

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

<b>1 – General Information</b>	
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	Bachelor of Automation and Computer Integrated Technology
The official name of the educational program	Systems engineering
Type of diploma and scope of educational program	Bachelor's degree, single, 240 ECTS credits, term of study 3 years 10 months
Availability of accreditation	Certificate of accreditation UD series №21010616 valid until July 1, 2024 (specialty) -
Cycle / level	First (bachelor's) level, NRC of Ukraine - 6 level, FQ-EHEA - the first cycle, EQF-LLL - level 6
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	<a href="https://acit.kname.edu.ua/">https://acit.kname.edu.ua/</a>
<b>2 Aim of Educational Program</b>	
<p>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 and / or digital production with the use of modern software and hardware and information technologies, performing theoretical research automation project, substantiation of the choice of technical means of automation, design of automation systems and development of application software for various purposes. The program is designed in accordance with the mission and strategy of the university, which is to train highly qualified personnel for regional development and urban economy</p>	
<b>3 Features of the program</b>	
Subject area	Object of study: technical, software, mathematical, informational and organizational support of automation systems of objects and processes in various fields of activity with the use of modern microprocessor and computer technology, specialized application software and information technology.

	<p>Theoretical content of the subject area: concepts and principles of systems analysis, theory of automatic control, automation systems and computer-integrated technologies.</p> <p>Methods, techniques and technologies. The applicant must master the methods and software tools for modeling, design, automated management of complex organizational and technical objects, information technology; knowledge of technical means of automation, ability to develop application software for various purposes for automation systems.</p> <p>Tools and equipment: modern software and hardware and computer-integrated technologies for the design, modeling, research 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 higher education of the first (bachelor's) level in the field of automation and instrument making in the specialty 151 Automation and computer-integrated technologies. The emphasis of the program is on the formation of a specialist capable of solving problems of developing new, improving and operating existing automation systems in urban management and / or digital production using modern software and hardware, automation hardware and computer-integrated technologies Industry 4.0.</p> <p>Keywords: automation systems, computer-integrated technologies, robotic systems, Internet of Things, digital production</p>
Features of the program	<p>The educational program is aimed at training specialists in automation and computer-integrated technologies for regional and municipal economy. A feature of the OP is in-depth practical training using specialized software for automation systems design, microprocessor programming, programmable logic controllers, industrial robots and CNC equipment, computer-integrated CAD / CAM / CAE systems, including on the material base of industrial partners including the possibility of implementing dual education programs. At realization of OP it is provided:</p> <ul style="list-style-type: none"> <li>- use in the educational process of the laboratory of automation of systems and objects of municipal economy (ETC);</li> <li>- Acquisition of skills in the development of modern software based on the IT Academy of SNI;</li> <li>- use of the Internet of Things laboratory in the educational process;</li> <li>- use in the educational process of the laboratory of modeling of cyberphysical systems on the basis of the computer cluster equipped with the ANSYS software complex;</li> <li>- use of digital production laboratory in the educational process;</li> <li>- mastering by applicants of modern 3D-printing technologies on the basis</li> </ul> <p>Workshop "Engineering and Computer Graphics".</p>
<b>4 Suitability of graduates to employment and further training</b>	
Suitability for employment	<p>Graduates can work in professions in accordance with the current version of the National Classification of Occupations of Ukraine DK 003: 2010:</p> <p>3114 - a specialist in configured computer systems</p> <p>3115 - specialist in automation of production processes</p>

