 50% of scientific and pedagogical workers who have a scientific degree and / or academic title, at least 25% have a scientific degree of doctor of sciences or the academic title of professor are involved in the implementation of the program. A system of professional development of teachers has been implemented, including in cooperation with leading IT companies. IT employers and professional practitioners in the field of software engineering are involved in the educational process.
Logistics	The implementation of the program is provided by: - premises for conducting training sessions and control measures;

	- multimedia equipment for simultaneous use in classrooms; - availability of social infrastructure, including a library with a reading room and dormitories; computer workplaces, laboratories, polygons, equipment, equipment, Internet access and information resources necessary for training, teaching and scientific activities.
9. Academic mobility	
National credit mobility	On a general basis within Ukraine. On the basis of bilateral agreements with higher education institutions of Ukraine.
International credit mobility	Within the framework of the EU Erasmus + program on the basis of bilateral agreements with educational institutions of foreign partner countries.
Training of foreign applicants for higher education	On the basis of agreements between the International Humanitarian University and higher education institutions of foreign countries.

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

2.1. List of OP components

N/A code	Components of the educational program (academic disciplines, course projects (works), practices, qualification work)	Number of credits	Form final control	
			Exam	Passed
1.1 GENERAL TRAINING CYCLE				
1. Occupational safety in the industry		3		2.1
2. Organization of scientific research		4		1.1
3. Intellectual property in Ukraine		3	1.1	
4. Preparation for qualification work		6		2.1
5. Scientific and research practice		6		1.1
6. Pedagogical (assistant practice)		3		1.2
7. Pre-diploma practice		3		2.1
1.2 VOCATIONAL TRAINING CYCLE		28		
8. Research of computer systems of artificial intelligence		6		1.2
9. Research and design of computer systems and networks		15	1.2	
10. Network Information Technologies		7	1.2, 2.1	
Total volume of required components:		28		
2.1 GENERAL TRAINING CYCLE		13		
2.2 VOCATIONAL TRAINING CYCLE		21		
Total volume of sample components:		34		
THE TOTAL AMOUNT OF THE EDUCATIONAL PROGRAM		90		

3 CERTIFICATION OF THE APPLICANT FOR THE FIRST LEVEL OF HIGHER EDUCATION

Forms of certification of applicants for higher education	Certification of higher education applicants is carried out in the form of public defense (demonstration) of final qualification work and ends with the issuance of a document of the established sample on awarding him a master's degree with the qualification: master of computer engineering according to the educational and professional program "Computer Engineering".
Requirements for qualification work	Qualification work should involve the solution of a complex specialized task or practical problem in the field of computer engineering that requires research and / or innovation and is characterized by uncertainty of conditions and requirements. The qualification work aims to systematize, consolidate and expand theoretical knowledge and practical skills in the specialty, develop the creative abilities and skills of the applicant to fully apply their knowledge to solve scientific, technical, project and organizational and economic problems using theories and methods of information technology; Final qualifying work (WRC) contains: - files with software information tools developed by the student and their source texts;

- explanatory note;
- demonstration materials.

The final qualification work should demonstrate the graduate's ability to perform actual tasks of the specialty and the ability to use the acquired competencies and learning outcomes, logically, on the basis of the research, justify design decisions, draw reasoned conclusions and formulate specific proposals and recommendations for the completed task.

The qualification work must be checked for academic plagiarism.

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

4. MATRIX OF COMPLIANCE OF PROGRAM COMPETENCIES WITH THE COMPONENTS OF THE EDUCATIONAL PROGRAM

	CE 1	CE 2	CE 3	CE 4	CE 5	CE 6	CE 7	CE 8	CE 9	CE 10
IC1	+		+	+	+	+	+	+	+	+
SC 1	+	+	+	+	+	+	+	+	+	+
SC 2	+	+		+	+	+	+	+	+	+
SC 3		+								
SC 4	+		+	+	+	+	+	+	+	+
SC 5	+	+		+	+	+	+	+	+	+
SC 6		+		+	+	+	+	+	+	+
SC 7	+	+	+	+	+	+	+	+	+	+
SC 8										
SC 1	+			+		+	+	+	+	+
SC 2								+	+	+
SC 3				+		+	+	+	+	+
SC 4				+		+	+	+	+	+
SC 5				+		+	+			
SC 6								+	+	+
SC 7		+		+		+	+	+	+	+
SC 8				+		+	+			
SC 9		+		+		+	+			
SC 10								+	+	+
SC 11								+	+	+

5. MATRIX OF PROVIDING PROGRAM LEARNING OUTCOMES (LO) WITH RELEVANT COMPONENTS OF THE EDUCATIONAL PROGRAM

	CE 1	CE 2	CE 3	CE 4	CE 5	CE 6	CE 7	CE 8	CE 9	CE 10
LO 1						+	+	+	+	+
LO 2		+		+	+	+	+	+	+	+
LO 3				+	+	+	+	+	+	+
LO 4				+		+	+	+	+	+
LO 5		+		+		+		+		
LO 6				+		+	+	+	+	+
LO 7	+	+		+		+	+	+	+	+
LO 8			+			+	+	+	+	+
LO 9	+	+		+		+	+	+	+	
LO 10						+	+	+	+	+
LO 11	+	+						+		+
LO 12			+	+	+					+
LO 13		+	+	+	+					

6. CHARACTERISTICS OF THE SYSTEM OF INTERNAL QUALITY ASSURANCE OF THE FIRST LEVEL OF HIGHER EDUCATION

The system of internal quality assurance of higher education consists of the following procedures and measures provided for by the Law of Ukraine "On Higher Education":

1) defining the principles and procedures for ensuring the quality of higher education;

2) monitoring and periodic review of educational programs;

3) annual evaluation of first-level students, research and teaching staff of higher education institutions and regular publication of the results of such evaluations on the official website of the higher education institution or on information stands;

4) providing advanced training for research and teaching staff;

5) ensuring the availability of the necessary resources for the organization of the educational process, including independent work of students of the first level of higher education, according to the educational program;

6) ensuring the availability of information systems for effective management of the educational process;

7) ensuring publicity of information about educational programs, degrees and qualifications;

8) ensuring an effective system for preventing and detecting academic plagiarism in the scientific works of employees of higher education institutions and first-level higher education students.

7. LIST OF REGULATORY DOCUMENTS ON WHICH THE EDUCATIONAL PROGRAM IS BASED

1. The Law of Ukraine "On Higher Education" of 01.07.2014 No. 1556-VII.

2. Resolution of the Cabinet of Ministers of Ukraine of 23.11.2011 № 1341 "On Approval of the National Qualifications Framework".

3. Resolution of the Cabinet of Ministers of Ukraine of 29.04.2015 No. 266 "On Approval of the List of Fields of Knowledge and Specialties for Training of Higher Education Applicants".

4. Classifier of professions DK 003:2010. Replaced by DK 003:2005; Effective from 2010-11-01 - (National Classifier of Ukraine).

6. Standard of higher education in the specialty 123 "Computer Engineering" of the field of knowledge 12 "Information Technology" for the second (master's) level of higher