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MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Autonomous

Educational institution of higher education

"NORTH CAUCASUS FEDERAL UNIVERSITY"

APPROVED BY

Acting Director of the Institute

Advanced Engineering

Cand. Tech. Sci., Associate Professor

A.A. Porokhnya

PRODUCTION PROGRAM
TECHNOLOGICAL (DESIGN AND TECHNOLOGICAL)
Technological (design and technological) practice

Field of study	11.03.02 Infocommunication Technologies and Communication Systems
Profile	Intelligent Data Processing in Infocommunication Systems and Networks
Year of start of training	2026
Form of study	Full-time
Implemented in a semester	4

Developed by

Professor at the School of Digital Sciences,

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Dr. Tech. Sci., Professor

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Stavropol, 2026

1. Internship Goals

The goals of technological (design and technological) practice in the field of training 11.03.02. Infocommunication technologies and communication systems are: consolidation of theoretical knowledge and acquisition of the first practical skills in the field of future professional activity.

2. Objectives of the practice

The objectives of the practice are:

- familiarization with the trends in the development of technology in the field of communication systems and networks, guiding media, switching systems and terminal subscriber devices based on the equipment of the university's educational laboratories;
- familiarization with the general technical characteristics and design of basic telecommunications equipment, primarily multiplexer equipment;
- familiarization with job descriptions of engineering categories of employees;
- personal participation in the process of equipment maintenance in the educational laboratories of the university;
- familiarization with measures for labor protection and safety, etc.
- study of trends in the development of science and technology in the field of communication systems and networks, guiding media, switching systems and terminal subscriber devices;
- Study of the characteristics of basic telecommunications equipment, primarily multiplexer equipment;
- development and research of new circuitry solutions in communication networks and switching systems;
- personal participation in the process of testing telecommunication equipment in the educational laboratories of the university;
- conducting experiments according to a given methodology and analyzing the results;
- Taking measurements and observations, describing studies, preparing data for reviews, reports and scientific publications;
- mathematical modeling of information and communication processes and objects based on both standard computer-aided design and research packages, and independently created original programs;
- Preparation of a report on the completed task, participation in the implementation of the results of research and development.

3. The Place of Practice in the Structure of the Educational Program of Higher Education

The place of the internship in the structure of the EP HE: B2.V.01 (P) "Industrial technological (design and technological) practice" refers to the B2 cycle "Practice".

4. Place and time of the internship

The bases of technological (design and technological) practice are departments, laboratories of the university and other organizations of the city, which have: modern equipment, hardware and software for conducting research in the field of infocommunications, appropriate technologies and the necessary personnel scientific and technical potential.

Internship in third-party organizations is based on contracts, according to which students are provided with internship places, organizational, informational and methodological assistance in the process of internship. Such organizations are: PJSC Rostelecom Stavropol, PJSC Signal Stavropol, Telecom-S LLC Stavropol, JSC Concern Energomera Stavropol, JSC Monocrystal Stavropol, LLC Orintex Stavropol, GKU SK Regional Center of Information Technologies Stavropol, Infocom-S LLC Stavropol, Stilsoft LLC Stavropol. Students can independently search for places of internship. In this case, students submit to the department a petition (consent) of the organization to provide a place for internship with an indication of the period of its

implementation. If there are vacant positions, students can be enrolled in them if the work performed meets the requirements of the internship program.

The choice of places for practical training for disabled persons and persons with disabilities is carried out taking into account the requirements of their accessibility for this category of students. When determining places of practical training for disabled persons and persons with disabilities, the recommendations of medical and social expertise reflected in the individual rehabilitation program of a disabled person regarding the recommended conditions and types of work must be taken into account.

Technological (design and technological) practice is carried out in the 4th semester for 2 weeks.

