

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

Data visualization

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)

Orlova A.Y.

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:

- to form in the masters an understanding of the principles and skills of data pre-processing for subsequent visualization;
- to form the theoretical and practical foundations for the application of visualization techniques for various types and data structures;
- to form the theoretical foundations and practical skills in applying visual analysis techniques to detect hidden patterns in data;
- to form skills in designing and programming data visualization systems.

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

The discipline "Data visualization" 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_3. Ability to manage knowledge in practice: analyze, synthesize, critically summarize and present information	ID-1 UK-3. manage domain knowledge in practice.	manages domain knowledge in practice
	ID-2 UK-3. analyze domain information.	analyzes the information of the subject area.
	ID-3 UK-3. synthesize domain information.	synthesizes domain information
UC-5. The ability to find, process and analyze information from different sources of tasks	ID-1 UK-5. find information from different sources.	finds information from different sources
	ID-2 UK-5., process information from different sources.	processes information from different sources
	ID-3 UK-5. analyze information from different sources.	analyzes information from different sources
CPC-3 Able to analyze professional information, highlight the main thing in it, structure, format and present in the form of analytical reviews with reasonable conclusions and recommendations	ID-1 CPC-3. analyze professional information and present it in the form of analytical reviews with substantiated conclusions and recommendations;	analyzes professional information and presents it in the form of analytical reviews with substantiated conclusions and recommendations
	ID-2 CPC-3. highlight the main points in professional information and present them in the form of analytical reviews with substantiated conclusions and recommendations.	highlights the main points in professional information and presents them in the form of analytical reviews with substantiated conclusions and recommendations

4. Scope of academic discipline and forms of control *

Volume of classes: total: 4 credits 144 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	1 semestr
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	MAIN COMPONENTS OF THE STATISTICAL ENVIRONMENT R	UC-3; UC-5, CPC-3	2		4	10
2	DESCRIPTION OF THE R LANGUAGE	UC-3; UC-5, CPC-3	2		4	10
3	BASIC GRAPHICS R	UC-3; UC-5, CPC-3	2		4	10
4	DESCRIPTIVE STATISTICS AND DISTRIBUTION FITTING	UC-3; UC-5, CPC-3	2		4	10
5	CLASSICAL METHODS AND CRITERIA OF STATISTICS	UC-3; UC-5, CPC-3	2		4	10
6	LINEAR MODELS IN ANALYSIS OF VARIANCE	UC-3; UC-5, CPC-3	2		4	10
7	REGRESSION MODELS OF DEPENDENCES BETWEEN QUANTITATIVE VARIABLES	UC-3; UC-5, CPC-3	2		4	10

8	GENERALIZED, STRUCTURAL AND OTHER REGRESSION MODELS	UC-3; UC-5, CPC-3	2		4	10
9	SPATIAL ANALYSIS OF IS CREATION OF CARTOGRAMS	UC-3; UC-5, CPC-3	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. Bogdanov, M.R. Perspective web development languages / M.R. Bogdanov. - 2nd ed., Rev. - Moscow: National Open University "INTUIT", 2016. - 265 p. : ill. - Access mode: by subscription. - URL: <http://biblioclub.ru/index.php?page=book&id=428953> (date of access: 03/04/2022). - Text : electronic.

2. 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: 03/04/2022). - Bibliography. in book. - ISBN 978-5-8353-1770-7. - Text : electronic.

8.1.2. List of additional literature:

1. Gorbunov, A.A. Automated methods for processing experimental results / A.A. Gorbunov, A.D. Pripadchev; Ministry of Education and Science of the Russian Federation, Federal State Budgetary Educational Institution of Higher Education "Orenburg State University". - Orenburg: OGU, 2016. - 99 p. : ill. - Access mode: by subscription. - URL: <http://biblioclub.ru/index.php?page=book&id=485285> (date of access: 03/04/2022). - Bibliography. in book. - ISBN 978-5-7410-1599-5. - Text : electronic.

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

1. Gorbunov, A.A. Automated methods for processing experimental results / A.A. Gorbunov, A.D. Pripadchev; Ministry of Education and Science of the Russian Federation, Federal State Budgetary Educational Institution of Higher Education "Orenburg State University". - Orenburg: OGU, 2016. - 99 p. : ill. - Access mode: by subscription. - URL: <http://biblioclub.ru/index.php?page=book&id=485285> (date of access: 03/04/2022). - Bibliography. in book. - ISBN 978-5-7410-1599-5. - Text : electronic

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	Р7-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.