

**Profile of the educational program "Systems Engineering"
151 Automation and computer-integrated technologies**

1 – General Information	
Full name of the higher educational institution	Beketov National University of Urban Economy in Kharkiv
Degree of higher education and title of qualification in the original language	Master of Automation and Computer Integrated Technology
The official name of the educational program	Systems engineering
The official name of the educational program	Master's degree, single, 90 ECTS credits, term of study 1 years 4 months
Availability of accreditation	-
Cycle / level	Second (Master's) level, NQF of Ukraine – 7 th level FQ-EHEA – 2 nd level EQF-LLL – 7 th level
Requirements for the level of education of the entrant	Presence of complete general secondary education, educational qualification level of junior specialist or bachelor's degree
Language of instruction	Ukrainian
Term of the educational program	5 years
Internet address of the permanent post of the description of the educational program	http:// www.kname.edu.ua/
2 – Aim of Educational Program	
Training of specialists capable of complex solution of problems of development of new and modernization and operation of existing automation systems and computer-integrated technologies in municipal economy	
3 – Features of the program	
Subject area	<p>The objects of study and activity of masters in automation and computer-integrated technologies are: objects and control processes (technological processes, production, organizational structures), technical, informational, mathematical, software and organizational support of automation systems in various fields.</p> <p><i>Learning objectives:</i> training of engineers and scientists capable of complex solutions to complex problems and problems of creation, improvement, modernization, operation and maintenance of automation systems, their components, cyberphysical systems, digital transformation technologies behind Industry 4.0, contribute to the process of rapid adaptation of products and services of enterprises and</p>

	<p>companies, as well as provide the transition from the physical world to the digital.</p> <p>Theoretical content of the subject area: concepts and principles of automatic control theory, principles of development of automation systems and computer-integrated technologies.</p> <p><i>Methods, techniques and technologies:</i> methods of analysis, synthesis, design, commissioning, modernization, operation and maintenance of automation systems and computer-integrated technologies, cyberphysical industries; methodology of scientific research of control objects and automation systems of complex organizational and technical objects.</p> <p><i>Tools and equipment:</i> digital and network technologies, microprocessors, programmable logic controllers (PLCs), embedded digital devices and systems (Embedded Systems), intelligent mechatronic and WLAN-compatible components of Internet of Things technology (IoT), specialized software for design, development and operation of automation systems.</p>
Orientation of the educational program	Educational and professional program
The main focus of the educational program and specialization	<p>General education in the field of 15 Automation and instrument making in the specialty 151 Automation and computer-integrated technologies.</p> <p><i>Keywords:</i> control and automation systems, design, automatic control in municipal economy, programming of microcontroller systems, computer networks, computer-integrated technologies.</p>
Features of the program	<p>Acquisition of professional competencies in automation and computer-integrated technologies in the field of automation of urban economy.</p> <p>The emphasis of the program is on the formation of a specialist capable of solving complex technical problems in the field of automation and instrumentation, engineering of complex computerized systems of municipal economy.</p>
4 – Suitability of graduates to employment and further training	
Suitability for employment	<p>Professional activity as a specialist in automation and computer-integrated technologies, including automation of production processes.</p> <p>According to the Classifier of Professions DK 003: 2010 Master of Science in 151 Automation and Computer-Integrated Technologies may hold the following positions:</p> <p>2131. Researcher (automation and instrumentation, computing)</p> <p>2131.1- Computer Systems Engineer</p> <p>2131.2 - Computer Software Engineer</p> <p>2131.2 - Engineer of automated control systems production</p>
Suitability for employment	Opportunity to continue education at the third (educational and scientific) level of higher education and receive additional postgraduate education.
5 – Teaching and assessment	
Teaching and assessment	Teaching and learning includes lectures, practical and laboratory classes, self-study, individual consultations with teachers, practice and master's thesis with the use of modern educational pedagogical technologies, problem-oriented learning, student-centered learning.

Evaluation	Teaching and learning includes lectures, practical and laboratory classes, self-study, individual consultations with teachers, practice and master's thesis with the use of modern educational pedagogical technologies, problem-oriented learning, student-centered learning.
6 – Program qualifications	
Integral qualifications	Teaching and learning includes lectures, practical and laboratory classes, self-study, individual consultations with teachers, practice and master's thesis with the use of modern educational pedagogical technologies, problem-oriented learning, student-centered learning.
General qualifications (GQ)	GQ 1. Ability to conduct research at the appropriate level. GQ 2. Ability to generate new ideas (creativity). GQ 3. Ability to abstract thinking, analysis and synthesis. GQ 4. Ability to work in an international context
Special qualifications (SQ) defined by the higher education institution	SQ 1. Ability to automate complex technological objects and complexes, create cyberphysical systems based on intelligent control methods and digital technologies using databases, knowledge bases, artificial intelligence methods, robotic and intelligent mechatronic devices; SQ 2. Ability to design and implement highly reliable automation systems and their application software to implement management and information processing functions, to protect intellectual property rights to new design and engineering solutions SQ 3. Ability to apply modeling and optimization methods to study and improve the efficiency of systems and processes for managing complex technological and organizational and technical facilities. SQ 4. Ability to analyze production and technological systems and complexes as objects of automation, to determine methods and strategies of their automation and digital transformation. SQ 5. Ability to integrate knowledge from other fields, apply a systematic approach and take into account non-technical aspects in solving engineering problems and conducting research. SQ 6. Ability to apply modern methods of automatic control theory for the development of automated control systems for technological processes and objects. SQ 7. Ability to use specialized software and digital technologies to solve complex problems and problems of automation and computer-integrated technologies. SQ 8. Ability to develop functional, technical and information structure of computer-integrated management systems of organizational and technological complexes using network and information technologies, software and hardware control systems, industrial controllers, mechatronic components, robotic devices and human-machine interface.
Special qualifications (SQ) defined by the higher education institution	SQ 9. Ability to apply methods of modeling project management projects and creating effective management systems for organizational and technical facilities of the city. SQ 10. Ability to create control microprocessor systems. SQ 11. Have special knowledge of programming technology of microcontroller and multiprocessor systems. SQ 12. Know the theoretical foundations of creation and implementation of automated process control systems, their composition.