	3121 - specialist in information technology 3121 - software development and testing specialist 3121 - specialist in computer program development 3123 - robot controller
Further training	Opportunity to study according to the program of the second (master's) level of higher education. Acquisition of additional qualifications in the system of postgraduate education.
<b>5 Teaching and assessment</b>	
Teaching and learning	Student-centered learning, problem-oriented learning, lectures, practical classes, laboratory work, independent work, consultations, preparation of qualifying work. Teaching methods: problem-solving, illustrations and demonstrations, part-search, research, practical
Evaluation	Current control: oral and written interviews, tests, presentations of individual tasks. Final control: written exams and diff. tests, defense of term papers and practice reports. Certification: public defense of qualification work.
<b>6 Program competencies</b>	
Integral competence	Ability to solve complex specialized problems and practical problems, characterized by complexity and uncertainty of conditions, during professional activities in the field of automation or in the learning process, which involves the application of theories and methods of the industry.
General qualifications (GQ), defined by the standard of higher education in the specialty	GQ 1. Ability to apply knowledge in practical situations .. GQ 2. Ability to communicate in the state language both orally and in writing. GQ 3. Ability to communicate in a foreign language GQ 4. Skills in the use of information and communication technologies. GQ 5. Ability to search, process and analyze information from various sources. GQ 6. Skills for safe activities. GQ 7. The desire to preserve the environment. GQ 8. Ability to work in a team. GQ 9. 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; GQ 10. Ability to preserve and increase moral, cultural, scientific values and achievements of society based on understanding 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, technology and technology, use different types and forms physical activity for active recreation and healthy living.
Special qualifications (SQ), defined by the standard of higher education	SQ 1. Ability to apply knowledge of mathematics, to the extent necessary to master the mathematical apparatus and use mathematical methods for analysis and synthesis of automation systems. SQ 2. Ability to apply knowledge of physics, electrical engineering, electronics and microprocessor technology to the extent necessary to understand the processes in automation systems and computer-integrated technologies.

	<p>SQ 3. Ability to perform analysis of automation objects based on knowledge of the processes occurring in them; be able to apply the methods of automatic control theory for research, analysis and synthesis of automatic control systems.</p> <p>SQ 4. Ability to apply methods of systems analysis, mathematical modeling, identification and numerical methods to develop mathematical models of individual elements and automation systems in general, to analyze the quality of their operation using the latest computer technology.</p> <p>SQ 5. Ability to justify the choice of technical means of automation on the basis of understanding the principles of their work, analysis of their properties, purpose and technical characteristics, taking into account the requirements for the automation system and operating conditions; to possess skills of adjustment of technical means of automation and control systems.</p> <p>SQ 6 Ability to use the latest technologies in the field of automation and computer-integrated technologies to solve professional problems, in particular, design of multilevel control systems, data collection and archiving to form a database of process parameters and their visualization using human-machine interface.</p> <p>SQ 7. Ability to justify the choice of technical structure and be able to develop application software for microprocessor control systems based on local automation, industrial logic controllers and programmable logic arrays and signal processors.</p> <p>SQ 8. Ability to design automation systems taking into account the requirements of relevant regulations and international standards.</p> <p>SQ 9. Ability to freely use modern computer and information technology to solve professional problems, program and use application and special computer-integrated environments to solve automation problems.</p> <p>SQ 10. Ability to take into account social, environmental, ethical, economic aspects, requirements of labor protection, industrial sanitation and fire safety in the formation of technical solutions.</p> <p>SQ 11. Taking into account the commercial and economic context in the design of automation systems</p>
<b>7 Program learning outcomes</b>	
<p>Program learning outcomes (PLO), defined by the standard of higher education in the specialty</p>	<p>PLO 01 Know linear and vector algebra, differential and integral calculus, functions of many variables, functional series, differential equations for functions of one and many variables, operational calculus, theory of functions of complex variables, probability theory and mathematical statistics, theory of random processes. for the use of mathematical apparatus and methods in the field of automation.</p> <p>PLO 02 Know physics, electrical engineering, electronics and circuitry, microprocessor technology at the level required to solve typical problems and problems of automation</p> <p>PLO 03 Be able to apply modern information technologies and have the skills to develop algorithms and computer programs for the use of high-level languages and object-oriented programming technologies, create databases and use Internet resources</p> <p>PLO 04 Understand the essence of the processes occurring in the objects of automation (by industry) and be able to analyze the objects of automation and justify the choice of structure, algorithms and control schemes based on the results of their properties</p> <p>PLO 05 Be able to apply the methods of automatic control theory for research, analysis and synthesis of automatic control systems</p> <p>PLO 06 Be able to apply methods of systems analysis, modeling, identification and numerical methods for the development of</p>