5. List of planned results of the internship, correlated with the planned results of the development of the educational program

Code, formulation of competence	Indicator code, wording	Planned results characterizing the stages of the formation of competencies, indicators
UK-8, is able to create and maintain safe living conditions in everyday life and in professional activities to preserve the natural environment, ensure the sustainable development of society, including in the threat and occurrence of emergencies and military conflicts.	ID-1 _{UK-8} is familiar with the general characteristics of ensuring security and sustainable development in various spheres of life; classification of military emergencies, principles and methods of organizing the protection of the population from dangers arising in peacetime and during military operations.	The ability to be guided in practical activities by the principles and methods of organizing the protection of the population from dangers arising in peacetime and during the conduct of hostilities has been formed.
	ID-2UK-8 assesses the probability of potential danger in everyday life and professional activities and takes measures to prevent it.	The ability to correctly assess the probability of potential danger in everyday life and professional activities and take measures to prevent it has been formed.
	ID-3 _{UK-8} applies the basic methods of protection in the threat and occurrence of emergencies and military conflicts in everyday life and professional activities.	The ability to apply in practice the basic methods of protection in the threat and occurrence of emergencies and military conflicts in everyday life and professional activities has been formed.
PC-1, Capable of developing switching subsystems and network platforms, data transmission networks, transport networks and radio access networks, satellite communication systems.	ID-1PK-1 understands and is guided by the principles of construction and operation of communication networks, including their constituent subsystems, and signaling protocols, standards for the quality of data, voice and video transmission used in communication networks, in the legislation of the Russian Federation in the field of communications.	The ability to orient oneself in the principles of construction and operation of communication networks, including their constituent subsystems, and signaling protocols, standards for the quality of data, voice and video transmission used in communication networks, in the legislation of the Russian Federation in the field of communications has been formed.
	ID-2PK-1 analyzes statistical parameters of traffic, develops solutions for operational reconfiguration of the network, changing the parameters of the switching subsystem, network platforms, for the use of equipment of new technologies; changing and adjusting	The ability to analyze the statistical parameters of traffic and develop solutions for the operational reconfiguration of the network, changing the parameters of the switching

	the parameters of the switching subsystem, transport networks and data transmission networks, for organizing new and expanding existing communication directions.	subsystem, network platforms, for the use of new technology equipment; changing and adjusting the parameters of the switching subsystem, transport networks and data transmission networks, for organizing new and expanding existing communication directions has been formed.
	ID-3PK-1. analyzes the statistics of the main performance indicators of radio systems and data transmission systems, develops measures to maintain them at the required level, calculates the capacity of telecommunications networks.	The ability to analyze the statistics of the main performance indicators of radio systems and data transmission systems and develop measures to maintain them at the required level, to calculate the capacity of telecommunications networks has been formed.
	ID-4PC-1 develops communication schemes and integration of new network elements, builds and expands the switching subsystem and network platforms; performs work on switching equipment, deploys service platform equipment, equipment of new technologies on the network, fulfills plans to expand existing equipment of network platforms and new technologies.	The ability to develop schemes for the organization of communication and integration of new network elements, to build and expand the switching subsystem and network platforms; to perform work on switching equipment, to deploy equipment of service platforms, equipment of new technologies on the network, to fulfill plans for the expansion of existing equipment of network platforms and new technologies.
PC-2, Able to apply modern theoretical and experimental research methods in order to create new promising means of infocommunication, use and implementation of research results	ID-1PK-2 understands the basics of electrical engineering, network technologies, principles of operation, indicators of the use and functioning of telecommunication equipment, the requirements of technical regulations, international and national standards and other regulatory documents in the field of assessing the quality indicators of information and communication equipment.	The ability to use the basics of electrical engineering, network technologies, principles of operation, indicators of the use and functioning of telecommunication equipment, the requirements of technical regulations, international and national standards and other regulatory documents in the field of assessing the quality indicators of the operation of information and communication equipment in practical activities has been formed.
	ID-2PK-2 complies with the requirements of programs and methods for conducting experimental tests of communication facilities and systems (information and communication equipment).	The ability to be guided in practical activities by the requirements of programs and methods for conducting experimental tests of objects and communication systems (information and

