

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

1 - General information	
Full name of the higher educational institution and structural subdivision	Ternopil Ivan Pulyk National University Department of Instruments and Control and Measuring Systems
Degree of higher education and title of qualification in the original language	Master's degree in micro- and nanosystem engineering
The official name of the educational program	Educational and professional program "Micro- and nanosystem technology" of the second level (master's) level of higher education in the field of knowledge 15 "Automation and instrumentation"
Type of diploma and scope of educational and professional program	Master's degree, single, 90 ECTS credits, term of study 1 year 4 months
Availability of accreditation	Accreditation Commission of Ukraine, certificate of accreditation of ND № 2087404 (date of issue of the certificate 02.08.2017) Validity: until 01.07 2024
Cycle / level	NRC of Ukraine - level 8, FQ-EHEA - second cycle, EQF-LLL - level 7
Prerequisites	Having a bachelor's degree
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	
Education of highly qualified specialists with modern creative thinking and advanced competencies, able to solve complex specialized problems and practical problems of micro- and nanosystem technology, characterized by complexity and uncertainty of conditions.	
3 - Characteristics of the educational program	
Subject area	Field of knowledge 15 "Automation and instrumentation" Specialty 153 "Micro- and nanosystem technology"

	<p>Educational program "Micro- and nanosystem technology"</p> <p><i>Objects of study and activity</i> - physical processes and phenomena on which the functioning of micro- and nanosystems is based; technological processes of their production, principles of operation, complex systems and devices of micro- and nanosystem technology.</p> <p><i>Learning objectives</i> - the acquisition of competencies necessary for research and development of the latest and use of existing technologies, materials and devices of micro- and nanosystem technology, their design, manufacture, testing, operation and modernization.</p> <p><i>Theoretical content of the subject area</i> - the fundamental principles of construction and operation of complex micro- and nanosystem technology; methods of modeling objects and processes that take place in them; properties of materials; features of technological processes.</p> <p>Methods, techniques and technologies for measuring and modeling the characteristics of materials, devices, devices and systems; planning experiments and processing their results.</p> <p><i>Tools and equipment</i> - devices and devices of micro- and nanosystem technology, control and measuring equipment, specialized technological equipment and facilities, software for calculating parameters, characteristics, modeling and programming, development and maintenance of design documentation</p>
Orientation of the educational program	The structure of the program involves mastering the acquired knowledge of devices and devices of micro- and nanosystem technology.
The main focus of the educational program and specialization	Emphasis is placed on the formation and development of professional competencies in the field of materials and devices of micro- and nanosystem technology related to automation and instrumentation; study of theoretical and methodological provisions, organizational and practical tools.
Features of the program	The program consists of in-depth theoretical, special practical and research training, summarizing the results of research, design decisions and is performed in an active research environment aimed at design, operation and maintenance metrological systems, equipment equipped with information systems and complexes, which are used in light industry. Regular updating, which allows to take into account the trends of progressive development of metrology and information-

	measuring technology. Is mobile under the program of academic mobility "Double diploma"
4 - Suitability of graduates to employment and further education	
Suitability for employment	<p>Main positions according to DK 003: 2010: 2149- Professionals in other fields of engineering;</p> <p>2149 - Professionals in other fields of engineering:</p> <ul style="list-style-type: none"> - commissioning and testing engineer; - engineer for the organization of operation and repair; - engineer of patent and invention work; - repair engineer; - engineer for the introduction of new equipment and technology; - standardization and quality engineer; - research engineer; - design engineer; - engineer-technologist; - production preparation engineer. <p>2310 - Teachers of universities and higher educational establishments:</p> <ul style="list-style-type: none"> - assistant; - teacher of higher education. <p>2320 - Teachers of secondary schools:</p> <ul style="list-style-type: none"> - teacher of vocational school. <p>2351– Professionals in the field of teaching methods:</p> <ul style="list-style-type: none"> - junior researcher (teaching methods). <p>Key positions by: International Standard Classification of Occupations 2008 (ISCO-08):</p> <ul style="list-style-type: none"> 2141 - Industrial and production engineers, 2144 - Mechanical engineers, 2152 - Electronics engineers, 2512 - Software developers, 3113 - Electrical engineering technicians.
Further education	<p>Obtaining education at the third (educational and scientific) level of higher education.</p> <p>Acquisition of additional qualifications in the system of postgraduate education.</p>
5 – Teaching and assessment	
Teaching and learning	<p>Student-centered learning, self-study, problem-oriented learning, interactive and distance learning, research-based learning, participation in specially designed individual choice courses, participation in specialized seminars, professional discussions, writing scientific texts and preparing publications, Teaching is carried out in the form of: lectures, seminars and practical classes, individual calculation work, course work.</p>

