MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution
higher education
NORTH CAUCASIAN FEDERAL UNIVERSITY

I APPROVE
Dean of the Faculty of Mathematics and computer science named after Professor N.I. Chervyakov , Candidate of Physical and Mathematical Sciences, Associate Professor T.A. Grobova

Industrial Internship Program

Technological (Project and Technological) Internship / Технологическая (проектно-технологическая) практика

Direction of training	02.04.01 Mathematics and Computer Science
Directionality (profile)	Training Program for Electronic Information
Year of commencement of studies	2026
Form of study	full-time
Implemented in a semester	4

Developed by

Associate Professor of the Department of Computational Mathematics and Cybernetics , Candidate of Physical and Mathematical Sciences, Associate Professor
Lapina M. A.

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1. Objectives of the practice

The objectives of the industrial practice are Technological (Project and Technological) Internship / Технологическая (проектно-технологическая) практика) in the direction of training 02.04.01 Mathematics and computer science focus (profile) " Training Program for Electronic Information » are:

- consolidation and deepening of theoretical knowledge;
- developing students' primary professional skills in the application of modern mathematical methods and software to solve problems in science, technology, economics and management, and the use of information technology in design, engineering, management and financial activities in organizations, institutions and enterprises of the city and region;
- the formation and development of professional competencies of the master's student, necessary for conducting independent research work, the result of which is the writing and successful defense of a final qualifying work.

2. Practice objectives

The objectives of the practice are:

- professional orientation of students, formation of a complete understanding of their profession;
- fostering responsibility and independence in the performance of duties in primary positions in the field of application of modern mathematical methods and information technologies;
- development of practical skills in organizing work in the field of application of modern mathematical methods and information technologies.

3. The place of practice in the structure of the educational program 02.0 4 .01 Mathematics and Computer Science

Place of practice in the structure of the educational program of higher education: Industrial practice B2.V.03(P), 4th semester, 2 weeks.

Industrial practice, in accordance with the federal state educational standard, is mandatory and represents a form of organization of the educational process directly focused on the professional and practical training of students.

The practice is based on the following disciplines and types of practices: Intelligent information processing systems and machine learning, Application of artificial neural networks and deep learning in steganalysis , Data analysis in cybersecurity .

4. Place and time of the internship

Type of practice – industrial;

Type of practice – technological (design-technological) practice;

The form of the practice is discrete.

- design- technological) internship B2.V.03(P) is implemented in accordance with the curriculum. It is completed in the fourth semester and lasts two weeks. The internship is conducted at enterprises assigned by order of North Caucasus Federal University and having entered into an agreement on practical training. Among the enterprises selected are those with specific experience in mathematics and computer science and using new information technologies, as well as teaching laboratories from the university's departments, primarily the graduate department.
- scientific divisions of the university;
- OJSC "Concern Energomera "
- OJSC " SevKavNIPIgaz "
- OOO "Computer Union".

5. List of planned practical results, correlated with the planned results of mastering the educational program

Code, formulation of competence	Code, indicator formulation	Planned results characterizing the stages of formation of competencies, indicators
Able to organize and manage the work of a team, developing a team strategy to achieve the set goal (UK-3).	ID-1 UK-3 Manages the production activities of employees ID-2 UK-3 Prepares and presents presentations of plans and results of personal and team activities	Manages the production activities of employees Prepares and presents plans and results of personal and team activities
Able to determine and implement priorities of one's own activities and ways to improve them based on self-assessment (UK-6).	ID-1 UK-6 Ready for self-development, self-realization, and use of creative potential ID-2UK-6 Defines and implements priorities of own activities	Ready for self-development, self-realization, and the use of creative potential Defines and implements priorities for own activities
Able to demonstrate fundamental knowledge of mathematical and natural sciences, programming and information technology (PC-1).	ID-1 PC-1 In his professional activities, he demonstrates fundamental knowledge of mathematics and natural sciences. ID-2 PC-1 Solves problems of professional activity using programming and information technology tools	In his professional activities, he demonstrates fundamental knowledge of mathematics and natural sciences. Solves professional problems using programming and information technology tools
Able to create and explore new mathematical models in the natural sciences, industry and business, taking into account the capabilities of modern information technology, programming and computer equipment (PC-7).	ID-1 PC-7 With the help of modern information technologies, explores newly created mathematical models in the natural sciences of industry; ID-2 PC-7 Conducts Parallel Computer and Network Technologies as part of his professional activities ID-3 PC-7 Uses modern programming languages and application software packages to implement specific algorithms and mathematical models	With the help of modern information technologies, explores newly created mathematical models in the natural sciences of industry; Conducts parallel computer and network technologies within the framework of professional activities Uses modern programming languages and application software packages to implement specific algorithms and mathematical models
Able to use modern methods of development and implementation of specific algorithms of mathematical models based on programming languages and application packages for modeling (PC- 6).	ID-1 PC-6 Using modern software packages for modeling, it explores newly created mathematical models; ID-2 PC-6 Uses modern methods for developing algorithms for mathematical models ID-3 PC-6 Uses modern programming languages to implement specific algorithms and mathematical models	Using modern software packages for modeling, it explores newly created mathematical models; Uses modern methods for developing algorithms for mathematical models Uses modern programming languages to implement specific algorithms and mathematical models
Capable of participating in the management of projects for the creation of information systems and software packages at the	ID-1 PC-8 Manages the development, development and maintenance of information systems and software systems	Manages the development, development and maintenance of information systems and software systems Applies software development

