МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
Федеральное государственное бюджетное образовательное учреждение высшего образования
«КУБАНСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ»
Факультет - экономический

УТВЕРЖДАЮ:
Проректор по учебной работе, качеству образования – первый проректор
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РАБОЧАЯ ПРОГРАММА ДИСЦИПЛИНЫ (МОДУЛЯ)
Б1.О.02 INFORMATION AND ANALYTICAL SYSTEMS AND TECHNOLOGIES IN THE FINANCIAL SPHERE

Направление подготовки/специальность 38.04.08 Финансы и кредит (Finance and Credit)

Направленность (профиль) / специализация Финансы в цифровой экономике (Finance in the Digital Economy)

Форма обучения очная с использованием электронного обучения и дистанционных образовательных технологий

Квалификация Магистр

Krasnodar 2025

The work program of the discipline "Information and analytical systems and technologies in the financial sphere" is compiled in accordance with the federal state educational standard of higher education in the direction of training 38.04.08 Finance and credit

The program was compiled:
Gish A.Z., docent

The work program of the discipline «System analysis and decision-making in the financial and investment sphere» утверждена на заседании кафедры анализа данных и искусственного интеллекта № 9 от 20 мая 2024 г.

Head of the Department of Data Analysis
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Approved at the meeting of the Educational and Methodological Commission of the Faculty of Computer Technology and Applied Mathematics Protocol № 3 от 21 мая 2024 г.

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1. Objectives and tasks of studying the discipline (module)

1.1. Objective of mastering the discipline

The objective of the discipline B1.0.02 "Information and analytical systems and technologies in the financial sphere" is to form a set of knowledge, skills and abilities in the field of information and analytical systems and technology in the financial sphere based on mathematical, probabilistic, statistical models and the apparatus of financial and computer mathematics. Acquiring skills in working with modern software in the field of financial monitoring, data analysis, artificial intelligence systems, to form a holistic system of knowledge and modern competencies in the field of making financial and investment decisions in masters, as well as the ability to use them when making organizational and managerial decisions in professional activities.

1.2. Objectives of the discipline

The main objective of studying the discipline "Information and analytical systems and technologies in the financial sphere" is the implementation of the requirements established by the Federal State Educational Standard of Higher Education in the field of training 38.04.08 "Finance and Credit", approved by the order of the Ministry of Education and Science of the Russian Federation No. 991 dated 12.08.2020 in the field of training 38.04.08 Finance and Credit, to prepare masters for professional activities in terms of investment project management.

During the study of the discipline, the following objectives are set:

- to study the theoretical and methodological foundations of using information and analytical systems and technologies in the financial sphere;
- to study modern techniques and methods for collecting financial and economic data, processing and analyzing them;
- to study the methods of using electronic resources to search, accumulate, process and transmit information;
- to study the methods of using intelligent information and analytical systems in solving practical and research problems;
- to study modern scientific approaches to data analysis in the financial sphere;
– study modern intelligent information and analytical technologies in solving applied and fundamental problems in the financial sphere;
– study the methodology and standardization of the financial consulting and financial planning process;
– acquire skills in collecting, systematizing and analyzing information to analyze data in the financial sphere;
– acquire skills in using electronic resources to search, accumulate, process and transmit information;
– acquire skills in using intelligent information and analytical systems in solving practical and research problems;
– acquire skills in using software (text, graphic, tabular and analytical applications, applications for visual presentation of data) for data analysis in the financial sphere;
– acquire skills in financial consulting and financial planning using intelligent information and analytical systems;
– develop knowledge and skills in the field of information and analytical systems and technology in the financial sphere;
– develop competencies in using intelligent information and analytical systems in solving practical and research problems;
– develop competencies in using intelligent information and analytical systems in applied and fundamental research in the field of financial relations.

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

The discipline "Information and analytical systems and technologies in the financial sphere" refers to the part formed by the participants of educational relations of Block 1 "Disciplines (modules)" of the curriculum. In accordance with the working curriculum, the discipline is studied in the 1st year of full-time and part-time education. Type of midterm assessment: credit.

