MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
STATE HIGHER EDUCATIONAL INSTITUTION
Uzhhorod National University

APPROVED
ProtocolAcademic Council of
"Uzhhorod Nationaluniversity"
dated 23 March 2023, № 3

EDUCATIONAL PROFESSIONAL PROGRAM

"Automation and computer-integrated technologies"

second (master's) level of higher education

majoring in 174 Automation, computer-integrated technologies and robotic devices

areas of knowledge 17 Electronics, automation and electronic communications

Qualification: Master of Automation, Computer Integrated Technology and Robotic Devices

IMPLEMENTED by
order Rector of
"Uzhhorod National university"
dated 04 April 2023, № 141/01-04

Uzhhorod - 2023

AGREEMENT SHEET
of educational professional program
"Automation and computer-integrated technologies"

1. Rector **Volodymyr SMOLANKA**
04 April 2023

2. Guarantor of educational professional program **Valentyn IVANYTSKY**
09 February 2023

3. Dean of the structural unit **Jolana HOLYK**
09 February 2023

4. Head of the project team **Valentyn IVANYTSKY**
09 February 2023

5. Head of the educational part **Anatoliy Shtymak**
20 March 2023

АРКУШ ПОГОДЖЕННЯ
освітньо-професійної програми
«Автоматизація та комп'ютерно-інтегровані технології»

1. Ректор **Володимир СМОЛАНКА**
23.03.2023 **р.**

2. Гарант освітньо-професійної програми **Валентин ІВАНИЦЬКИЙ**
09.02 **2023 р.**

3. Декан структурного підрозділу **Йолана ГОЛИК**
09.02 **2023 р.**

4. Керівник робочої групи **Валентин ІВАНИЦЬКИЙ**
09.02 **2023 р.**

5. Начальник навчальної частини **Анатолій ШТИМАК**
20.03 **2023 р.**

Educational and professional training program for applicants of the second (master's) level of higher education is developed in accordance with the requirements of the Law of Ukraine "On Higher Education" based on the standard of higher education of Ukraine for specialty 151 "Automation and computer-integrated technologies", approved and implemented by Order Ministry of Education and Science of Ukraine dated August 10, 2020 № 1022.

Developed by a project team consisting of:

1. Ivanytsky Valentyn, Doctor of Physics and Mathematics Sciences, Professor of the Department of Computer Systems and Networks (guarantor of the educational and professional program).
2. Meshko Roman, senior lecturer of the Department of Instrument Making.
3. Ryaboshchuk Mykhaylo, Ph. Doctor, Associate Professor of the Department of Instrument Making.
4. Chychura Ihor, Ph. Doctor, Associate Professor of the Department of Instrument Making.

1 Profile of the educational program «Automation and computer-integrated technologies» in the specialty №174 Automation, computer-integrated technologies and robotic devices

1 - General information	
Full name of the higher educational institution and structural subdivision	State higher educational institution Uzhhorod National University. Faculty of Engineering
Degree of higher education and title of qualification in the original language	Degree of higher education: second (master's). Educational qualification: Master of Automation, Computer Integrated Technologies and Robotic Devices.
The official name of the educational program	Automation and computer-integrated technologies
Type of diploma and scope of educational program	Master's degree, single, 90 ECTS credits, term of study 1 year and 4 months.
Existence of accreditation	Certificate of accreditation series ND №0791820, issued by the Ministry of Education and Science of Ukraine on December 19, 2016, Valid until July 1, 2023. The educational program was introduced in 2023.
Cycle / level	National Qualifications Framework of Ukraine - level 7, FQ-EHEA - the second cycle, EQF-LLL - level 7.
Prerequisites	Training under the program is conducted on the basis of the first (bachelor's) level of higher education. Enrollment is carried out in accordance with the conditions of admission, which are determined by the "Rules of admission to Uzhgorod National University." There are no special requirements for professional selection of entrants.
Language (s) of teaching	Ukrainian/English
Validity of the educational program	Until the next review in accordance with the validity of the accreditation certificate
Internet address of the permanent placement of the description of the educational program	http://www.uzhnu.edu.ua/uk/infocentre/15068
2 - The purpose of the educational program	
The purpose of the program is to train professionals capable to comprehensive solutions ofcomplex problems of creation, improvement, modernization, operation and maintenance of technical automation systems, robotic devices and their components, which are behind the tasks of Industry 4.0 and contribute to rapid adaptation to the world of digital technologies and services of various enterprises and companies.	
3 - Characteristics of the educational program	
Subject area of the program	Field of knowledge 17"Electronics, automation and electronic communications" Specialty 174 "Automation, computer-integrated technologies and robotic devices"
Orientation of the educational program	Educational-professional program for the master with professional orientation. Focuses on the acquisition by students of professional