	<p>SQ 13. Have special knowledge on the design of neural networks in industrial automation, the use of H-regulators.</p> <p>SQ 14. Have special knowledge on the design and implementation of intelligent automation systems and their application software.</p> <p>SQ 15. Ability to build and apply mathematical models in the study of objects and systems of urban management.</p> <p>SQ 16. Ability to apply modern approaches and methods to the design and development of automation systems of different levels and purposes.</p>
7 – Program learning outcomes	
Professional qualifications (PQ)	<p>PQ 1. Create automation systems, cyberphysical production based on the use of intelligent control methods, databases and knowledge bases, digital and network technologies, robotic and intelligent mechatronic devices.</p> <p>PQ 2. Create highly reliable automation systems with a high level of functional and information security of software and hardware.</p> <p>PQ 3. Apply specialized conceptual knowledge, including modern scientific achievements, as well as critical thinking of modern problems in the field of automation and computer-integrated technologies to solve complex problems of professional activity.</p> <p>PQ 4. Apply modern approaches and methods of modeling and optimization for research and creation of effective automation systems with complex technological and organizational-technical objects.</p> <p>PQ 5. To develop computer-integrated control systems for complex technological and organizational-technical objects, applying a systematic approach taking into account non-technical components of evaluation of automation objects.</p> <p>PQ 6. Fluent in state 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 innovation projects.</p> <p>PQ 7. Analyze production and technical systems in a particular field of activity as objects of automation and determine the strategy of their automation and digital transformation.</p> <p>PQ 8. Apply modern mathematical methods, methods of automatic control theory, reliability theory and systems analysis for research and creation of automation systems with complex technological and organizational-technical objects, cyberphysical industries.</p> <p>PQ 9. To develop functional, organizational, technical and information structures of automation systems with complex technological and organizational-technical objects, to develop software-technical control complexes with application of network and information technologies, industrial controllers, mechatronic components, robotic devices, human-machine means interface and taking into account technological conditions and requirements for production management.</p> <p>PQ 10. Develop and use specialized software and digital technologies to create automation systems for complex organizational and technical facilities, professionally own special software.</p> <p>PQ 11. Adhere to the norms of academic integrity, know the basic legal norms for the protection of intellectual property, commercialization of research, invention and design activities.</p>

	PQ 12. Collect the necessary information using scientific and technical literature, databases and other sources, analyze and evaluate it.
Professional competencies (PQ) defined by the educational institution	<p>PQ 13. Design modern automated municipal management systems based on mathematical methods and computer technology using databases, knowledge bases and situational management.</p> <p>PQ 14. To use modern technologies of creation of software microcontroller systems for the decision of complex problems of automation of difficult technological objects of municipal economy.</p> <p>PQ 15. Know the theoretical and practical foundations of the processes of creation and implementation of ACS TP, be able to develop applications for ACS TP.</p> <p>PQ 16. To develop control microprocessor systems for the city economy on the basis of computer-integrated technologies.</p> <p>PQ 17. Use methods of intellectual information processing.</p> <p>PQ 18. Model fuzzy regulators in automatic control systems of municipal economy</p>
8 – Resource support for program implementation	
Staffing	The implementation of the program is provided by highly qualified personnel with scientific degrees and academic titles who have extensive experience in teaching and research work.
Material and Technical Support	The implementation of the program is provided by highly qualified personnel with scientific degrees and academic titles who have extensive experience in teaching and research work.
Information and educational and methodological support	<p>Educational components of the educational program "Systems Engineering" are provided with teaching materials: textbooks; lecture notes; Guidelines; individual tasks; illustrative materials, etc.</p> <p>All teaching materials are available for students in the reading rooms of the Scientific Library http://library.kname.edu.ua/index.php/uk/, including in the information service room equipped with computers with Internet access and local network of the University, in the digital repository http://eprints.kname.edu.ua, on the portal of the Distance Learning Center http://dl.kname.edu.ua/</p>
9 – Academic mobility	
National credit mobility	According to the Regulations on academic mobility of students, graduate students, doctoral students, scientific, pedagogical and research staff Beketov National University of Urban Economy in Kharkiv
International credit mobility	<p>Agreement on cooperation between Beketov National University of Urban Economy and:</p> <ul style="list-style-type: none"> - Łódź (Technical University (Poland), agreement № 89 of October 2017. - University of Nova Gorica (Slovenia), agreement № 88 dated 12.10.2017 - Middle East Technical University (Turkey, Ankara), agreement № 69 of 28.03. 2016 - Aristotle University (Greece, Thessaloniki), agreement № 75 dated February 22, 2018.

	- Estonian University of Natural Sciences (Tartu), agreement № 90 of 10.10. 2017
Training of foreign applicants for higher education	According to the Rules of admission to study at Beketov National University of Urban Economy in Kharkiv