

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
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and Mathematical Sciences, Associate
Professor T.A. Grobova

Industrial Internship Program

Research Work / Научно-исследовательская работа

Direction of training
Directionality (profile)
Year of commencement of studies
Form of study
Implemented in a semester

02.04.01 Mathematics and Computer Science
Training Program for Electronic Information
2026
full-time
3, 4

Developed by

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1. Objectives of the practice

The objectives of the industrial practice are research work in the direction of training 02.04.01 - Mathematics and computer science, focus (profile) «Training Program for Electronic Information» are:

- are the consolidation and deepening of theoretical knowledge;
- development of professional competencies related to the use of modern methods of processing and interpreting information in scientific research activities, with the organization of scientific and applied research, and the presentation of the results of scientific activities;
- developing students' 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.

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, writing scientific publications, inventions, abstracts of presentations at conferences of various levels, preparation of scientific documentation.

3. The place of practice in the structure of the educational program 02.04.01 Mathematics and Computer Science

Place of practice in the structure of the educational program of higher education: Industrial practice B2.V.02(P), 3-4 semesters.

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 practice: Operational practice, Scientific research work, Scientific research methodology.

4. Place and time of the internship

Type of practice – industrial;

Type of practice – research work;

The form of the practice is dispersed.

- Internship B2.In.02(P), research work is carried out in accordance with the curriculum. It is completed in the 3rd and 4th semesters. Internships are conducted at enterprises assigned by order of the North Caucasus Federal University and that have entered into an agreement on practical training. Among the enterprises selected are those with certain experience in the field of mathematics and computer science and using new information technologies, as well as educational laboratories of the university departments, primarily the graduating department; scientific divisions of the university; Faculty classrooms .

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	ID-1 UK-3 Manages the production	Capable of managing the

the work of a team, developing a team strategy to achieve the set goal (UK-3).	activities of employees ID-2 UK-3 Prepares and presents presentations of plans and results of personal and team activities	production activities of employees Prepares and presents presentations of plans and results of personal and team activities
Able to analyze and take into account cultural diversity in the process of intercultural interaction (UK-5).	ID-1 UK-5 Analyzes and draws conclusions on social, ethical, scientific and technical issues arising in professional activities. ID-2 UK-5 Objectively evaluates the diversity of cultures and identifies their individual characteristics	Manages the production activities of employees Prepares and presents plans and results of personal and team activities
Capable of conducting patent research, determining forms and methods of legal protection and defense of rights to the results of intellectual activity, and managing rights to them to solve problems in the field of development of science, engineering and technology (PC-4).	ID-1 PC-4 Makes rational choices regarding methods of protecting intellectual property rights; ID-2 PC-4 Conducts patent research in the field of computing and communication systems.	Finds and formulates significant problems of applied and computer mathematics. Knows and uses methods to solve significant problems in applied and computer mathematics.
Capable of participating in the management of projects for the creation of information systems and software packages at the stages of the life cycle (PC-8)	ID-1 PC-8 Manages the development, development and maintenance of information systems and software systems ID-2 PC-8 Knows and applies software development trends in his/her professional activities	Conducts research into new mathematical models in the natural sciences Develops new and improves existing concepts, theories and methods
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	Independently creates application software products Knows and is able to find modern information technologies, including domestically produced ones, necessary for the creation of applied software products

6. Structure and content of the practice

The total workload of industrial practice – Research Work / Научно-исследовательская работа is 9 credit units, 324 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-3 UK-5 PC-4	Study of regulatory and technical documentation, educational and	28/28	Interview

		methodological materials . Setting research objectives, receiving assignments.	12/12	Knowledge test
Functional-activity	PC-4 PC-8 PC-9	Collection, processing and systematization of factual and literary material, fulfillment of production tasks.	174/174	Interview , writing essays
		Preparation, design of scientific articles and testing of scientific research results .	64/64	Publications in scientific - journals Interview
Final	UK-3 UK-5 PC-4 PC-8 PC-9	Preparation, execution and defense of the report.	40/40	Publications in scientific - journals Interview
		Passing the practical test.	6/6	Written report
Total:			324	

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 industrial research work, 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	4	1	1 - 7

7.2 Fund of assessment tools for practice

The Assessment Toolkit (AT) for Industrial Internships (IIP) is based on a list of competencies to be mastered, 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. Kukushkina V. V. Organization of scientific research work of students (masters): a textbook in the direction of "Management" / V. V. Kukushkina. - M .: INFRA-M, 2014 .-- 264 p.: ill., table. - (Higher education. Master's program). - Stamp: Additional Council of the UMO. - On the title page and transl.: Electronic Library System Znanium.com. - Bibliography : pp. 259-260. - ISBN 978-5-16-004167-4

2. Ichetovkina N.M. Psychological and pedagogical practices: organization, methodological guidelines, diagnostic tools: a teaching aid for students / N.M. Ichetovkina , T.D. Luk'yanova ; Ministry of Education and Science of the Russian Federation. - Glazov: GSPI, 2014. - 112 p.: table. - ISBN 978-5-93008-177-0; Ditto [Electronic resource]. URL: <http://biblioclub.ru/index.php?page=book&id=428685>

8.1.2. Further reading:

1. Astanina S. Yu. Research work of students (modern requirements , problems and their solutions) [Electronic resource]: monograph / S. Yu. Astanina , N. V. Shestak , E. V. Chmykhova . - Electronic text data. - M .: Modern Humanitarian Academy, 2012. - 156 p . - 978-5-8323-0832-6. Access mode: [http : // www . iprbookshop . ru / 16934. html](http://www.iprbookshop.ru/16934.html)

2. Shtarkov Yu. M. Universal Coding: Theory and Algorithms [Electronic resource] / Moscow: Fizmatlit, 2013. - 280 p. - 978-5-9221-1517-9. Access mode: [http : // biblioclub . ru / index . php ? page = book red & id = 275569](http://biblioclub.ru/index.php?page=bookred&id=275569)

8.1.3. Methodological literature :

1. Methodological recommendations for completing industrial practice research work for students majoring in 02.04.01 Mathematics and Computer Science.

8.1.4. Internet resources:

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