The discipline "Information and analytical systems and technologies in the financial sphere" is based on general economic knowledge obtained by students in a number of previous disciplines: financial and economic analysis (advanced level), methodology and organization of economic research, corporate finance in the digital economy, legal regulation in the financial sphere, financial markets and institutions. Knowledge of these disciplines will help graduate students to study in more detail the specifics of using intelligent information and analytical systems in applied and (or) fundamental research in the field of financial relations. This discipline will help to obtain practical skills in the field of using electronic resources for searching, accumulating, processing and transmitting information, to form competencies in using intelligent information and analytical systems in applied and fundamental research in the field of financial relations, to study methods of using intelligent information and analytical systems in solving practical and research problems, to study the theoretical and methodological foundations of using information and analytical systems and technologies in the financial sector. The knowledge, skills and abilities obtained in the process of studying the discipline can be used to study the disciplines of corporate lending technology, modern risk management practice, financial planning and forecasting in the digital economy, financial consulting and in the preparation of the final qualifying work (master's thesis) and in practical activities.

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

The study of this academic discipline is aimed at developing the following competencies in students:

Code and name of indicator* of achievement of competence	Learning outcomes for the discipline
ОПК-2 Able to apply advanced instrumental methods of economic and financial analysis in applied and/or fundamental research in the field of financial relations, including the use of intelligent information and analytical systems	
ИОПК-2.2 - Applies intelligent information and analytical systems in applied and/or fundamental research in the field of financial relations	Knows modern methods of obtaining, analyzing, and processing information. Knows the basic information technologies used in the process of financial consulting.
	Able to assess resource costs for the implementation and operation of the hardware and information component of the financial consulting process. Able to apply advanced instrumental methods of economic and financial analysis in applied and (or) fundamental research in the field of financial relations, including using intelligent information and analytical systems.
	Has a working knowledge of software (text, graphic, tabular and analytical applications, applications for visual presentation of data) for working with information at the level of an experienced user for the purpose of data analysis. Has the ability to assess resource costs for the implementation and operation of the hardware and information component of the financial consulting process

The learning outcomes for the discipline are achieved within the framework of all types of contact and independent work of students in accordance with the approved curriculum.

The indicators of achievement of competencies are considered to be formed upon achievement of the learning outcomes corresponding to them.

2. Structure and content of the discipline

2.1 Distribution of the labor intensity of the discipline by types of work

The total workload of the course is 3 credit units (108 hours), their distribution by types of work is presented in the table.

Types of work	Total hours	Form of study			
		full-time		mixed	correspondence
		2 semester (hour)	X semester (hour)		1 semester (hour)
Contact work, including:	**24,2**	**24,2**			**12,2**
Classroom activities (total):	**24**				**12**
lecture-type classes	6	6			4
laboratory classes	18	18			8
practical classes					
Seminar classes					
Other contact work:					
Independent Work Control (IWC)					
Interim assessment (IA)	0,2	0,2			0,2
Independent work, including:	**83,8**	**83,8**			**92**
Coursework/project (KR/CP) (preparation)	-	-			-
Test	-	-			-

Completion of individual assignments (preparation for practical assignments, implementation of practice-oriented projects)		43,8	43,8			52
Independent study of sections, self-preparation (working through and reviewing lecture material and textbook and teaching aid material, preparing for practical classes, colloquiums, solving problems, etc.)		40	40			40
Control:						**3,8**
Preparing for the exam						3,8
Total labor intensity	**hour**	**108**	**108**			**108**
	including contact work	**24,2**	**24,2**			**12,2**
	зач. ед	**3**	**3**			**3**

2.2 Contents of the discipline

Distribution of types of academic work and their labor intensity by sections of the discipline.