Evaluation	<p>Assessment of student achievement is carried out on a four-point scale - ("excellent", "good", "satisfactory", "unsatisfactory"); 2-level national scale ("credited" / "not credited");</p> <p>100-point; ECTS scale (A, B, C, D, E, F, FX).</p> <p>Assessment methods: oral and written exams, practice, presentations, project work.</p> <p>Types of control:</p> <ul style="list-style-type: none"> - by levels: self-control, control at the level of the teacher, control at the level of the head of the department, control at the level of the dean's office, control at the level of the rectorate, state control; - by term: operational (incoming, current, intermediate, final) and deferred. Modular learning format. <p>State certification in the form of qualification master's thesis.</p>
6 – Program competencies	
Integral competence	<p>Ability to solve complex problems and problems during professional activities in the field of micro- and nanosystem technology or in the learning process, which involves research and / or innovation and is characterized by complexity and uncertainty of conditions and requirements.</p>
General Competences (GQ)	<p>GQ 1. Ability to abstract thinking, analysis and synthesis.</p> <p>GQ 2. Ability to communicate in the state language both orally and in writing.</p> <p>GQ 3. Ability to communicate in a foreign language.</p> <p>GQ 4. Ability to conduct research at the appropriate level.</p> <p>GQ 5. Ability to search, process and analyze information from various sources.</p> <p>GQ 6. Ability to generate new ideas (creativity).</p> <p>GQ 7. Interpersonal skills.</p>
Professional competencies of the specialty (FC)	<p>FC 1. Ability to effectively use complex control and measuring, technological and research equipment in research and production of materials, components, devices and devices of micro- and nanosystem technology for various purposes.</p> <p>FC 2. Ability to perform testing and diagnostics of devices and equipment, as well as processing and analysis of the results.</p> <p>FC 3. Ability to analyze and synthesize micro- and nanoelectronic systems for various purposes.</p> <p>FC 4. Ability to develop, reasonably select and use modern methods of signal processing and analysis in micro- and nanoelectronic devices and systems.</p> <p>FC 5. Ability to argue the choice of methods for solving complex problems and problems of micro- and nanosystem technology, critically evaluate the results and justify decisions.</p>

	<p>FC 6. Ability to use modern systems of search and analysis of scientific and technical information, to conduct patent search and research and to protect intellectual property.</p> <p>FC 7. Ability to develop and implement scientific and / or innovative projects in the field of micro- and nanosystem technology, as well as related interdisciplinary projects.</p>
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7 - Program learning outcomes

<p>Regulatory component Selective component</p>	<p>IIP 01. Formulate and solve complex engineering, production and / or scientific problems during the design, manufacture and research of micro- and nanosystem technology for various purposes and the creation of competitive developments, the implementation of results in business projects.</p> <p>IIP 02. Identify directions, develop and implement projects to modernize the production of micro- and nanosystem technology, taking into account technical, economic, legal, social and environmental aspects.</p> <p>IIP 03. Optimize the design of systems, devices and components of micro- and nanosystem technology, as well as technologies for their manufacture.</p> <p>IIP 04. Apply specialized conceptual knowledge, including modern scientific achievements, as well as critical understanding of modern problems in the field of micro- and nanoelectronics, to solve complex problems of professional activity.</p> <p>IIP 05. Fluent in state and foreign languages orally and in writing to discuss professional issues and results in the field of micro- and nanoelectronics, presentation of research results and innovation projects.</p> <p>IIP 06. Develop products and components of micro- and nanosystem technology, taking into account the requirements for their characteristics, technological and resource constraints; use modern design automation tools.</p> <p>IIP 07. Solve problems of synthesis and analysis of devices and devices of micro- and nanosystem technology.</p> <p>IIP 08. Collect the necessary information using scientific and technical literature, databases and other sources, analyze and evaluate it.</p> <p>IIP 09. Ensure the quality of production; to choose technologies that guarantee obtaining the necessary</p>
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characteristics of solid-state devices; apply modern methods of control of micro- and nanosystem technology.

PIP 10. Ensure professional development of team members taking into account the world experience and staffing requirements in the field of development and operation of micro- and nanoelectronic systems.

PIP 11. Investigate processes in micro- and nanoelectronic systems, devices and components using modern experimental methods and equipment, perform statistical processing and analysis of experimental results.

PIP 12 Build and study physical, mathematical and computer models of objects and processes of micro- and nanoelectronics.

PIP 13. Manage complex work processes in the field of production and / or research of micro- and nanoelectronic systems, objectively evaluate the performance of the team and individual employees, identify measures to improve performance.

PIP 14. Coordinate the work of teams of performers for research, design, development, analysis, calculation, modeling, production and testing of micro- and nanosystem technology.

PIP 15. To provide protection of intellectual property, commercialization of results of research, inventive and project activity.