	knowledge, skills, abilities and other competencies for the successful implementation of professional practical and scientific activities in the field of automation and computer-integrated technologies of technical and robotic systems.
The main focus of the educational program and specialization	Higher special education of the second level in the field of automation, computer-integrated technologies and robotic devices of modern instrument making and technology. Keywords. Automation. Automated processes. Automated devices. Robotic devices. Automated technologies. Automated systems. Computer-integrated technologies. Robotic devices. Mechatronic devices. Control devices. Designing.
Features of the program	The program is implemented in Ukrainian and English. The program provides the mandatory internships at enterprises in the region that operate modern automation systems and robotic devices or use computer-integrated technologies.
4 - Suitability of graduates for employment and further study	
Suitability for employment	Graduates of the educational program are suitable for engineering, design production, research and teaching work at enterprises whichactivities are related to the automation of production management systems, the introduction of computer-integrated technologies, mechanization and automation of production and technological processes, adjustment and repair technical and electronic-computer means of automation and household appliances. According to the national classifier of Ukraine "Classification of economic activities DK 009.2010" the graduate can be employed at enterprises and organizations with the following type of activity: Manufacture of computers, electronic parts. Manufacture of electrical equipment. Manufacture of machinery and equipment. Manufacture of motor vehicles and trailers. Manufacture of other transport equipment. Repair and installation of machinery and equipment. On land and pipeline transport. Warehousing and support activities. Telecommunications. Technical tests and research. Research and experimental development in natural sciences and engineering. Comprehensive maintenance of facilities. Professional and technical education. Higher Education. Repair of computers, household goods and personal items. The graduate specialist is able to perform professional work according to the following items of the National Classifier of Ukraine "Classifier of professions 003: 2010": Chief specialist in automated control systems, chief specialist in installation and commissioning of automation systems, chief specialist in low-current systems, control and measuring devices and automation. Head of the department of mechanization and automation of production processes. Research engineer in computer systems and automation, engineer in automated production management systems.

	Computer application engineer. Electronics engineer of non-traditional and renewable energy production systems. Engineer for mechanization and automation of production processes. Junior researcher, research consultant (branch of engineering). Systems management and maintenance engineer. The programmer in appliedprograms. Assistant. Teacher of professional and technicaleducational institution. State expert. Technical inspector. Head of the technical amateur children's team (workshop, studio, etc.).
Further education	Continuation of education at the third educational and scientific level of higher education. Have the right to acquire additional qualifications of the second (master's) level of higher education in the system of adult education.
5 - Teaching and assessment	
Teaching and learning	Credit-transfer system of learning orientation. Student-centered learning, self-study, problem-oriented learning, individual-creative approach, design and technological training in laboratory workshops, training through production and research practice, e-learning and distance learning.
Assessment	Accumulative point-rating system, which provides for the assessment of students in all types of classroom and extracurricular educational activities and is aimed at mastering the workload of the educational program. This system includes: - current, phased, modular, final controls and evaluations; - exams; tests, differentiated tests on practices, term papers and projects; - qualification work with defense in the examination commission. Intermediate and final assessment of knowledge is based on a student-centered personal approach using modern methods and practices. Assessment of knowledge of higher education seekers is based on: - Regulations on the organization of the educational process in the State Higher Educational Institution "Uzhgorod National University" https://www.uzhnu.edu.ua/uk/infocentre/get/31357; - Regulations on the procedure and methods of conducting semester (course) exams and tests at Uzhgorod National University https://www.uzhnu.edu.ua/uk/infocentre/get/5952; - Regulations on the attestation of applicants for higher education and the examination commission at the State Higher Educational Institution "Uzhhorod National University" https://www.uzhnu.edu.ua/uk/infocentre/get/11070. Observance of the norms of academic integrity is carried out in accordance with the Regulations on Academic Integrity at Uzhhorod National University https://www.uzhnu.edu.ua/uk/infocentre/get/12223. Re-crediting of loans is based on the Regulation on recognition (re-crediting) of ECTS credits for participants of academic mobility programs at the State Higher Educational Institution "Uzhgorod National University" https://www.uzhnu.edu.ua/uk/infocentre/get/20131. The procedure for evaluating applicants for higher education also takes into account the results of non-formal education in accordance