stages of the life cycle (PC-8)	ID-2 PC-8 Knows and applies software development trends in his/her professional activities	trends in his professional activities
Able to take into account knowledge of problems and trends in the development of the software market in professional activities (PC-9).	ID-1 PC-9 Selects software for their professional activities, taking into account market development trends. ID-2 PC-9 Takes into account the development trends of the software market and applies these development trends in professional activities	Selects software for their professional activities, taking into account market development trends. Takes into account the development trends of the software market and applies these development trends in professional activities

6. Structure and content of the practice

The total workload of industrial practice – Technological (Project and Technological) Internship / Технологическая (проектно-технологическая) практика is 3 credit units, 108 hours.

Sections (stages) of practice	Implemented competencies /indicators	Types of educational work in practice, including independent work of students	Labor intensity (hour.)	Forms of current control
Preparatory	UK-6 PC-9	Industrial instruction, safety instruction.	2	Written report
		Study of normative and technical documentation of educational and methodological materials.	4	Knowledge test
Functional-activity	UK-3 PC-1 PC-7 PC-6 PC-8 PC-9	Collection, processing and systematization of factual and literary material, fulfillment of production tasks.	80	Written report Diary
Final	UK-6 PC-7 PC-8 PC-9	Preparation, execution and defense of the report.	20	Written report
		Passing the practical test.	2	Written report

7. Guidelines for students on completing their internship

7.1 Using 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 internship developed by the department.

To successfully complete the practical assignments for the pre-graduation industrial internship, the student must independently and thoroughly study the following sources of literature:

Item No.	Type of independent work	Recommended sources of information (Source No.)			
		Main	Additional	Methodological	Internet resources

1	Collection, processing and systematization of factual and literary material	1-3	1-2	1	1-7
2	Execution of calculation tasks	1-3	1-2	1	1-7
3	Study of application software packages Matlab , Mathcad , Deductor , etc.	2, 3	2	1	1 - 7

7.2 Fund of assessment tools for practice

The Assessment Toolkit (AT) for industrial technological (project-technological) internships is based on a list of acquired competencies, indicating the stages of their development during the internship. The AT provides objective monitoring of the achievement of planned learning outcomes. The AT includes:

- description of indicators and criteria for assessing competencies at various stages of their formation, description of assessment scales;
- methodological materials defining the procedures for assessing knowledge, skills, abilities and (or) work experience, characterizing the stages of competence development;
- standard test assignments and other materials necessary for assessing knowledge, skills and the level of mastery of the competencies being developed during the internship.

FOS is an appendix to this practice program.

8. Educational, methodological and informational support for practice

8.1. Recommended literature.

8.1.1. Main literature:

1. Computer networks [Electronic resource]: textbook / V.G. Kartashevsky [et al.]. - Electronic text data. - Samara: Volga Region State University of Telecommunications and Informatics, 2016. - 267 p. - 2227-8397. Access mode: http://www.iprbookshop.ru/71846.html

2. Modular Arithmetic and Its Applications in Infocommunication Technologies: [monograph] / N. I. Chervyakov et al. - Moscow: FIZMATLIT, 2017. - 400 p.: ill., table, port . - Bibliography at the end of the section. - ISBN 978-5-9221-1716-6

3. Application of artificial neural networks and residual class systems in cryptography / N. I. Chervyakov [et al.]. - M.: FIZMATLIT, 2012. - 280 p.: ill., app. - ISBN 978-5-9221-1386-1

8.1.2. Further reading:

1. Batovrin , V. K.
& nbsp ;& nbsp ;& nbsp ;Systems and Software Engineering. Dictionary-reference Electronic resource: Textbook for universities / V. K. Batovrin . - Systems and Software Engineering. Dictionary-reference, 2019-04-19. - Saratov: Profobrazovanie, 2017. - 280 p. - The book is in the premium version of the IPR BOOKS electronic library system. - ISBN 978-5-4488-0129-7

2. Bykadorova, E. A.
& nbsp ;& nbsp ;& nbsp ; Fundamentals of programming information content Electronic resource / Bykadorova E. A., Sinyavskaya O. N. - St. Petersburg: Lan, 2020. - 72 p. - ISBN 978-5-8114-4567-7, unlimited copies Meyer, B.

