Profile of the educational program in the specialty 152 "Metrology and information-measuring 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 Metrology and Information and Measurement Engineering
The official name of the educational program	Educational and professional program "Metrology and information-measuring technology" of the first (bachelor's) level of higher education
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 ND № 2087404 (date of issue of the certificate 02.08.2017) 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	
Provide education in the field of metrology and information and measurement technology with wide access to employment. Professional training that allows to perform design and technological work in the field of development, manufacture and operation of information and measuring equipment.	
3 - Characteristics of the educational program	

Subject area	Field of knowledge **15 "Automation and instrumentation"** 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, standard schemes of functional devices; - materials and technologies for the manufacture of electronic devices, micro- and nanosystem technology of various, including physical, solar and biomedical purposes; - computer technology and specialized software for calculations of parameters, characteristics and modeling of micro- and nanosystem technology products. Learning objectives: training of specialists capable of complex solutions to the design of devices, electronic sensors, built-in electronic control circuit, especially with the use of micro- and nanosystem technology (reconfigured chip circuits (FPGA, FPGA)), microcontrollers, SoC (on-chip systems) , MEMS (mechanical-electrical-measuring systems in the crystal), as well as the development of algorithms and software for data management and processing and construction of micro- and nanosystem *Theoretical content of the subject area*. Concepts and principles of metrological and information-measuring systems. *Methods, techniques and technologies*. Methods of designing control systems using classical and modern methods, use modern software in solving problems of synthesis and analysis of micro- and nanosystem devices. *Tools and equipment:* modern tools for creating micro- and nanosystem measuring instruments, tools and equipment for fabrication and adjustment.
Orientation of the educational program	Educational and professional for bachelor's degree training
The main focus of the educational program and specialization	The emphasis of the program is personal and group competencies, emphasis on written and other forms of communication in the native language, knowledge of foreign languages. The program is focused on improving the efficiency of design solutions, their development and improvement in science, technology, industrial enterprises, metrological laboratories and expert departments. The educational program establishes sectoral qualification requirements for socio-economic activities of graduates of higher education in the specialty 152 "Metrology and Information and Measurement Technology" bachelor's degree and state requirements for the properties and qualities of a person who has obtained a certain educational level.
Features of programs	The practice is carried out in specialized metrological laboratories and metrological institutions. Internships abroad and teaching in a foreign language are possible.

	Regular updating, which allows to take into account the trends of progressive development of metrological devices and information and measuring equipment. Is mobile under the program of academic mobility "Double diploma"
4 - Suitability of graduates to employment and further education	
Suitability for employment	Main positions according to DK 003: 2010: 2144.2 - design engineer (electronics) 2145.2 - equipment complete engineer 3115 - equipment maintenance and repair technician, 3119 - technician for the preparation of technical documentation, 3119 - debugging and testing technician, 3121 - technician-programmer. Key positions in the International Standard Classification of Occupations 2008 (ISCO-08): 2141 - Industrial and production engineers, 2144 - Mechanical engineers, 2152 - Electronics engineers, 2512 - Software developers, 3113 - Electrical engineering technicians.
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	Student-centered learning, self-study, problem-oriented learning, learning through laboratory and industrial practice.
Evaluation	Exams, tests, course projects and work, essays, presentations.
6 - Program competencies	
Integral competence	Ability to solve complex problems and practical problems in a particular field of professional activity or in training, which involves research and innovation and is characterized by uncertainty of conditions and requirements.
General Competences (GQ)	GQ 1 Ability to apply knowledge in practical situations. GQ 2 Ability to conduct research at the appropriate level. GQ 3 Ability to adapt and act in a new situation. GQ 4 Ability to work both autonomously and in a team. GQ 5 Ability to motivate people and move towards a common goal. GQ 6 Ability to evaluate and ensure the quality of work. GQ 7 Ability to analyze and synthesize. GQ 8 Ability to communicate in the state language both orally and in writing. GQ 9 Ability to communicate in a foreign language. GQ 10 Skills in the use of information and communication technologies. GQ 11 Ability to search, process and analyze information from various sources. GQ 12 Ability to identify, pose and solve problems. GQ 13 Ability to make informed decisions.