	with the Regulations on the procedure for recognition in Uzhhorod National University of higher education results obtained in non-formal education https://www.uzhnu.edu.ua/uk/infocentre/get/22966. There is a clear procedure for reviewing appeals of applicants for higher education, which is described in the Regulations on the application of measures to resolve conflicts and disputes (disputes) in the activities of employees and applicants for higher education at the State Higher Educational Institution "Uzhgorod National University" https://www.uzhnu.edu.ua/uk/infocentre/get/22964and Regulations on the procedure for appealing the results (appeal) of assessment at the State Higher Educational Institution "Uzhhorod National University"https://www.uzhnu.edu.ua/uk/infocentre/get/22967.
6 - Program Competencies (PC)	
Integral competence	The ability to solve complex problems and problemsautomation, computer-integrated technologies and robotic devices inprofessional activities and in the learning process, whichinvolve innovation and research using modern programming methods and intelligent technologies.
General Competences (GC):	GC1. Ability to conduct research and professional activities with extensive use of modern software, computer and intelligent technologies. GC2. Ability to generate new technical ideas in the field of professional activity. GC3. Ability to abstract thinking, analysis and synthesis GC4. Ability to work in an international context.
Special (professional) competencies (SC)	SC1. Ability to automate complex technical and technological facilities and complexes and create modern cyber-physical systems based on intelligent control methods and digital technologies using robotic and intelligent mechatronic devices. SC2. Ability to design and implement highly reliable technical automation systems and robotic complexes and their application software. SC3. Ability to protect intellectual property rights to new design and engineering solutions and to the correct use of scientific and technical information, taking into account copyright. Ability to conduct patent research. SC4. Ability to apply modeling methods andoptimization todevelop, research and increase efficiencysystems and processes for managing complex technical and technological objects. SC5. The ability to analyze technical, robotic and technological systems to determine their automation strategy based on modern controllers of various levels of integration. SC6. Ability to analyze information from different sources and to integrate acquired knowledge from other fields, apply a systems approach and take into account non-technical aspects in solving engineering problems. SC7. Ability to use specialized software and digital technologies to solve complex problems and tasks of automation, computer-integrated technologies and robotic technique installation. SC8. Ability to develop functional, technical andinformation structure of computer-integrated systemscontrol using network and information technologies, industrial controllers, robotic devices and human-machine

	interface means. SC9. Ability to manage projects, marketing, organization of design and production units involved in the automation of technological processes and production using computer-integrated technologies and robotic complexes.
7 - Program learning outcomes (PLO)	
PLO1. Create highly reliable technical automation systems with a high levelfunctional and information security of all components based on the use of basic knowledge of physics and mathematics, intelligent, digital and network technologies, databases and knowledge bases and robotic and mechatronic devices. PLO2. Collect the necessary information from various modern sources, analyze and evaluate it. PLO3. Apply specialized conceptual knowledge and modern scientific achievements and critically comprehend modern problems in the field of automation, computer-integrated technologies and robotic complexes to solve various technical problems of professional activity. PLO4. Develop computer-integrated systems for managing complex technological and organizational-technical facilities, taking into account the non-technical components of the assessment of automation facilities, safety standards and environmental protection. PLO5. Communicate freely in state, Ukrainian and foreign languages orally and in writing to discuss professional problems and results in the field of automation and computer-integrated technologies, presentation of research results and projects. PLO6. Analyze production and technical systems and technological processes of instrument making as objects of automation and determine the strategy of the process of their automation and digital transformation. PLO7.Apply modern mathematical methods, methods of automatic control theory, modeling and optimization for research and creation of effective automation systems for technological and technical objects, cyberphysical industries. PLO8. Develop functional, technical and information structures of automation systems with complex technological and technical objects and develop software and hardware control systems using network and information technologies, industrial controllers, robotic devices, human-machine interface, taking into account technological conditions and requirements of specific production. PLO9. Develop and use specialized software and digital technologies to create automation systems for complex technical and technological objects. PLO10. Follow the norms of academic integrity, know the basic legal norms for the protection of intellectual property, commercialization of research, inventive and design activities. PLO11. Apply modern technologies of scientific research, to be able to reveal the scientific essence of problems in the professional sphere, to find ways to solve them. Plan and perform scientific and applied research in the field of automation and computer-integrated technologies. PLO12. Develop programs and teach specialized disciplines in institutionshigher education.	
8 - Resource support for program implementation	
Staffing	The professional qualities of the guarantor and members of the educational program support team and other teachers involved in the implementation of the program must comply with the Licensing Conditions for conducting educational activities at the second (master's) level of higher education..