Sections (topics) of the discipline studied in the 1st semester (1st year) (full-time education)

№	Name of sections (topics)	Number of hours				
		Total	Classroom work			Extracurricular work
			Л	ПЗ	ЛР	СРС
1.	Theoretical foundations of the use of information and analytical systems and technologies in the financial sector	23	1		2	20
2.	Methodological tools for using information and analytical systems and technologies in the financial sector	26	2		4	20
3.	Modern information and analytical technologies in solving applied and fundamental problems in the financial sphere	27	1		6	20
4.	Intelligent information and analytical systems in applied and fundamental research in the field of financial relations	31,8	2		6	23,8
	TOTAL by discipline sections	**107,8**	**6**		**18**	**83,8**
	Independent Work Control (IWC)	**-**				
	Interim assessment (IA)	**0,2**				
	Preparing for the test					
	Total workload for the discipline	**108**				

Sections (topics) of the discipline studied in the 1st semester (1st year) (correspondence course)

№	Name of sections (topics)	Number of hours				
		Total	Classroom work			Extracurricular work
			Л	ПЗ	ЛР	СРС
1.	Theoretical foundations of the use of information and analytical systems and technologies in the financial sector	20	-		-	20
2.	Methodological tools for using information and analytical systems and technologies in the financial sector	23	1		2	20
3.	Modern information and analytical technologies in solving applied and fundamental problems in the financial sphere	24	2		2	20

4.	Intelligent information and analytical systems in applied and fundamental research in the field of financial relations	37	1		4	32
	TOTAL by discipline sections	**104**	**4**		**8**	**92**
	Independent Work Control (IWC)	**-**				
	Interim assessment (IA)	**0,2**				
	Preparing for the test	**3,8**				
	Total workload for the discipline	**108**				

Note: L – lectures, PC – practical classes/seminars, LC – laboratory classes, SIW – student independent work

2.3 Contents of sections (topics) of disciplines

2.3.1 Lecture-type classes

№	Section (Topic) Title	Section Contents (Topics)	Current control form
1.	Theoretical foundations of the use of information and analytical systems and technologies in the financial sector	Basic terms and parameters in the field of economics used to analyze the state of financial and economic activity of an enterprise, quickly formed by using information technologies at the enterprise. Basic principles of designing information systems in the field of economics. Basic concepts of statistical, intelligent information and analytical systems, regression models, neural networks, fuzzy production and hybrid systems.	Control questions
2.	Methodological tools for using information and analytical systems and technologies in the financial sector	Using electronic resources to search, accumulate, process and transmit information. The main types of mathematical models used to analyze various socio-economic systems and application software for them. Mathematical apparatus and information technologies in the field of business processes for setting the task of business analytics and its implementation. Methods of system analysis regarding socio-economic tasks and processes. Theory of system analysis in the field of economics for analyzing the economic situation. Calculations on technical and economic justifications of project solutions. The main methods of analyzing socio-economic tasks and processes using methods of system analysis, mathematical modeling and financial analysis. Methods of collecting financial information for its subsequent analysis. Methodology for justifying the cost of project solutions in the field of applied informatics in economics. Architecture of modern databases and basic algorithms for maintaining databases. Mathematical models for various socio-economic tasks.	Control questions
3.	Modern information and analytical technologies in solving applied and fundamental problems in the financial sphere	Basic modern information and analytical technologies in solving applied and fundamental problems in the financial sphere. Use of multivariate statistical data analysis systems in the financial sphere. Regression, cluster, discriminant, factor analysis. Financial consulting and financial planning using statistical information and analytical systems. Use of software (text, graphic, tabular and analytical applications, applications for visual presentation of data) for data analysis in the financial sphere.	Control questions

4.	Intelligent information and analytical systems in applied and fundamental research in the field of financial relations	Intelligent information and analytical systems in applied and fundamental research in the field of financial relations. Using artificial intelligence systems to analyze data in the financial sphere. Using neural network technologies to analyze data in the financial sphere. Using hybrid systems to analyze data in the financial sphere. Developing applications and creating software prototypes for solving applied problems in the field of financial analysis and monitoring the current situation. Fundamentals of programming applications and creating software prototypes for solving applied problems in the field of financial analysis and monitoring the current situation. Financial consulting and financial planning using intelligent information and analytical systems.	Control quetions