		communication equipment) has been formed.
	ID-3PC-2 works with software used in the processing of information of infocommunication systems and their components, technical means of data collection and processing, with various information systems and databases.	The ability to work with software used in the processing of information from information and communication systems and their components, technical means of data collection and processing, with various information systems and databases has been formed.
	ID-4PK-2 controls the quality indicators of the operation of information and communication equipment in accordance with their standard indicators.	The ability to control the quality indicators of the operation of information and communication equipment in accordance with their regulatory indicators has been formed.
	ID-5PK-2 conducts experimental research on existing programs and methods of testing objects and communication systems (information and communication equipment) in order to assess their quality performance.	The ability to conduct experimental studies on the existing programs and methods of testing objects and communication systems (information and communication equipment) in order to assess their quality performance has been formed.
PC-3, is able to carry out calculations on the design of networks, structures and infocommunication tools in accordance with the terms of reference using both standard methods, techniques and design automation tools, and independently created original programs.	ID-1PK-3 understands regulatory, regulatory, technical, organizational and methodological documents that regulate the design preparation, implementation and operation of communication systems (telecommunication systems), the construction of facilities and communication lines.	The ability to be guided in practice by regulatory, regulatory, technical, organizational and methodological documents regulating the design preparation, implementation and operation of communication systems (telecommunication systems), the construction of facilities and communication lines has been formed.
	ID-2PC-3 operates with technologies used in the transport network, modern requirements for performance, availability, security, scalability, integration of technologies, manageability of communication systems (telecommunications); principles of planning the capacity of radio access networks.	The ability to operate with technologies used in the transport network, modern requirements for performance, availability, security, scalability, technology integration, manageability of communication systems (telecommunications); principles of planning the capacity of radio access networks has been formed.
	ID-3PK-3 calculates the parameters and characteristics of the network and infocommunication facilities, analyzes their qualitative indicators based on statistics and radio measurements, and uses specialized	The ability to calculate the parameters and characteristics of the network and infocommunication tools, analyze their qualitative

	design software.	indicators based on statistics and radio measurements, and use specialized design software has been formed.
	ID-4PK-3 identifies and analyzes the advantages and disadvantages of design solutions, assesses the risks associated with the implementation of the project.	The ability to identify and analyze the advantages and disadvantages of design solutions has been formed, and evaluates the risks associated with the implementation of the project.
	ID-5PK-3 collects initial data for the design of the network and infocommunication facilities, determination of the optimal configuration and topology of the transport network; develops technical solutions for the implementation of the communication system (telecommunication system) and its components.	The ability to collect initial data for the design of the network and infocommunication tools, to determine the optimal configuration and topology of the transport network; to develop technical solutions for the implementation of the communication system (telecommunication system) and its components has been formed.
	ID-6PK-3 develops circuit design solutions for the components of radio-electronic facilities, selects the element base for the development of circuit solutions, conducts automated modeling and experimental work to check the technical characteristics of the modernized radio-electronic facilities.	The ability to develop circuit design solutions for the components of radio-electronic facilities, to select the element base for the development of circuit solutions, to carry out automated modeling and experimental work to check the technical characteristics of the modernized radio-electronic facilities has been formed.
PC-4, Able to prepare standard technical projects and primary control of the compliance of the developed projects and technical documentation for various information and communication facilities with national and international standards and technical regulations	ID-1PK-4 complies with the principles of a systematic approach in the design of communication systems (telecommunications), infocommunication facilities and their components, requirements for the development of technical documentation.	The ability to be guided in practice by the principles of a systematic approach in the design of communication systems (telecommunications), infocommunication facilities and their components, requirements for the development of technical documentation has been formed.
	ID-2PK-4 understands and is guided by the principles of construction and operation of infocommunication tools and their components, modern technical solutions for the implementation of communication systems (telecommunication systems) and its components, the software used.	The ability to be guided in practical activities by the principles of construction and operation of infocommunication tools and their components has been formed.
	ID-3PK-4 develops design documentation in accordance with standards and technical regulations; develops and submits presentation materials on the project.	The ability to develop project documentation in accordance with standards and technical regulations; to develop and present presentation materials

