

Документ подписан простой электронной подписью

Информация о владельце:

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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»

APPROVE

Acting Director of the Institute,
Candidate of Technical Sciences,
Associate Professor A.A. Porohnia

DISCIPLINE WORK PROGRAM

Application of mathematical logic in control systems

Direction of training
Directionality (profile)

Starting year

Form of study

Implemented during the semester

09.04.03 Applied Informatics

Knowledge Management

2026

full-time

1

Developed

Associate Professor of the Department
(developer position)

Amirokov S.R.

S.N.P.

Stavropol 2026 y.

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

The purpose of mastering the discipline is the formation of universal and general professional competencies among students based on the development of a complex of knowledge in the field of applied informatics.

The tasks of mastering the discipline:

- getting an idea about the main structures, objects and tasks of mathematical logic;
- obtaining knowledge about the main results of classical mathematical logic;
- getting an idea about the methods of working with formalized logical theories;
- development of logical and algorithmic intuition.

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

The discipline "Application of mathematical logic in control systems" refers to the disciplines of the mandatory part.

3. The list of planned learning outcomes for the discipline (module), correlated with the planned results of mastering the educational program

Code, wording of competence	Code, indicator wording	Planned learning outcomes for the discipline (module), characterizing the stages of formation of competencies, indicators
UC-1 Ability for abstract thinking, analysis and synthesis	ID-1 UC-1 uses methods of abstract thinking.	uses methods of abstract thinking.
	ID-2 UC-1 uses methods of analysis.	uses methods of analysis.
	ID-3 UC-1 uses synthesis methods.	uses synthesis methods.
UC-4 Ability to self-educate and self-learn new research methods	ID-1 UC-4. uses self-education to master new research methods.	uses self-education to master new research methods.
	ID-2 UC-4. implements independent training in new research methods.	implements independent training in new research methods.
CPC-8 Willingness to act in non-standard situations, bear social and ethical responsibility for the decisions made	ID-1 UC-8. acts in accordance with legal and professional standards in non-standard situations.	acts in accordance with legal and professional standards in non-standard situations.
	ID-2 UC-8. bears social responsibility for the decisions made.	bears social responsibility for the decisions made.
	ID-3 UC-8. bears ethical responsibility for decisions made	bears ethical responsibility for decisions made
CPC-1. Able to independently acquire, develop and apply mathematical, natural science, socio-economic and professional knowledge to solve non-standard problems, including in a new or	ID-1 CPC-1. acquires mathematical, natural science, socio-economic and professional knowledge to solve non-standard problems, including in a new or unfamiliar environment and in an interdisciplinary context	acquires mathematical, natural science, socio-economic and professional knowledge to solve non-standard problems, including in a new or unfamiliar environment and in an interdisciplinary context

unfamiliar environment and in an interdisciplinary context	ID-2 CPC-1. develops mathematical, natural science, socio-economic and professional knowledge to solve non-standard problems, including in a new or unfamiliar environment and in an interdisciplinary context;	develops mathematical, natural science, socio-economic and professional knowledge to solve non-standard problems, including in a new or unfamiliar environment and in an interdisciplinary context;
	ID-3 CPC-1. applies mathematical, natural science, socio-economic and professional knowledge to solve non-standard problems, including in a new or unfamiliar environment and in an interdisciplinary context	applies mathematical, natural science, socio-economic and professional knowledge to solve non-standard problems, including in a new or unfamiliar environment and in an interdisciplinary context
CPC-4 Able to put into practice new scientific principles and research methods	ID-1 CPC-4. puts into practice new scientific principles	Puts into practice new scientific principles
	ID-2 CPC-4. put into practice new research methods	Applies new research methods in practice
CPC-6. Able to explore modern problems and methods of applied informatics and the development of the information society	ID-2 CPC-6. explore modern methods of applied informatics for the development of the information society;	explores modern methods of applied informatics for the development of the information society

4. Scope of academic discipline and forms of control *

Volume of classes: total: 4 credits 108 acad.h.	Full-time education, in acad. hours
contact work:	
Lectures / of which practical training	18
Laboratory work / of which practical training	36
Practical training / of which practical training	
Independent work	90
Forms of control	
Exam	
credit	
credit with an assessment	
Settlement and graphic works	
Coursework	
Test papers	

* Discipline (module) provides for the use of e-learning, distance learning technologies

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

№	Section (topic) of the discipline and summary	Formed competencies, indicators	Full-time			
			Contact work of students with a teacher / of them in the form of practical training, hours			Independent work
			Lectures	Practical training	Laboratory work	
1	Turing machines	UC-1, UC-4, UC-8; CPC-1; CPC-4; CPC-6	2		4	10
2	Recursive functions	UC-1, UC-4, UC-8; CPC-1; CPC-4; CPC-6	2		4	10
3	Algorithms.	UC-1, UC-4, UC-8; CPC-1; CPC-4; CPC-6	2		4	10
4	Predicate calculus	UC-1, UC-4, UC-8; CPC-1; CPC-4; CPC-6	2		4	10
5	Predicates.	UC-1, UC-4, UC-8; CPC-1; CPC-4; CPC-6	2		4	10

