

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of 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
Grobova T. A.

WORKING PROGRAM OF THE DISCIPLINE

Frontier Lectures on Electronic Information Engineering / Лекции по передовым достижениям
в области электронной информационной инженерии

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	1

Developed by

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

1. The purpose and objectives of mastering the discipline (module)

The purpose of mastering the course "Frontier Lectures on Electronic Information Engineering / Лекции по передовым достижениям в области электронной информационной инженерии" is to obtain the necessary amount of knowledge, skills and abilities, theoretical and methodological foundations for constructing parallel computing systems, and the formation of competencies (UK-3; OPK-1) of the future master's degree.

The main objectives of studying the discipline are:

1. Formation of knowledge on the basics of information engineering.
2. Training in methods and algorithms for searching and processing information.
3. Instilling practical skills in the use of tools for computer modeling of scientific knowledge.

2. The place of the discipline (module) in the structure of the educational program

The course "Frontier Lectures on Electronic Information Engineering / Лекции по передовым достижениям в области электронной информационной инженерии" is one of the disciplines of the Compulsory part.

3. List of planned learning outcomes for the discipline (module), correlated with the planned learning outcomes for the educational program

Code, formulation of competence	Code, indicator formulation	Planned learning outcomes for the discipline (module), characterizing the stages of formation of competencies, indicators
UK-3 Able to organize and manage team work, developing a team strategy to achieve the set goal.	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	Conducts research into new mathematical models in the natural sciences Develops new and improves existing concepts, theories and methods
OPK-1 Able to find, formulate and solve current and significant problems in applied and computer mathematics	ID-1 OPK-1 Finds and formulates significant problems of applied and computer mathematics. ID-2 OPK-1 knows and uses methods for solving significant problems of applied and computer mathematics	Uses information on the main areas of self-development, self-realization, and the use of creative potential; significant problems of applied and computer mathematics Able to find, formulate, and solve current problems in applied and computer mathematics; Uses skills to solve problems in applied and computer mathematics

4. Volume of the academic discipline (module) and forms of control *

Amount of classes: total: 3 credits , 108 academic hours .	OFO, in astronomical hours
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Contact work:	
Lectures/including practical training	
Laboratory work /including practical training	
Practical classes /including practical training	16
Independent work	92
Forms of control	
Exam	
Credit in the 1st semester	
Credit with grade	
Calculation and graphic works	
Coursework	

5. The content of the discipline (module), structured by topics (sections) indicating the number of hours and types of classes

No.	Section (topic) of the discipline and brief content	Developed competencies, indicators	full-time education			
			Contact work of students with a teacher/of which in the form of practical training, hours			Independent work, hours
			Lectures	Practical classes	Laboratory work	
Semester 1						
1.	Topic 1. The role of science in modern society and the organizational and research foundations of scientific work. Stages of scientific research.	UK-3, OPK-1		2.00		10:00
2.	Topic 2. Science in modern society. Great names in the history of science. The main functions of science in society (cognitive, ideological, productive, cultural, educational).	UK-3, OPK-1		2.00		12:00
3.	Topic 3. Organization of scientific research in Russia. Main stages of scientific development in Russia. Organization of scientific institutions in Russia.	UK-3, OPK-1		2.00		12:00
4.	Topic 4. Methodology, methods, and techniques of conducting scientific research. Specific and special methods of scientific research.	UK-3, OPK-1		2.00		12:00

5.	Topic 5. Methodological foundations of scientific knowledge and creativity. Methods for evaluating scientific research topics. Information retrieval systems.	UK-3, OPK-1		2.00		12:00
6.	Topic 6. Specialized Methods of Scientific Research. Classification of systems (static, dynamic, deterministic, stochastic). The importance of mathematical models in scientific research and their main types.	UK-3, OPK-1		2.00		12:00
7.	Topic 7. Scientific Research Methodology. Stages of Experimental Methodology. Structural Components of Problem Solving. Analytical Methods. Computational Experiment. Classification of Experiments. Scope and Labor Intensity of Experimental Research.	UK-3, OPK-1		2.00		12:00
8.	Topic 8. Types and forms of educational and research work of university students. Selecting a research topic.	UK-3, OPK-1		2.00		10:00
	TOTAL for 1 semester			4:00 PM		92.00
	TOTAL			4:00 PM		92.00

6. Fund of assessment tools for the discipline (module)

The assessment toolkit (AST) for a course (module) is based on a list of mastered competencies with associated indicators. The AST provides objective monitoring of the achievement of planned learning outcomes. The AST includes:

- description of indicators and criteria for assessing competencies at various stages of their formation, description of assessment scales;
- methodological materials that define the procedures for assessing knowledge, skills, abilities and (or) work experience that characterize the stages of competencies formation (included in the methodological guidelines for those types of work that are provided for by the curriculum and provide for the assessment of the development of competencies);
- standard assessment tools necessary for assessing knowledge, skills and the level of development of competencies.

FOS is an appendix to this discipline (module) program.

7. Methodological guidelines for students on mastering the discipline

When starting work, each student should take into account the following provisions.

The discipline (module) is structured on a thematic principle, each topic is a logically complete section.

Practical classes are conducted with the aim of consolidating the acquired information and acquiring skills for its application in solving practical problems in the relevant subject area .