3. Object-oriented programming and software engineering / B. Meyer. - 2nd ed., corrected . - Moscow: National Open University "INTUIT", 2016. - 286 p.

4. Ekhlakov , Yu. P.
& nbsp ;& nbsp ;& nbsp ; Software Project Management. Standards, Models Electronic resource / Ekhlakov Yu. P.: textbook for universities. - 2nd ed., stereo. - St. Petersburg: Lan, 2020. - 244 p. - ISBN 978-5-8114-5335-1, unlimited copies

5. Klaverov , V.B.
& nbsp ;& nbsp ;& nbsp ; Project Management. Case of Practical Training Electronic resource: study guide / V.B. Klaverov . - Saratov: IPR Media, 2018. - 142 p. - The book is in the basic version of the IPRbooks electronic library system . - ISBN 978-5-4486-0076-0
6. Orlov, S. A. Software Engineering. Software Development Technologies: textbook / S. A. Orlov. - 5th ed., updated and supplemented. - St. Petersburg : Piter, 2017. - 640 p. - (Textbook for universities). - Appendices: pp. 620-628. - Bibliography : pp. 629-635. - ISBN 978-5-496-01917-0

8.1.3. Methodological literature :

1. Guidelines for industrial (technological (design and technological)) practice for the course 02.04.01 Mathematics and computer science.

8.1.4. Internet resources:

1. https://ш.wikipedia.org/wiki/Список оптика List of operating systems
2. http://www.intuit.ru/studies/courses/1089/217/info Fundamentals of Microsoft Operating System Organization Windows
3. http://www.osp.ru (published by Open Systems)
4. http://www.computer-musem.ru (Weekly PC- week RE and virtual computer museum).
5. https://ru.wikipedia.org/wiki Wikipedia, the free encyclopedia.
6. http://www.allmath.ru/ All mathematics - higher mathematics, applied mathematics, mathematical methods in economics, financial mathematics
7. http://www . exponenta.ru/ Educational mathematics website.

8.2 Software:

1. Microsoft Visual Studio Community with CUDA module (In free access)
2. Microsoft Visual Studio Code (Open Source)
3. Microsoft Visio Standard 2013 agreement 01- ea / 13 dated February 25, 2013
4. MathWorks MATLAB Builder EX, MATLAB Builder JA Agreement No. 130- ea / 13 dated November 28, 2013 .
5. DBDesigner 4 (Free)
6. Microsoft Visual Studio Community (In free access)
7. Microsoft SQL Server 2012 Express (Freely Available)

9. Logistics for the internship

The premises are classrooms for conducting classes provided for by the master's degree program, equipped with equipment and technical teaching aids, the composition of which is determined in the working programs of the disciplines (modules).

The rooms for independent student work are equipped with computers with the ability to connect to the Internet and provide access to the Organization's electronic information and educational environment.

The organization is provided with the necessary set of licensed and freely distributed software, including domestically produced ones.

Students are provided with access (remote access), including in the case of the use of e-learning and distance learning technologies, to modern professional databases and information reference systems, the composition of which is determined in the working programs of disciplines (modules) and is subject to updating as necessary).

10 Peculiarities of mastering practice by individuals with disabilities

Students with disabilities are provided with special textbooks, teaching aids and didactic materials, special technical teaching aids for collective and individual use, the services of an

assistant (helper) who provides students with the necessary technical assistance, as well as the services of sign language interpreters and tactile sign language interpreters .

Internships for students with disabilities can be organized together with other students, as well as in separate groups.

The internship of students with disabilities is carried out taking into account the characteristics of their psychophysical development, individual capabilities and health status.

In order to ensure accessibility of higher education under the educational program for individuals with disabilities during their internship, the following is provided:

1) for persons with visual impairments:

- the presence of an assistant who provides the student with the necessary technical assistance, taking into account individual characteristics (helps to take up a workstation, move around, read and complete assignments, including taking down dictation),
- written assignments, as well as instructions on how to complete them, are written in large print,
- special textbooks, teaching aids and didactic materials (with large print or audio files),
- individual uniform illumination of at least 300 lux,
- if necessary, the student is provided with a magnifying device to complete the assignment;

2) for persons with hearing impairments:

- the presence of an assistant who provides the student with the necessary technical assistance, taking into account individual characteristics (helps to take up a workstation, move around, read and complete assignments, including taking down dictation),
- the availability of sound amplification equipment for collective use is ensured; if necessary, the student is provided with sound amplification equipment for individual use;
- is provided with appropriate sound means for reproducing information;

3) for persons with disabilities who have musculoskeletal disorders (including severe impairment of the motor functions of the upper limbs or the absence of upper limbs):

- written assignments are completed on a computer with specialized software or dictated to an assistant;
- at the student’s request, assignments can be completed orally