Logistics	The implementation of the educational program is provided by specialized laboratories: - microprocessorsystems, microcontrollers and industrial controllers; - automated design of technical automation systems; - electronics of the automated technological processes; - robotic devices; - automation of energy systems. Each specialized laboratory is equipped with a computer server center, a multimedia system and a Wi-Fi network with students' personal computer terminals. Computer systems of laboratories are equipped with modern software: - modeling and optimization of control systems of Proteus; - automated design of AutoCad; - theoretical study of automation systems MatLab. Two classrooms are equipped with all the equipment necessary for distance learning. Two scientific laboratories have been set up for production and research practice: - development and research of automation systems of modern resource-saving energy; - design of modern automated fiber optic systems. All the necessary social and household infrastructure is available.
Information and educational support	- the official website of the university http://www.uzhnu.edu.ua contains information about educational programs, educational, scientific and educational activities, structural units, rules of admission, contacts; - in all classrooms and laboratories there is a quality unlimited access to the Internet; - the university library has a huge fund of educational and scientific literature on the profile of the specialty on both paper and electronic media, in most departments of the library there are reading rooms with computer workstations; - its own book fund of the specialty is available, which has several hundred titles and is open for free use by students; - high-quality access of all students and teachers of the specialty to the virtual learning environment Moodle is organized; - on the website of the university for the general public are displayed curricula and work plans, internship programs, work programs of disciplines, schedules of the educational process and other information on the organization and provision of the educational process; - the database of the specialty contains educational and methodical complexes of disciplines, didactic materials for independent and individual work of students in disciplines, methodical instructions on performance of course works (projects) and qualifying diploma works (projects).
9 - Academic mobility	
National credit mobility	Academic mobility of students is carried out on the basis of bilateral agreements concluded between Uzhhorod National University and higher education institutions of Ukraine.
International credit mobility	According to the Regulations on academic mobility of students at Uzhhorod National University https://www.uzhnu.edu.ua/uk/infocentre/get/21269,

	the general order of the organization of academic mobility of students is established. Carried out in accordance with the Erasmus + International Academic Mobility Program.
Training of foreign applicants for higher education	Foreign citizens, as well as stateless persons residing in the territory of Ukraine on legal grounds are admitted to Uzhhorod National University. Peculiarities of admission and education are determined by the Regulations on education of foreign citizens at Uzhhorod National University https://www.uzhnu.edu.ua/uk/infocentre/get/9378

2 List of components of the educational-professional program and their logical sequence

2.1 List of components of the educational and professional program

Code of the academic discipline	Components of the educational program (academic disciplines, course projects (works), practices, qualification work)	Number of credits	Form of final control
Mandatory components (MC) of the educational program			
MC1	Intellectual property law	3	Test
MC2.	Computer-integrated systems and their information support	4	Exam
MC3	Program and metrological support of automation systems	3	Exam
MC4	Microprocessor systemsand their programming with the course project	5	Diff. Test, Exam
MC5	Design of objectsand systems of automation	4	Exam
MC6	Robots, cyber-physical and robotic complexes with the course project	5	Diff. Test, Exam
MC7	Management of organizational and technical objects and complexes	3	Test
MC8	Modeling and optimization of automation systems	3	Exam
MC9	Installation and operation of technological robotic complexes	4	Exam
MC10	Ukrainian as a foreign language	3	Test
MC11	Professional English	3	Test
MC12	Production and research practice	9	Diff. Test
MC13	Execution and defense of master's thesis	21	Defense against exam committee
Total amount of required components: 67 credits			
Selective components (SC) of the educational program			
SC1	University selective component	3	Test
SC2	Department selective component	4	Test
SC3	Department selective component	4	Test
SC4	Department selective component	4	Test
SC5	Department selective component	4	Test
SC6	Department selective component	4	Test
Total sample components: 23 credits			
TOTAL AMOUNT OF THE EDUCATIONAL PROGRAM: 90 credits			