2.3.2 Seminar-type classes (practical/seminar classes/laboratory work)

№	Section (Topic) Title	Section Contents (Topics)	Current control form
1.	Theoretical foundations of the use of information and analytical systems and technologies in the financial sector	Basic terms and parameters in the field of economics used to analyze the state of financial and economic activity of an enterprise, quickly formed by using information technologies at the enterprise. Basic principles of designing information systems in the field of economics. Basic concepts of statistical, intelligent information and analytical systems, regression models, neural networks, fuzzy production and hybrid systems.	Colloquium, tasks
2.	Methodological tools for using information and analytical systems and technologies in the financial sector	Using electronic resources to search, accumulate, process and transmit information. The main types of mathematical models used to analyze various socio-economic systems and application software for them. Mathematical apparatus and information technologies in the field of business processes for setting the task of business analytics and its implementation. Methods of system analysis regarding socio-economic tasks and processes. Theory of system analysis in the field of economics for analyzing the economic situation. Calculations on technical and economic justifications of project	Colloquium, tasks
3	Modern information and analytical technologies in solving applied and fundamental problems in the financial sphere	Basic modern information and analytical technologies in solving applied and fundamental problems in the financial sphere. Use of multivariate statistical data analysis systems in the financial sphere. Regression, cluster, discriminant, factor analysis. Financial consulting and financial planning using statistical information and analytical systems. Use of software (text, graphic, tabular and analytical applications, applications for visual presentation of data) for data analysis in the financial sphere.	Colloquium, tasks
4.	Intelligent information and analytical systems in applied and fundamental research in the field of financial relations	Intelligent information and analytical systems in applied and fundamental research in the field of financial relations. Using artificial intelligence systems to analyze data in the financial sphere. Using neural network technologies to analyze data in the financial sphere. Using hybrid systems to analyze data in the financial sphere. Developing applications and creating software prototypes for solving applied problems in the field of financial analysis and monitoring the current situation. Fundamentals of programming applications and creating software prototypes for solving applied problems in the field of financial analysis and monitoring the current situation. Financial consulting and financial planning using intelligent information and analytical systems.	Colloquium, Practice-oriented project

*Coursework (KR), calculation and graphic task (RGZ), writing an abstract (R), essay (E), colloquium (K), testing (T), round table (KS), (D) - discussion, individual practical task (IPT), etc. When studying the discipline, e-learning, distance learning technologies in accordance with the Federal State Educational Standard of Higher Education can be used.

2.3.3 Approximate topics for term papers (projects) – not provided.

2.4 List of educational and methodological support for independent work of students in a discipline (module)

№	Type of independent student work	List of educational and methodological support for the discipline on independent work
1	Lecture and seminar type classes	Methodological guidelines for preparation for lecture and seminar classes. Approved at a meeting of the Council of the Faculty of Economics of the Federal State Budgetary Educational Institution of Higher Education "Kuban State University". Minutes No. 1 of August 30, 2018. Access mode: https://www.kubsu.ru/ru/econ/metodicheskie-ukazaniya
2	Preparation of essays, papers, term papers.	Methodological guidelines for preparation for lecture and seminar classes. Approved at a meeting of the Council of the Faculty of Economics of the Federal State Budgetary Educational Institution of Higher Education "Kuban State University". Minutes No. 1 of August 30, 2018. Access mode: https://www.kubsu.ru/ru/econ/metodicheskie-ukazaniya
3	Carrying out laboratory work	Methodological guidelines for preparation for lecture and seminar classes. Approved at a meeting of the Council of the Faculty of Economics of the Federal State Budgetary Educational Institution of Higher Education "Kuban State University". Minutes No. 1 of August 30, 2018. Access mode: https://www.kubsu.ru/ru/econ/metodicheskie-ukazaniya
4	Completion of independent work by students	Methodological guidelines for preparation for lecture and seminar classes. Approved at a meeting of the Council of the Faculty of Economics of the Federal State Budgetary Educational Institution of Higher Education "Kuban State University". Minutes No. 1 of August 30, 2018. Access mode: https://www.kubsu.ru/ru/econ/metodicheskie-ukazaniya
5	Execution of calculation and graphic tasks	Methodological guidelines for preparation for lecture and seminar classes. Approved at a meeting of the Council of the Faculty of Economics of the Federal State Budgetary Educational Institution of Higher Education "Kuban State University". Minutes No. 1 of August 30, 2018. Access mode: https://www.kubsu.ru/ru/econ/metodicheskie-ukazaniya
6	Interactive teaching methods	Methodological guidelines for preparation for lecture and seminar classes. Approved at a meeting of the Council of the Faculty of Economics of the Federal State Budgetary Educational Institution of Higher Education "Kuban State University". Minutes No. 1 of August 30, 2018. Access mode: https://www.kubsu.ru/ru/econ/metodicheskie-ukazaniya

