

**Profile of the educational program in the specialty
153 "Micro- and nanosystem technology"**

1 - General information	
Full name of the higher educational institution and structural subdivision	Ternopil Ivan Puluj National Technical University Department of Instruments and Control-measurement Systems
Degree of higher education and title of qualification in the original language	Bachelor of Micro and Nanosystems techniques
The official name of the educational program	Micro- and nanosystem technique
Type of diploma and scope of educational program	Bachelor's degree, single; 240 ECTS credits, term of study - 3 years 10 months, for bachelors with a standard term of study; 120 ECTS credits, term of study - 1 year 10 months, for bachelors with reduced term of study; At least 50% of the educational program is allocated to provide general and special (professional) competencies in this specialty. The internship must be at least 4 ECTS credits.
Availability of accreditation	Accreditation Commission of Ukraine, certificate of accreditation of ND № 2087405 (date of issue of the certificate 11/23/2017) Validity: until 01.07 2024
Cycle / level	NRC of Ukraine - level 6, FQ-EHEA - first cycle, EQF-LLL - level 6
Prerequisites	Availability: - complete general secondary education - for bachelors with a standard term of study, - degree of junior specialist (junior bachelor) - for bachelors with reduced term of study
Language (s) of instruction	Ukrainian
Term of the educational program	Till 01.07 2024
Internet address of the permanent post of the description of the educational program	http://tntu.edu.ua/?p=uk/structure/faculties
2 - The purpose of the educational program	
Acquisition of competencies sufficient for professional activities in the field of materials and technologies, solving specialized complex practical and technological problems of development, design, production, installation, operation, maintenance, repair and modernization of electronic devices for physical and biomedical purposes, micro- and nanosystemic engineering and solar energy, characterized by complexity and uncertainty of conditions.	
3 - Characteristics of the educational program	
Subject area	Field of knowledge 15 "Automation and instrument making" Specialty 153 "Micro- and nanosystem technology" Educational program " Micro- and nanosystem technology " Object: - physical processes and phenomena on which the functioning of micro- and nanosystems is based; - properties of materials of micro- and nanoelectronics, technological processes, the principle of operation of electronic components, typical schemes of functional devices;

	<p>- materials and technologies for the manufacture of microelectronic devices and nanosystem technology of various, including physical, solar and biomedical purposes;</p> <p>- computer technology and specialized software for calculations of parameters, characteristics and modeling of micro- and nanosystem technology products.</p> <p>Objectives of education : training of specialists who can comprehensively solve problems in creating devices, electronic sensors, embedded electronic circuit, especially with the use of micro- and nanosystem technology (circuit in reconfigured crystals (FPGA, FPGA)), microcontrollers, SoC (system on crystals), MEMS (mechanical-electrical-measuring systems in crystals), as well as the development of algorithms and software for data management and processing and construction of micro- and nanosystem devices. <i>Theoretical content of the subject area.</i> Concepts and principles of metrological and information-measuring systems. <i>Methods, techniques and technologies.</i> Methods of design management using the latest classical microsystems and tasks of modern software in determining the synthesis and analysis of nanosystem devices.</p> <p><i>Tools and equipment:</i> modern tools for creating micro- and nanosystem measuring instruments, tools and equipment for fabrication and adjustment.</p>
Orientation of the educational program	Educational and professional for bachelor's degree training
The main focus of the educational program and specialization	Emphasis is placed on the formation and development of professional competencies in the field of instrumentation, related to micro- and nanosystem systems; study of theoretical and methodological provisions, organizational and practical tools.
Features of programs	<p>The program consists in deepening theoretical, special practical and research education, summarizing the results of research, design decisions and is performed in an active research environment aimed at the design, operation and maintenance of instrument systems, equipment equipped with micro- and nanosystem elements. light industry.</p> <p>Is mobile under the program of academic mobility "Double diploma"</p>
4 - Suitability of graduates	
to employment and further training	
Suitability for employment	<p>1222 - Heads of production units in industry,</p> <p>3114 - Technicians in the field of electronics and telecommunications,</p> <p>3119 - Other technical specialists in the field of physical sciences and technology,</p> <p>3133 - Medical equipment operators,</p> <p>3139 - Other operators of optical and electronic equipment,</p> <p>3439 - Other technical specialists in the field of management</p>
Further education	Opportunity to study for programs: 7 levels of the NRC of Ukraine, the second cycle FQ-EHEA, level 7 EQF-LLL
5 - Teaching and assessment	
Teaching and learning	Lectures, seminars, practical classes in small groups, individual work on the basis of textbooks, lecture notes, materials on the organization of individual work, consultations with teachers, implementation of term papers and dissertations, internships. Student-centered learning, self-study, problem-oriented learning