6	Method of resolutions in propositional logic	UC-1, UC-4, UC-8; CPC-1; CPC-4; CPC-6	2		4	10
7	propositional calculus	UC-1, UC-4, UC-8; CPC-1; CPC-4; CPC-6	2		4	10
8	Formal theories	UC-1, UC-4, UC-8; CPC-1; CPC-4; CPC-6	2		4	10
9	Statements, formulas, tautologies	UC-1, UC-4, UC-8; CPC-1; CPC-4; CPC-6	2		4	10
	TOTAL for 1 semester		18		36	90
	TOTAL		18		36	90

6. Fund of assessment tools by discipline (module)

The Fund of Evaluation Tools (FOS) by discipline (module) is based on the list of mastered competencies with indication of indicators. FOS provides an objective control of the achievement of the planned learning outcomes. FOS 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, abilities and (or) activity experience that characterize the stages of the formation of competencies (are included in the guidelines for those types of work that are provided for by the curriculum and provide for an assessment of the formation of competencies);
- typical assessment tools necessary for assessing knowledge, skills and the level of competence development.

FOS is an application to this discipline program.

7. Guidelines for students on mastering the discipline

Getting started, each student should take into account the following provisions.

The discipline is built according to the thematic principle, each topic is a logically completed section.

The lecture material is devoted to the consideration of the key, basic provisions of the courses and the explanation of the training tasks submitted for independent work of students.

Laboratory work is aimed at acquiring practical experience in the relevant subject area.

Independent work of students is aimed at independent study of additional material, preparation for laboratory classes, as well as performing all types of independent work.

For the successful mastering of the discipline, it is necessary to perform all types of independent work, using the recommended sources of information.

8. Educational, methodological and information support of the discipline

8.1. The list of basic and additional literature necessary for the development of the discipline (module)

8.1.1. List of basic literature:

1. Peremitina, T.O. Mathematical logic and theory of algorithms / T.O. Peremitina; Ministry of Education and Science of the Russian Federation, Tomsk State University of Control Systems and Radioelectronics (TUSUR). - Tomsk: TUSUR, 2016. - 132 p. : ill. – Access mode: by subscription. – URL: <http://biblioclub.ru/index.php?page=book&id=480886> (date of access: 03/04/2022). – Bibliography: p. 130. - Text: electronic.

2 Mathematical logic and theory of algorithms / comp. A.N. Makokha, A.V. Shaposhnikov, V.V. Berezhnoy; Ministry of Education of the Russian Federation, etc. - Stavropol: NCFU, 2017. - 418 p. – Access mode: by subscription. – URL: <http://biblioclub.ru/index.php?page=book&id=467015> (date of access: 03/04/2022). - Bibliography. in book. – Text : electronic.

3. Zyuzkov, V.M. Mathematical logic and theory of algorithms / V.M. Zyuzkov; Ministry of Education and Science of the Russian Federation, Tomsk State University of Control Systems and Radioelectronics (TUSUR). - Tomsk: El Content, 2015. - 236 p. – Access mode: by subscription. – URL: <http://biblioclub.ru/index.php?page=book&id=480935> (date of access: 03/04/2022). – ISBN 978-5-4332-0197-2. – Text : electronic.

8.1.2. List of additional literature:

1. Likhtarnikov, L. M. Mathematical logic: a course of lectures: practical work and solutions: textbook. manual for universities / L. M. Likhtarnikov, T. G. Sukacheva. - 4th ed., Sr. -

Saint Petersburg ; Moscow ; Krasnodar: Lan, 2009. - 276 p. : ill., tab. ; 21. - (Textbooks for universities. Special literature). – Bibliography: p. 273. - ISBN 978-5-8114-0082-9

2. Sudoplatov, S. V. Elements of discrete mathematics: textbook. for universities / S. V. Sudoplatov, E. V. Ovchinnikova; Novosib. state tech. un-t. – M.: INFRA-M; Novosibirsk: NSTU, 2002. - 280 p. - (Higher education). – Bibliography: p. 241-242. - App.: p. 243-269. – Prem. decree: p. 270-280. – ISBN 5-16-000957-4 (INFRA-M). – ISBN 5-7782-0332-2 (NSTU)

8.2. The list of educational and methodological support for independent work of students in the discipline

1. Likhtarnikov, L. M. Mathematical logic: a course of lectures: practical work and solutions: textbook. manual for universities / L. M. Likhtarnikov, T. G. Sukacheva. - 4th ed., Sr. - Saint Petersburg ; Moscow ; Krasnodar: Lan, 2009. - 276 p. : ill., tab. ; 21. - (Textbooks for universities. Special literature). – Bibliography: p. 273. - ISBN 978-5-8114-0082-9

