

Документ подписан простой электронной подписью

Информация о владельце:

ФИО: Порохня Андрей Алексеевич

Должность: И.о. директора института перспективных исследований

Дата подписания: 02.06.2026 12:57:32

Уникальный программный ключ:

990bea3aeec48c23bd8699e48288f8d1960c600

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

WORKING PROGRAM OF THE DISCIPLINE
Multidimensional data analysis

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

09.04.03 Applied Informatics
Knowledge Management 2026
full-time1
1

Developed by
Associate Professor of the Department of
Computational Mathematics
and Cybernetics
(developer job title)
Lapina M.A.
Full name

Stavropol 2026

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

The goal of mastering the discipline is to develop students' universal and general professional competencies based on the acquisition of a set of knowledge in the field of applied computer science.

Objectives for mastering the discipline:

1. development of personal and professional qualities in the master's degree student that enable him to carry out professional activities related to the analysis, development and implementation of information and analytical systems; 2. study by master's degree students of the problems and areas of application of methods for automating the analysis of information preparation for making management decisions using modern tools of wide application and specialized application software packages;
3. understanding the fundamentals of the problems and areas of application of artificial intelligence, expert and knowledge-based systems.

2. The place of the discipline (module) in the structure of the educational program The discipline "Multidimensional data analysis" is a compulsory discipline. It is mastered in the first semester.

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

Code, wording competencies	Code, indicator formulation	Expected results training in the discipline (module), characterizing stages formations competencies, indicators
OPK-4 Capable put into practice new scientific principles And methods research	ID-2 OPK-4. apply on practice new methods research	applies in practice new methods research
OPK-2 Capable develop original algorithms software in that using modern intellectual technologies, solutions professional tasks	ID-1 OPK-2. develop algorithms for professional dtasks;	is developing original algorithms for solution professional tasks
	ID-2 OPK-2. develop means for professional tasks	is developing software for solving professional tasks
PC-2 Develop to implement new competitive ideas in the field	ID-1 PC-2. Develop new ones competitive ideas in the field applied computer science.	develops new ones competitive ideas in the field applied informatics

applied computer science	ID-2PC-2.To implement new competitive ideas in the field applied computer science	implements new competitive ideas in the field applied informatics
PC-3. Apply develop fundamental interdisciplinary knowledge, methods scientific research And tools, including Mathematical scientific principles, methods applied computer science, algorithms and complexes programs	ID-1 PC-3. develop fundamental interdisciplinary knowledge ID-2PC-3. Develop methods scientific research	develops fundamental interdisciplinary knowledge develops methods of scientific research
OPK-6. Capable research modern problems and applied methods informatics and development informational societies	ID-2 OPK-6. research modern applied computer science for development informational societies;	explores modern applied methods informatics for the development of information societies

4. Volume of academic discipline and forms of control *

Number of classes: total: 4 credits, 144 academic hours.	OFO, in academic hours
Contact work:	
Lectures/including practical training	18
Laboratory work/including practical training	27
Practical classes/including practical training	
Independent work	90
Forms of control	
Exam	
Credit	
Credit with grade	1st semester
Calculation and graphic works	
Coursework	
Tests	

* The course (module) involves the use of e-learning, distance learning technologies(unless otherwise established by the educational standard)

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	Formable competencies , indicators	full-time				Forms of current control academic performance
			Contact work students with teacher /from them in shape practical preparation, hours			Independent work, hours	
			Lectures	Practical classes	Laboratory works		
1	Main directions of intellectualization of applied systems and systems decision making	OPK-2, OPK-4, OPK-6, PC-2, PC-3	2		4	10	Interview
2	Knowledge representation in intelligent systems	OPK-2, OPK-4, OPK-6, PC-2, PC-3	2		4	10	Interview
3	Structure and main components of applied intelligent systems	OPK-2, OPK-4, OPK-6, PC-2, PC-3	2		4	10	Interview
4	Classification of applied intelligent systems	OPK-2, OPK-4, OPK-6, PC-2, PC-3	2		4	10	Interview
5	Basic concepts and definitions of decision theory	OPK-2, OPK-4, OPK-6, PC-2, PC-3	2		4	10	Interview

6	Decision Making Using Statistical Hypothesis Testing	OPK-2, OPK-4, OPK-6, PC-2, PC-3	2		4	10	Interview
7	Bayesian and sequential decision making procedures	OPK-2, OPK-4, OPK-6, PC-2, PC-3	2		4	10	Interview
8	Decision making using discriminant analysis	OPK-2, OPK-4, OPK-6, PC-2, PC-3	2		4	10	Interview
9	Tree-like classifiers	OPK-2, OPK-4, OPK-6, PC-2, PC-3	2		4	10	Interview
	TOTAL for 1 semester		18		36	90	
	TOTAL		18		36	90	

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

The Fund of Assessment Tools (FAST) for a discipline (module) is based on a list of mastered competencies with indicators. FAST ensures objective control over the achievement of planned learning outcomes. FAST includes:

- description of indicators and criteria for assessing competencies at various stages their formation, description of assessment scales;
- methodological materials defining the procedures for assessing knowledge and skills, skills and (or) experience of activities that characterize the stages of formation of competencies (included in the methodological 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 level formation of competencies.

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

7. Methodological instructions for students on mastering the discipline

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

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

The lecture material is devoted to the examination of key, basic provisions of the courses and the explanation of educational assignments assigned to students for independent work.

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 completion of all types of independent work.