Educational and methodological materials for the independent work of students with disabilities and persons with disabilities are provided in forms adapted to the limitations of their health and perception of information.:

For people with visual impairments:

– in printed form in enlarged font,

– in the form of an electronic document,

– in the form of an audio file,

– in printed form in Braille.

For people with hearing impairments:

– in printed form,

– in the form of an electronic document.

For people with musculoskeletal disorders:

– in printed form,

– in the form of an electronic document,

– in the form of an audio file.

1. **Educational technologies used in the development of the discipline (module)**

During the study of the discipline, the use of the following educational technologies is provided: lectures, laboratory work, independent work of students.

The competence-based approach in teaching the discipline is implemented in the use of interactive technologies and active methods (design techniques, analysis of specific situations of other forms) in combination with extracurricular work.

Information technologies used in the study of the discipline: the use of information resources available on the Internet information and telecommunications network.

Adaptive educational technologies used in the study of the discipline – consultations using e-mail are provided for people with disabilities.

2. **Assessment tools for ongoing academic performance monitoring and intermediate assessment**

Assessment tools are designed to monitor and evaluate the educational achievements of students who have mastered the program of the discipline "System analysis and decision-making in the financial and investment sphere."

Assessment tools include control materials for conducting ongoing control in the form of multi-level tasks, situational tasks, solving practical problems and intermediate certification in the form of questions and assignments for assessment.

The structure of assessment tools for current and interim assessment

The code and name of the indicator (in accordance with p. 1.4)	Learning outcomes (according to p. 1.4)	Name of the evaluation tool	
		Current control	Intermediate certification
ИОПК-2.2 - Applies intelligent information and analytical systems in applied and/or fundamental research in the field of financial relations	Knows modern methods of obtaining, analyzing and processing information.	Section 1, Colloquium Topic 1, Discussion Topic 1, Test	Questions 1-11
	Knows the basic information technologies used in the financial consulting process.	Section 1.2, colloquium topic 2	Questions 9-11, 13-21
	Able to assess resource costs for the implementation and operation of the hardware and information component of the financial consulting process.	Section 2,3,4, survey, colloquium topic 3, practice-oriented project	Questions 12, 25-29
	Able to apply advanced instrumental methods of economic and financial analysis in applied and/or fundamental research in the field of financial relations, including the use of intelligent information and analytical systems.	Section 2,3,4, survey, colloquium topic 4, practice-oriented project	Questions 22-23, 31-34
	Proficient in software (text, graphic, tabular and analytical applications, applications for visual presentation of data) for working with information at the level of an experienced user for the purpose of data analysis.	Section 2,3,4, survey, colloquium topic 3, practice-oriented project	Questions 12, 19-22, 31-34
	Possesses the ability to assess resource costs for the implementation and operation of the hardware and information component of the financial consulting process.	Section 1.3, survey, practice-oriented project	Questions 24-30
	Possesses the ability to apply advanced instrumental methods of economic and financial analysis in applied and/or fundamental research in the field of financial relations, including the use of intelligent information and analytical systems.	Section 1.4, survey, practice-oriented project	Questions 35-39

Standard control tasks or other materials necessary for assessing knowledge, skills, abilities and (or) experience of activities characterizing the stages of formation of competencies in the process of mastering the educational program