2. Sudoplatov, S. V. Elements of discrete mathematics: textbook. for universities / S. V. Sudoplatov, E. V. Ovchinnikova; Novosib. state tech. un-t. – M.: INFRA-M; Novosibirsk: NSTU, 2002. - 280 p. - (Higher education). – Bibliography: p. 241-242. - App.: p. 243-269. – Prem. decree: p. 270-280. – ISBN 5-16-000957-4 (INFRA-M). – ISBN 5-7782-0332-2 (NSTU)

8.3. The list of resources of the information and telecommunication network "Internet", necessary for the development of the discipline

www.biblioclub.ru - Electronic library system "University Library Online"

www.eLibrary.ru - Scientific electronic library

www.iprbookshop.ru - Electronic library system IPRbooks

9. The list of information technologies used in the implementation of the educational process in the discipline (module), including the list of software and information reference systems

When lecturing, computer technology is used, presentation multimedia materials are demonstrated. In seminars and practical classes, students present presentations prepared by them during self-study hours.

Information reference systems:

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

1	КонсультантПлюс - http://www.consultant.ru/
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Программное обеспечение:

1	Операционная система: Astra Linux
2	P7-Офис

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

Lecture classes	Classroom for conducting training sessions, equipped with multimedia equipment and teaching aids.
Laboratory studies	The classroom for conducting seminar-type classes is equipped with specialized furniture and technical teaching aids that serve to present educational information: a projector, an interactive whiteboard. There is an Internet connection, access to the educational network of the university.
Independent work	A room for independent work of students equipped with computer equipment with the ability to connect to the Internet and the ability to access the electronic information and educational environment of the university

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

Mastering the discipline (module) by students with disabilities can be organized jointly with other students, as well as in separate groups.

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

In order to make higher education accessible to persons with disabilities in the course of mastering a discipline (module), the following is ensured:

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 a workplace, move around, read and complete the task, including taking dictation),

- written assignments, as well as instructions on the order of their implementation, are made out in an enlarged font,

- special textbooks, teaching aids and didactic materials (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 task;

2) for people with hearing disabilities:

- the presence of an assistant who provides the student with the necessary technical assistance, taking into account individual characteristics (helps to take a workplace, move around, read and complete the task, including taking dictation),

- the availability of sound amplifying equipment for collective use is ensured, if necessary, the student is provided with sound amplifying equipment for individual use;

- provided with appropriate sound means of information reproduction;

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

- written tasks are performed on a computer with specialized software or dictated to an assistant;

- at the request of the student, tasks can be performed orally.

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

According to Part 1 of Article 16 of the Federal Law of December 29, 2012 No. 273-FZ "On Education in the Russian Federation", e-learning is understood as the organization of educational activities using the information contained in databases and used in the implementation of educational programs and information technologies that ensure its processing, technical means, as well as information and telecommunication networks that ensure the transmission of the specified information over communication lines, the interaction of students and teachers. Distance educational technologies are understood as educational technologies implemented mainly with the use of information and telecommunication networks with indirect (at a distance) interaction between students and teachers.

The implementation of the discipline can be carried out using distance learning technologies and e-learning in whole or in part. The components of the teaching materials of the discipline (the work program of the discipline, assessment and methodological materials, certification forms), implemented using distance learning technologies and e-learning, contain an indication of their use.

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

When using distance learning technologies and e-learning, the schedule for the discipline indicates: ways of implementing the interaction of participants in educational relations through the information and telecommunication network "Internet" (VCS-video conferencing, ET - electronic testing); links to the electronic information and educational environment of the NCFU, to educational platforms and resources of other organizations, to which open access is provided through the information and telecommunication network "Internet"; for synchronous learning - the time of online classes and teachers; for asynchronous learning - authors of online courses.

When organizing intermediate certification using distance learning technologies and e-learning, Methodological recommendations are used for the use of technical means that ensure the objectivity of the results when conducting intermediate and state final certification for educational programs of higher education - bachelor's programs, specialist's programs and master's programs using distance learning technologies (Letter of the Ministry of Education and Science of the Russian Federation of December 7, 2020 No. MN-19/1573-AN "On the submission of methodological recommendations").

The implementation of the discipline using e-learning and distance educational technologies is carried out using the electronic information and educational environment of NCFU, which is accessible to students via the Internet, or using the resources of other organizations, including platforms that provide services for video conferences, online meetings, and distance learning (MTS-Link), as well as using the capabilities of social networks for communication between students and teachers.

Educational and methodological support of the discipline implemented using e-learning and distance learning technologies includes a work program presented in electronic form, teaching aids or a course of lectures, methodological instructions for performing 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 the NCFU.