	GQ 14 Basic ideas about the basics of philosophy, psychology, pedagogy, contributing to the development of general culture and socialization personality, inclination to ethical values, knowledge of national history, economics and law, understanding of the causal links of society and the ability to use them in professional and social activities. GQ 15 Basic knowledge of basic sciences, to the extent necessary for the development of general professional disciplines. GQ 16 Ability to be critical and self-critical. GQ 17 Ability to work in an interdisciplinary team. GQ 18 Ability to work in an international context. GQ 19 Ability to act on the basis of ethical considerations (motives). GQ 20 The desire to preserve the environment. GQ 21 Skills for safe activities.
Professional competencies of the specialty (FC)	FC 1 System approach to solving specific problems. FC 2 Ability to identify, formulate and solve specific problems. FC 3 Analysis of requirements and creation of technical conditions for circuit design. FC 4 Basic knowledge of technical systems design (functional principles, modeling methods, methods of mathematical analysis). FC 5 Ability to perform functional tasks of technical systems design (system structure, process modeling). FC 6 Ability to carry out detailed design of system components. FC 7 Ability to perform operational tasks (development of structural, functional and electrical schematics). FC 8 Understanding of existing and new trends and their impact on new (future) markets. Orient in the conditions of frequent changes in professional activity. FC 9 Ability to conduct modeling and analysis of technical systems 7 (for modeling processes in different modes of operation, model and analyze technical systems). FC 10 Ability to create real prototypes and design experiments in a virtual environment using professional software. FC 11 Ability to apply knowledge of measurements to control the operation of the system (construction of the measurement scheme, operational control, control of functional parameters of the system). FC 12 Knowledge of specific programming languages or software. FC 13 Development and implementation of information systems for enterprises. FC 14 Management of the technical system through planning and control using concepts, methods and tools. FC 15 Understanding of management principles and their connection with the enterprise and business knowledge (project management, information technologies). FC 16 Ability to identify and analyze new problems and plan strategies to address them. FC 17 Critical analysis, synthesis and generalization of information, including previous research.

	FC 18 Reception and response to a variety of sources of information (eg, textual, numerical, verbal, graphic). FC 19 Skills in evaluating, interpreting and summarizing information and data (eg writing reports, essays, giving presentations). FC 20 Understanding the organization of metrological support for the production of its operation. FC 21 Make decisions in standard and non-standard situations and be responsible for them. FC 22 Use information and communication technologies in professional activities.
7 - Program learning outcomes	
Regulatory component **Selective component**	ПР01 Know the state language and communicate fluently. ПР02 Know the basics of design and be able to design control and measuring systems. ПР03 Know the basics of economics and organization of production, be able to calculate the preliminary cost of design. ПР04 Know the basics of metrology and metrological support and be able to apply this knowledge to the design of information and measurement systems. ПР05 Know the basics of electronic and quantum instruments, and use them to design instruments and information-measuring systems. ПР06 Know the basics of designing devices and be able to perform accurate calculations. ПР07 Know the basics of creating models of components, assemblies and elements of devices. ПР08 Know the basics of labor protection. ПР09 Know the basics and be able to design information and measurement systems. ПР10 Know the basics of electrical engineering and electronics, be able to use them to calculate the circuits of devices. ПР11 Know the basics of information transmission theory, and be able to develop the structure and algorithms of information transmission systems. ПР12 Know the basics of computer networks and be able to design them. ПР13 Be able to calculate the structural, functional and basic electrical circuits. ПР14 Know the basics of measurement theory, and be able to perform measurements. ПР15 Be able to use mathematical models in the design of instrument systems. ПР16 Know the principles of building mathematical models, be able to model signals and systems. ПР17 Know the basics of digital signal processing, and be able to design signal processing systems. ПР18 Know the mathematical and circuit basics of digital device design. Know the basics of programming and algorithmic languages. ПР19 Be able to design control and measurement and information and measurement systems.

	ПР20 Be able to design structural, functional and electrical schematics. ПР21 Be able to present the results of work in a professional and non-professional environment. ПР22 Know the basics of law and apply it in professional activities. ПР23 Know the basic principles and directions of metrology, instrument making, automation. ПР24 Know the basics of electromagnetic compatibility and be able to use it in the design of devices. ПР25 Know the basics of building information and measurement systems. ПР26 Know the basics of the theory of automated control. ПР27 Be able to use computer-aided design systems in professional activities. ПР28 Systems of control, diagnostics and increase of reliability. ПР29 Know the basic principles of power supply design and be able to design power supplies. ПР30 Know the basics of microprocessor technology and be able to design devices on it. ПР31 Know the basics of optics and be able to design optical devices.