Sample list of questions and tasks:

Example of test questions by topic

Topic 2 Theoretical foundations of using information and analytical systems and technologies in the financial sector

1. Advantages of neural networks.
2. Introduction to neural networks.
3. Stages of neural network development.
4. Parallels from biology. Known types of networks.
5. Basic artificial model.
6. Definition of an artificial neuron.
7. Activation functions.
8. Application of neural networks: pattern recognition, forecasting.
9. Application of neural networks: clustering, classification.
10. Application of neural networks: approximation, control.
11. Kolmogorov-Arnold theorem.
12. Hecht-Nielsen work.

13. Mathematical description of the neural network.
14. Data collection for a neural network.
15. Variable selection and dimensionality reduction.
16. Stages of problem solving.
17. Classification of problems.
18. Hardware implementation of neural networks.
19. Programs for modeling artificial neural networks.
20. Rosenblatt perceptron.
21. Training a single-layer perceptron. Delta rule.
22. Training a multilayer perceptron.
23. Backpropagation algorithm.
24. Retraining and generalization. Data selection.
25. Radial basis function. Basic principles.
26. Probabilistic neural network. PNN networks.
27. Generalized regression neural network (GRNN).
28. Linear network.
29. Neuro-genetic algorithm for input data selection.
30. Supervised and unsupervised learning - learning with and without a teacher.
31. Classification problems.
32. Kohonen network. Topological map.
33. Solving classification problems using different types of neural networks.
34. Classification statistics table.
35. Acceptance and rejection thresholds.
36. Solving regression problems in the ST: Neural Networks package.
37. Time series analysis problems. Forecasting future values of time series.
38. Forecasting time series in the ST: Neural Networks package.
39. Graphical user interface for Neural Networks Toolbox in Matlab.
40. Simple neuron. Activation function.
41. Neuron with vector input.
42. Neural network architecture.
43. Creating, initializing, and modeling a network.
44. Adaptation and learning procedures. Learning methods. Learning algorithms.
45. Perceptrons, linear, radial basis networks.
46. Clustering and classification networks
47. Self-organizing neural networks. LVQ networks.
48. Elman networks. Hopfield networks.
49. Approximation and filtering of signals. Control systems.
50. Computational model of a neural network.
51. Formation of neural network models. Application of the Simulink system.
52. Basic elements of the Matlab system.
53. Basic working techniques.
54. Graphic capabilities.

Examples of tasks on topic 2 Methodological tools for using information and analytical systems and technologies in the financial sector

1. Пре/пост процессирование. Многослойный персептрон (MLP)

Задание 1. Создать нейронную сеть для решения задачи XOR в пакете ST: Neural Networks.

Задание 2. Создать нейронную сеть для аппроксимации функции x^2 в пакете ST: Neural Networks.

Задание 3. Создать нейронную сеть для аппроксимации функции $x^3 - x^2 + 18 / x$ в пакете ST: Neural Networks.

Задание 4. Создать нейронную сеть для решения задачи классификации Ирисов в

пакете ST: Neural Networks.

Задание 5. Создать нейронную сеть для аппроксимации функции $x^4/8 - x^2 + 3x - 5$ в пакете ST: Neural Networks.

Задание 6. Создать нейронную сеть для аппроксимации функции $\sqrt{x^6 - 5x^2 + x} / x$ в пакете ST: Neural Networks.

Задание 8. Создать нейронную сеть для решения задачи регрессии цветов Ириса в пакете ST: Neural Networks.

2. Радиальная базисная функция. Вероятностная нейронная сеть. Обобщенно-регрессионная нейронная сеть. Линейная сеть.

Задание 1. Создать нейронную сеть радиальной базисной функции для решения задачи регрессии цветов Ириса в пакете ST: Neural Networks.

Задание 2. Создать вероятностную нейронную сеть для решения задачи классификации цветов Ириса в пакете ST: Neural Networks.