		on the project has been formed.
	ID-4PK-4 develops technical solutions for the creation of a communication system (telecommunication system) and its components; preparation of a communication organization scheme, equipment placement plan, passage scheme and other necessary documents; estimation of costs for the creation (modernization) of a communication system (telecommunication system).	The ability to develop technical solutions for the creation of a communication system (telecommunication system) and its components; to prepare a communication organization scheme, a plan for the placement of equipment, a passage scheme and other necessary documents; to assess the costs of creating (modernizing) a communication system (telecommunication system).
PC-6, Capable of administering network subsystems of infocommunication systems and/or their components.	ID-1PK-6 understands the architecture and general principles of operation, hardware, software and software and hardware of the administered network, the procedure for configuring network elements of the infocommunication system.	The ability to use in practical activities the general principles of the functioning of hardware, software and software and hardware of the administered network, the procedure for setting up network elements of the information and communication system has been formed.
	ID-2PC-6 uses modern standards in the administration of devices and software; uses standard and external software and hardware to monitor the performance of the network infrastructure of the administered network.	The ability to be guided in practice by the requirements of modern standards in the administration of devices and software; to use standard and external software and hardware to control the performance of the network infrastructure of the administered network.
	ID-3PC-6 diagnoses failures and errors of network devices and software.	The ability to diagnose failures and errors of network devices and software has been formed.
	ID-4PK-6 carries out routine maintenance on network devices and software of the information and communication system.	The ability to carry out routine maintenance on network devices and software of the information and communication system has been formed.
	ID-5PK-6 installs and configures the system and application software necessary for the functioning of the IS in accordance with the work assignment, carries out standard design and parameterization of the IS in accordance with the regulations of the organization.	The ability to install and configure system and application software necessary for the functioning of the IS in accordance with the work assignment, to carry out standard design and parameterization of the IS in accordance with the regulations of the organization has been formed.

6. Structure and content of the internship

The total labor intensity of industrial technological (design and technological) practice is 3 credits, 108 hours.

Sections (stages) of practice	Implemented competencies / indicators	Types of Student's Work in Practice	Labor intensity (hours)	Forms of current control
Preparatory stage	UK-8	- Orientation conference.	2.00	Interview
		- introductory briefing at the place of practice.	1.00	Interview
		- familiarization with the technical equipment of the enterprise.	1.00	Interview
		- drawing up an individual internship plan and its approval by the supervisor.	2.00	Interview
Main stage	PC-1, PC-2, PC-3, PC-4, PP-6	- Problem statement; - collection, processing and systematization of initial data, factual and literary material; - implementation of all stages of technological processes.	96.00	Report, interview
Final stage	UK-8	- Preparation of reporting documents for the internship and preparation of the report.	4.00	Report Protection
		- Final conference.	2.00	Performance, test in practice
Total			108.00	Credit with a grade

7. Methodical recommendations for students on the passage of practice

7.1. Use of the material of the educational and methodological complex of practice

At the first stage, it is necessary to familiarize yourself with the structure of the internship, mandatory types of work and reporting forms, which are reflected in the Methodological Guidelines for the organization and conduct of practice, developed at the department.

For the successful completion of tasks on industrial technological (design and technological) practice, the student needs to independently study the presented sources of literature in detail

No p/n	Type of independent work	Recommended sources of information (No source)			
		Main	Additional	Methodical	Internet Resources
1	Collection, processing and systematization of factual and literary material	1, 2, 3	1, 2, 3, 4	1, 2	1, 2, 3, 4
2	Formulation of the problem, implementation of all stages of solving the problem, collection and preliminary processing of initial data, development of algorithms and programs, calculations	1, 2, 3	1, 2, 3, 4	1, 2	1, 2, 3, 4
3	Preparation of the report	1, 2, 3	1, 2, 3, 4	1, 2	1, 2, 3, 4

7.2. Fund of Assessment Tools for Practice

The Fund of Assessment Tools (FAT) for industrial technological (design and

technological) practice is based on a list of mastered competencies with an indication of the stages of their formation in the process of internship. FAT provides objective control over the achievement of planned learning outcomes. FAT includes:

- description of indicators and criteria for assessing competencies at various stages of their formation, description of assessment scales;
- methodological materials that determine the procedures for assessing knowledge, skills, and (or) experience of activity, characterizing the stages of competence formation;
- standard control tasks and other materials necessary to assess knowledge, skills and the level of mastery of the formed competencies in the process of internship.