Evaluation	Assessment is carried out on a 100-point scale, the national system (excellent, good, satisfactory, unsatisfactory), ECTS (A, B, C, D, E, F, FX). Written exams, oral presentations, reports on the results of practical tasks, current control of knowledge, defense of term papers and internships, certification of higher education.
6 - Program competencies	
Integral competence	Ability to solve complex specialized problems and practical problems characterized by complex and uncertain conditions during professional activities in the field of micro- and nanosystem technology, or in the learning process involving the use of theories and methods of automation and electronics.
General Competences (GQ)	<p>GQ 1. Ability of knowledge in practical situations.</p> <p>GQ 2. Knowledge and understanding of the subject area and understanding of professional activity.</p> <p>GQ 3. Ability to communicate in the state language both orally and in writing.</p> <p>GQ 4. Ability to communicate in foreign languages.</p> <p>GQ 5. Skills in the use of information and communication technologies.</p> <p>GQ 6. Ability to learn and master modern knowledge.</p> <p>GQ 7. Ability to search, process and analyze information from various sources.</p> <p>GQ 8. Interpersonal skills.</p> <p>GQ 9. Ability to work in a team.</p> <p>GQ 10. Skills for safe activities.</p> <p>GQ 11. Ability to evaluate and ensure the quality of work performed.</p> <p>GQ 12. Significance and legitimacy of the tasks and the adoption of mandatory techniques.</p>
Professional competencies of the specialty (FC)	<p>FC 1. Ability to use knowledge and understanding of scientific facts, concepts, theories, principles and methods for the design and application of micro- and nanosystem technology.</p> <p>FC 2. Ability to perform analysis of the subject area and regulatory documentation required for the design and application of devices and devices of micro- and nanosystem technology.</p> <p>FC 3. Ability to use mathematical principles and methods for the design and application of micro- and nanosystem technology.</p> <p>FC 4. Ability to apply appropriate scientific and engineering methods, modern information technology and computer software, computer networks, databases and Internet resources to solve professional problems in the field of micro- and nanosystem technology.</p> <p>FC 5. Ability to identify, classify, evaluate and describe processes in micro- and nanosystemic technology by constructing and analyzing their physical and mathematical models.</p> <p>FC 6. Ability to apply creative and innovative potential in the synthesis of engineering solutions and in the development of structural elements of solar energy, physical and biomedical devices.</p> <p>FC 7. Ability to solve engineering problems in the field of micro- and nanosystem technology, taking into account all aspects of development, design, production, operation and modernization.</p> <p>FC 8. Ability to determine and evaluate the characteristics and parameters of materials of micro- and nanosystem technology, analog and digital electronic devices, microprocessor systems.</p>
7 - Program learning outcomes	

<p>Regulatory component Selective component</p>	<p>ПІР01. Apply knowledge of the principles of operation of devices and systems of micro- and nanosystem technology in their design and operation.</p> <p>ПІР02. Apply knowledge and understanding of mathematical methods to solve theoretical and applied problems of micro- and nanosystem technology.</p> <p>ПІР03. Apply knowledge and understanding of physics, relevant theories, models and methods to solve practical problems of synthesis of devices of micro- and nanosystem technology.</p> <p>ПІР04. Evaluate the characteristics and parameters of materials of devices of micro- and nanosystem technology, know and understand the basics of solid-state and optical electronics, nanoelectronics, electrical engineering, analog and digital circuitry, microprocessor technology.</p> <p>ПІР05. Use information and communication technologies, applied and specialized software products to solve problems of design and commissioning of solar energy equipment, physical and biomedical electronics devices.</p> <p>ПІР06. Apply the skills of planning and conducting experiments to test hypotheses and study the phenomena of micro- and nanoelectronics, be able to use standard equipment, draw up device diagrams, analyze, model and critically evaluate the results.</p> <p>ПІР07. Investigate the characteristics and parameters of micro- and nanosystem technology, devices of physical and biomedical electronics, taking into account the objectives of the study, the requirements and specifics of the selected technical means.</p> <p>ПІР08. Build and identify mathematical models of technological objects, use them in the development of new micro- and nanosystem technology and the selection of optimal solutions.</p> <p>ПІР09. Design devices of micro- and nanosystem technology in accordance with customer requirements and available resource constraints.</p> <p>ПІР10. To develop technical means for diagnosing the technical condition of micro- and nanosystem technology, devices of physical and biomedical electronics.</p> <p>ПІР11. Organize and conduct scheduled and unscheduled maintenance, adjustment of technological equipment in accordance with current production requirements.</p> <p>ПІР12. Analyze the legal framework for the introduction of micro- and nanosystem technology; evaluate the benefits of engineering development, their environmental friendliness and safety.</p> <p>ПІР13. Fluently communicate orally and in writing in state and foreign languages on professional issues in compliance with the norms of modern Ukrainian business and professional language.</p> <p>ПІР14. Be able to learn new knowledge, advanced technologies and innovations, find new non-standard solutions and means of their implementation.</p> <p>ПІР15. Apply understanding of the theory of stochastic processes, methods of statistical processing and data analysis in solving professional problems.</p>
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