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

8. Educational, methodological and informational support of the discipline

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

List of main literature:

1. Krutikov, V.N. Data analysis / V.N. Krutikov, V.V. Meshechkin; Ministry of Education and Science of the Russian Federation, Federal State Budgetary Educational Institution of Higher Professional Education "Kemerovo State University". - Kemerovo: Kemerovo State University, 2014. - 138 p. : ill. - Access mode: by subscription. - URL: <http://biblioclub.ru/index.php?page=book&id=278426> (date of access: 04.03.2022). - Bibliography in the book. - ISBN 978-5-8353-1770-7. - Text: electronic.

2. Zhukovsky, O.I. Information technology and data analysis / O.I. Zhukovsky ; Ministry of Education and Science of the Russian Federation, Tomsk State University of Control Systems and Radioelectronics (TUSUR). - Tomsk: El Content, 2014. - 130 p.: diagrams, ill. - Access mode: by subscription. - URL: <http://biblioclub.ru/index.php?page=book&id=480500> (date of access: 04.03.2022). - Bibliography: p. 126. - ISBN 978-5-4332-0158-3. - Text: electronic.

3. Information systems and technologies in economics and management: a textbook for bachelors / edited by V.V. Trofimov; St. Petersburg State University of Economics and Finance. – 4th ed., revised and enlarged. – Moscow: Yurait, 2013. – 542 p. – (Bachelor. Basic course). – Stamp: Add. UMO.

– Bibliography at the end of chapters. – ISBN 978-5-9916-2351-3.

List of additional literature:

1. Goryainova, E.R. Applied methods of statistical data analysis / E.R. Goryainova, A.R. Pankov, E.N. Platonov. - Moscow: Publishing House of the Higher School of Economics, 2012. - 312 p. - Access mode: by subscription. - URL: <http://biblioclub.ru/index.php?page=book&id=227280> (date of access: 04.03.2022). - ISBN 978-5-7598-0866-4. - Text: electronic.

2. Akperov, I. G. Information technologies in management: textbook / I. G. Akperov, A. V. Smetanin, I. A. Konopleva. - Moscow: INFRA-M, 2012. - 399, [1] p. : ill., table. ; 23 cm - (Higher education). - Neck: Add. UMO. - Bibliography: p. 394-397. - ISBN 978-5-16-005001-0

List of educational and methodological support for independent work students in the discipline

1. Goryainova, E.R. Applied methods of statistical data analysis / E.R. Goryainova, A.R. Pankov, E.N. Platonov. - Moscow: Publishing House of the Higher School of Economics, 2012. - 312 p. - Access mode: by subscription. - URL: <http://biblioclub.ru/index.php?page=book&id=227280> (date of access: 04.03.2022). - ISBN 978-5-7598-0866-4. - Text: electronic.

2. Akperov, I. G. Information technologies in management: textbook / I. G. Akperov, A. V. Smetanin, I. A. Konopleva. - Moscow: INFRA-M, 2012. - 399, [1] p. : ill., table. ; 23 cm - (Higher education). - Neck: Add. UMO. - Bibliography: p. 394-397. - ISBN 978-5-16-005001-0

List of resources of the information and telecommunications network "Internet", necessary for mastering 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. List of information technologies used in the implementation educational process for the discipline (module), including a list of software and information reference systems

When delivering lectures, computer technology and demonstrations of presentation multimedia materials are used. During seminars and practical classes, students present presentations prepared by them during their independent work hours.

Information reference systems:

Information and reference and information and legal systems used in studying the discipline:

1	ConsultantPlus - http://www.consultant.ru/
---	--

Software:

1	Operating system: Astra Linux
2	R7-Office

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

Lectures classes	A classroom for conducting classes, equipped with multimedia equipment and technical teaching aids.
---------------------	---

Laboratory2 classes	The classroom for conducting seminar-type classes is equipped with specialized furniture and technical teaching aids used to present educational information: a projector, an interactive board. There is an Internet connection, access to the university's educational network.
Independent Job	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 health opportunities

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 tiflosigners.

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

The mastery of the 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 persons with disabilities, when mastering a discipline (module), 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 a workplace, move around, read and complete an assignment, including writing down dictation),
- written assignments, as well as instructions on the procedure for completing them, are drawn up in large font,
- special textbooks, teaching aids and didactic materials (having large font or audio files),
- individual uniform illumination of at least 300 lux,
- if necessary, the student is provided with the necessary information to complete the assignment magnifying device;

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 a workplace, move around, read and complete an assignment, including writing down dictation),
 - the availability of collective sound amplification equipment is ensured
- use, if necessary, the student is provided with sound amplification equipment for individual use;
- is provided with appropriate sound means of reproducing information;

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

²The list of laboratories used in the educational process is presented <https://www.ncfu.ru/sveden/objects/>

- 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 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 information contained in databases and used in the implementation of educational programs and the information technologies, technical means, and information and telecommunication networks that ensure its processing, ensuring the transmission of the specified information via communication lines, and the interaction of students and teaching staff. *distance learning technologies* are understood as educational technologies implemented mainly using information and telecommunication networks with indirect (at a distance) interaction between students and teaching staff.

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 and methodological kit of the discipline (work program of the discipline, assessment and methodological materials, forms of certification), 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 methods of interaction between participants in educational relations may be provided via the Internet information and telecommunications network.

When using distance learning technologies and electronic learning, the schedule for the discipline shall indicate: methods of interaction between participants in educational relations via the information and telecommunications network

"Internet" (VKS-videoconferencing, ET - electronic testing); links to the electronic information and educational environment of SKFU, to educational platforms and resources of other organizations, to which open access is provided via the information and telecommunications network "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 use of technical means that ensure the objectivity of results during midterm and state final assessment 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 Russia dated 07.12.2020 No. MN-19/1573-AN "On the direction 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.

The educational and methodological support of the 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.