2.2. Structural and logical scheme of realization ofprogrameducational components

<table>
<tr><td></td><td></td><td colspan="2">First year</td><td colspan="2">Second year</td></tr>
<tr><td></td><td></td><td>Semester 1</td><td>Semester 2</td><td colspan="2">Semester 3</td></tr>
<tr><td rowspan="4">15 credits</td><td rowspan="5">General training</td><td>MC11. Ukrainian as a foreign language</td><td>MC11. Ukrainian as a foreign language</td><td></td><td rowspan="8">MC13. Execution and defense of master's thesis
21 credits</td></tr>
<tr><td>MC1 Intellectual property law</td><td rowspan="2">MC8. Management of organizational and technical objects and complexes</td><td rowspan="6">MC12. Production and research practice
9 credits</td></tr>
<tr><td>MC2 Information support of automation systems</td></tr>
<tr><td>7 cr.</td><td>One selective component</td><td>One selective component</td></tr>
<tr><td rowspan="5">22 credits</td><td rowspan="6">Professionaltraining</td><td>MC3. Program and metrological support of automation system with the course project</td><td>MC10. Installation and operation of technological robotic complexes</td></tr>
<tr><td>MC5. Computer-integrated and network technologies</td><td>MC7. Robots, cyber-physical and robotic complexes</td></tr>
<tr><td></td><td>MC4. Microprocessor systems and their programming with the course project</td></tr>
<tr><td>MC6. Design of objectsand systems of automation</td><td>MC9. Modeling and optimization of automation systems</td><td></td></tr>
<tr><td>16cr.</td><td>Two selective components</td><td>Two selective components</td><td></td></tr>
<tr><td></td><td></td><td>30 credits</td><td>30 credits</td><td colspan="2">30 credits</td></tr>
</table>

3. Form of certification of applicants for higher education

Form of certification. Certification is carried out in the form of open public defense of a master's thesis.

Upon successful defense, applicants are awarded a master's degree in automation and computer-integrated technology.

Based on the results of training and certification, applicants are issued a diploma of the established standard.

Requirements for qualification work:

- Qualification work should demonstrate the graduate's ability to solve complex problems and problems of automation and computer-integrated technologies based on research and innovation under uncertain conditions and requirements.

- Qualification work should not contain academic plagiarism, fabrications and falsifications. Plagiarism is checked before the defense of the qualification work. The examination commission is provided with a certificate of the established form on the results of the plagiarism test.

- Qualification work must be published in the university website.

4. Matrix of correspondence of program competences (GC and SC) to mandatory components (MC) of the educational program

	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	MC9	MC10	MC11	MC12	MC13
GC1		+	+			+	+	+					+
GC2	+	+			+							+	+
GC3	+				+				+				+
GC4	+						+			+	+	+	
SC1		+		+	+				+		+	+	
SC2		+	+		+				+			+	+
SC3	+				+					+		+	+
SC4				+		+		+				+	+
SC5		+		+		+							
SC6	+						+			+	+		+
SC7		+	+	+			+		+	+			+
SC8		+	+				+						+
SC9			+		+			+					+

5. Matrix for providing program learning outcomes (PLO) to the mandatory components (MC) of the educational program

RC Cod / PLO Cod	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	MC9	MC10	MC11	MC12	MC13
PLO1		+	+	+		+	+		+				+
PLO2	+	+			+					+	+	+	+
PLO3				+			+	+				+	
PLO4	+	+					+		+				
PLO5			+	+		+				+	+	+	
PLO6						+	+		+				+
PLO7		+		+	+			+				+	+
PLO8	+	+	+				+						+
PLO9		+	+	+	+	+	+	+					+
PLO10	+				+		+		+				+
PLO11	+				+	+						+	
PLO12	+	+	+	+									+