Students' independent work is aimed at independent study of additional material, preparation for practical and laboratory classes, and completion of all types of independent work.

To successfully master the discipline, it is necessary complete all types of independent work using the recommended sources of information.

8. Educational, methodological and informational support of the discipline

8.1. List of basic and additional literature required for mastering the discipline (module)

8.1.1. List of 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](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. Barsky A.B. Introduction to neural networks [Electronic resource] / A.B. Barsky. - Electronic text data. - M.: Internet University of Information Technologies (INTUIT), 2016. - 358 p. - 2227-8397. Access mode: <http://www.iprbookshop.ru/52144.html>

8.1.2. Further reading:

1. 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
2. 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)

8.1.3. Methodological literature :

1. Methodological recommendations for educational practice - research work (obtaining primary skills in research work) for the direction 02.04.01 Mathematics and computer science, focus (profile) Training Program for Electronic Information .

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> Fundamentals of Microsoft Operating System Organization Windows
3. <http://www.osp.ru> (published by Open Systems)
4. <http://www.computer-museum.ru> (PC Weekly - 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 (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. List of information technologies used in the implementation of the educational process in the discipline (module), including a list of software and information reference systems

Lectures are delivered using computers and multimedia presentations. During seminars and practical classes, students present presentations they prepared during their independent work hours.

Information reference systems:

Information and reference and information and legal systems used in the study of the discipline:

1	The All-Russian Mathematics Portal is a modern information system offering Russian and international mathematicians various opportunities to find information about mathematical life in Russia. Main sections: journals, personalities, organizations, conferences, seminars, video library, and library.
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Software:

1	MathWorks MATLAB, 130-ea/13 dated November 28, 2013, license 920056
2	PTC Mathcad , 29-ea/14 dated 07/08/2014, license 4A1917867
3	Maple 17, 130-ea/13 from 11/28/2013
4	Microsoft Windows 10 Prof, 27- ea /16 dated 08/02/2016, license 69366049
5	Microsoft Office Standard 2013, 01- ea /13 from 02/25/2013, license 61541869

10. Description of the material and technical base necessary for the implementation of the educational process in the discipline (module)

Practical classes	A classroom for conducting classes, equipped with multimedia equipment and technical teaching aids.
Independent Job	A room for independent student work equipped with computers and the ability to connect to the Internet and access the university's electronic information and educational environment.

11. Features of mastering the discipline (module) by persons 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.

The acquisition of a discipline (module) by students with disabilities can be organized jointly with other students, as well as in separate groups.

The acquisition of a discipline (module) by students with disabilities is carried out taking into account the characteristics of psychophysical development, individual capabilities and health status.

In order to ensure accessibility of higher education under the educational program for individuals with disabilities, the following is provided when mastering a discipline (module):

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 impairments 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.

12. Features of the implementation of the discipline using distance learning technologies and e-learning

According to Part 1 of Article 16 of Federal Law No. 273-FZ of December 29, 2012, "On Education in the Russian Federation," *e-learning* is defined as the organization of educational activities using information contained in databases and used in the implementation of educational programs, as well as information technologies, technical means, and information and telecommunications networks that facilitate the transmission of said information over communication lines, as well as interaction between students and teaching staff. *Distance learning technologies* are educational technologies implemented primarily using information and

telecommunications networks through indirect (remote) interaction between students and teaching staff.

The course may be delivered using distance learning technologies and e-learning, in whole or in part. The components of the course's teaching and methodological kit (the course curriculum, assessment and methodological materials, and assessment forms) implemented using distance learning technologies and e-learning contain instructions for their use.

When organizing educational activities using distance learning technologies and e-learning, asynchronous and synchronous methods of interaction between participants in educational relations may be provided through the Internet information and telecommunications network.

When using distance learning technologies and e-learning, the curriculum for the discipline shall indicate: methods of interaction between participants in educational relations via the Internet (videoconferencing, electronic testing); links to the SKFU electronic information and educational environment, to educational platforms and resources of other organizations that are openly accessible via the Internet; for synchronous learning - the time of online classes and teachers; for asynchronous learning - the authors of online courses.

When organizing midterm assessment using distance learning technologies and e-learning, the Methodological Recommendations for the Application of Technical Means Ensuring the Objectivity of Results during Midterm and State Final Assessments for Higher Education Programs— Bachelor's Degree Programs , Specialist Programs , and Master's Degree Programs Using Distance Learning Technologies—are used (Letter of the Ministry of Education and Science of the Russian Federation dated December 7, 2020, No. MN-19/1573-AN "On the Submission of Methodological Recommendations").

The implementation of the discipline with the use of e-learning and distance learning technologies is carried out using the electronic information and educational environment of SKFU, to which students have access via the information and telecommunications network "Internet", or using the resources of other organizations, including platforms that provide services for video conferencing, online meetings and distance learning (MTS-link), as well as using the capabilities of social networks for communication between students and teachers.

The educational and methodological support for a discipline implemented using e-learning and distance learning technologies includes a work program, educational and methodological manuals or a course of lectures, methodological instructions for the implementation of various types of educational activities of students provided for by the discipline, and other educational and methodological materials posted in the information and educational environment of SKFU, presented in electronic form.