	<p>mathematical and simulation models of individual elements and automation systems in general, to analyze the quality of their operation using the latest computer technology.</p> <p>PLO 07 Be able to apply knowledge of the basic principles and methods of measuring physical quantities and basic technological parameters to justify the choice of measuring instruments and assess their metrological characteristics</p> <p>PLO 08 Know the principles of technical means of automation and be able to justify the choice of technical means of automation based on the analysis of their properties, purpose and technical characteristics, taking into account the requirements of the automation system and operating conditions; have skills in setting up technical means of automation and control systems;</p> <p>PLO 09 Be able to design multi-level control and data acquisition systems for the formation of a database of process parameters and their visualization using human-machine interface, using the latest computer-integrated technologies</p> <p>PLO 10 Be able to justify the choice of technical structure and develop application software for microprocessor control systems based on local automation, industrial logic controllers and programmable logic arrays and signal processors</p> <p>PLO 11 Be able to perform work on the design of automation systems, know the content and rules of design materials, the composition of project documentation and the sequence of design work, taking into account the requirements of relevant regulations and international standards</p> <p>PLO12 Be able to use a variety of specialized software to solve typical engineering problems in the field of automation, in particular, mathematical modeling, computer-aided design, database management, computer graphics methods</p> <p>PLO 13 Be able to take into account social, environmental, ethical, economic aspects, requirements of labor protection, industrial sanitation and fire safety in the formation of technical solutions. Be able to use different types and forms of physical activity for active recreation and healthy living.</p> <p>PLO 14 Be able to use in production and social activities fundamental concepts and categories of state formation to substantiate their own worldviews and political beliefs, taking into account the processes of socio-political history of Ukraine, legal principles and ethical norms</p>
<b>8 Resource support for program implementation</b>	
Staffing	All scientific and pedagogical workers have qualifications according to educational components, experience of practical and scientific and pedagogical activities, regularly improve their skills through participation in scientific projects, conferences, internships at industrial enterprises, universities and research institutions of Ukraine and foreign countries.
Material and Technical Support	<p>The material and technical support of the educational program meets the requirements and provides an opportunity for effective training of applicants.</p> <p>Lectures on program disciplines are held in classrooms with multimedia equipment. Practical classes are held in specialized computer classes with the use of information and communication equipment and the use of information systems and software products. Specialized laboratories for automation of municipal systems and</p>

	facilities are used for laboratory classes; the Internet of Things; modeling of cyberphysical systems based on a computing cluster equipped with ANSYS software; digital production
Information and educational and methodological support	All educational components are provided with teaching materials posted in the relevant courses on the Moodle distance learning platform. Applicants have free access to modern professional literature and periodicals; Scopus and Web of Science databases; Springer resources; ScienceDirect databases from Elsevier; on the ScienceDirect platform. Educational and methodical materials are available for students in the reading rooms of the scientific library <a href="http://library.kname.edu.ua/index.php/uk/">http://library.kname.edu.ua/index.php/uk/</a> , including in the hall of the information service, equipped with computers with Internet access and local network of the University, in the digital repository <a href="http://eprints.kname.edu.ua">http://eprints.kname.edu.ua</a> , on the portal of the Center for Distance Learning <a href="https://dl.kname.edu.ua/">https://dl.kname.edu.ua/</a>
<b>9 Academic mobility</b>	
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
National credit mobility International credit mobility	Agreement on cooperation between Beketov National University of Urban Economy in Kharkiv and: - Łód (Technical University (Poland), - University of Nova Gorica (Slovenia), - Middle Eastern Technical University (Turkey, Ankara), - Aristotle University (Greece, Thessaloniki), - Estonian University of Natural Sciences (Tartu),
Training of foreign applicants for higher education	According to the Rules of admission to study at Beketov National University of Urban Economy in Kharkiv