The FAT is an appendix to this internship program.

8. Educational, methodological and information support of practice

8.1. Recommended reading

8.1.1. Reference citations:

1. Yakovlev S.V. Electronics: a textbook / S.V. Yakovlev - Stavropol: SevKavGTU, 2012. - 270 p.
2. Sokolov S.V. Elektronika [Elektronnyi resurs]: uchebnoe posobie dlya vuzov [Elektronika]: a textbook for higher education institutions]. Tekstovye dannye [Textual data]. Moscow: Hotline - Telecom, 2013. - 204 p. - Rezhim dostupa: <http://www.iprbookshop.ru/37144>. EBS "IPRbooks".
3. Shpakov P.S., Yunakov Yu.L. Mathematical processing of measurement results: a textbook / Publisher: Siberian Federal University, 2014. - URL: http://biblioclub.ru/index.php?page=book_red&id=435837&sr=1.

8.1.2. Further reading:

1. Lappi F.E. Analysis of Simple Electronic Circuits. From Electrical Engineering to Electronics. Circuits with Diodes and Transistors [Elektronnyi resurs]: uchebnoe posobie [Circuits with diodes and transistors]: textbook/ Lappi F.E. Electron. Textual data. - Novosibirsk: Novosibirsk State Technical University, 2012. - 144 p. - Mode of access: <http://www.iprbookshop.ru/45360>. EBS "IPRbooks".
2. Pinigin K.Y. Modeling of electronic devices in the MultiSim environment [Elektronnyi resurs]: uchebno-metodicheskoe posobie / Pinigin K.Yu., Zhmud V.A. - Electron. Tekstovye dannye [Textual data]. - Novosibirsk: Novosibirsk State Technical University, 2012. - 74 p. - Mode of access: <http://www.iprbookshop.ru/45403>. EBS "IPRbooks".
3. Electronics. Part One. Laboratory Workshop on Analog Electronics in the Software-Hardware Environment NI ELVIS II [Elektronnyi resurs]: uchebnoe posobie / E.I. Tsimbalist [i dr.]. - Electron. Tekstovye dannye [Electron. Text Data]. - Tomsk: Tomsk Polytechnic University, 2013. - 302 p. - Available at: <http://www.iprbookshop.ru/34741>. EBS "IPRbooks".
4. Collection of Problems on Electrical Engineering and Electronics [Elektronnyi resurs]: uchebnoe posobie / Yu.V. Bladyko [i dr.]. - Elektron. tekstovye dannye [Electron. Textual data]. - Minsk: Vysheishaya shkola, 2013. - 478 p. - Rezhim dostupa: <http://www.iprbookshop.ru/20262>. - EBS «IPRbooks».

8.1.3. Methodical literature:

1. Regulations on the organization and conduct of student practices in the Federal State Autonomous Educational Institution of Higher Education "North Caucasus Federal University".- Stavropol: NCFU, 2018.
2. "Pre-diploma industrial practice": guidelines for the practice / compiled by M.V. Samus. - Stavropol: NCFU, 2021. - 25 p. : ill. (electronic var).

8.1.4. Internet resources:

1. <http://www.labcenter.com/index.cfm>.
2. <http://www.chipinfo.ru>.
3. <http://www.intuit.ru> – National Open University "INTUIT".
4. <http://www.edu.ru>.

8.2. Software:

1. Computer program "MathCAD".
2. NI Multisim 12 Virtual Simulation System.

8.3. Material and technical support of the internship

Specialized computer class with MS Windows XP/7/8/10, MS Office 2003/2007/2010 operating system and NI Multisim 12 NI Lab environment installed.

8.4 Features of the development of practice by persons with disabilities:

If there are students with disabilities, this practice is adapted taking into account the recommendations of the psychological, medical and pedagogical commission, the individual rehabilitation program of the disabled person and is carried out at the Department of Infocommunications of the University.