Задание 3. Создать обобщенно-регрессионную нейронную сеть для решения задачи регрессии цветов Ириса в пакете ST: Neural Networks.

Задание 4. Создать линейную нейронную сеть для решения задачи регрессии цветов Ириса в пакете ST: Neural Networks.

Задание 5. Создать нейронную сеть радиальной базисной функции для аппроксимации функции $\sqrt{x^6 - 5x^2 + x} / x$ в пакете ST: Neural Networks. Сравнить результат с многослойным персептроном.

Задание 6. Создать нейронную сеть радиальной базисной функции для аппроксимации функции $x^3 - x^2 + 18 / x$ в пакете ST: Neural Networks. Сравнить результат с многослойным персептроном.

Задание 7. Создать нейронную сеть радиальной базисной функции для аппроксимации функции $x^4/8 - x^2 + 3x - 5$ в пакете ST: Neural Networks. Сравнить результат с многослойным персептроном.

3. Сеть Кохонена

Задание 1. Создать нейронную сеть Кохонена для решения задачи кластеризации цветов Ириса в пакете ST: Neural Networks. Построить топологическую карту.

Задание 2. Создать нейронную сеть Кохонена для решения задачи кластеризации строительных предприятий Краснодарского края в пакете ST: Neural Networks. Построить топологическую карту.

Задание 3. Создать нейронную сеть Кохонена для решения задачи кластеризации сельскохозяйственных предприятий Краснодарского края в пакете ST: Neural Networks. Построить топологическую карту.

Задание 4. Создать нейронную сеть Кохонена для решения задачи кластеризации торгово-закупочных предприятий Краснодарского края в пакете ST: Neural Networks. Построить топологическую карту.

Задание 5. Создать нейронную сеть Кохонена для решения задачи кластеризации регионов Краснодарского края в пакете ST: Neural Networks. Построить топологическую карту.

Задание 6. Создать нейронную сеть Кохонена для решения задачи кластеризации финансового состояния регионов РФ в пакете ST: Neural Networks. Построить топологическую карту.

Задание 7. Создать нейронную сеть Кохонена для решения задачи кластеризации социального состояния регионов РФ в пакете ST: Neural Networks. Построить топологическую карту.

Задание 8. Создать нейронную сеть Кохонена для решения задачи кластеризации экономического развития регионов РФ в пакете ST: Neural Networks. Построить топологическую карту.

4. Решение задач классификации в пакете ST: Neural Networks

Задание 1. Решить задачу классификации цветов Ириса в пакете ST: Neural Networks. С помощью интеллектуального помощника данных и самостоятельно, используя различные типы нейронных сетей. Сравнить результат. Работу представить в трех видах: печатном (реферат), мультимедийном (презентация) и программном (созданные нейронные сети в пакете ST: Neural Networks). Последние два записать на электронный носитель.

Задание 2. Решить задачу классификации строительных предприятий Краснодарского края в пакете ST: Neural Networks. С помощью интеллектуального помощника данных и самостоятельно, используя различные типы нейронных сетей. Сравнить результат. Работу представить в трех видах: печатном (реферат), мультимедийном (презентация) и программном (созданные нейронные сети в пакете ST: Neural Networks). Последние два записать на электронный носитель.

Задание 3. Решить задачу классификации сельскохозяйственных предприятий в пакете ST: Neural Networks. С помощью интеллектуального помощника данных и самостоятельно, используя различные типы нейронных сетей. Сравнить результат. Работу представить в трех видах: печатном (реферат), мультимедийном (презентация) и программном (созданные нейронные сети в пакете ST: Neural Networks). Последние два записать на электронный носитель.

Задание 4. Решить задачу классификации торгово-закупочных предприятий Краснодарского края в пакете ST: Neural Networks. С помощью интеллектуального помощника данных и самостоятельно, используя различные типы нейронных сетей. Сравнить результат. Работу представить в трех видах: печатном (реферат), мультимедийном (презентация) и программном (созданные нейронные сети в пакете ST: Neural Networks). Последние два записать на электронный носитель.

Задание 5. Решить задачу классификации финансового состояния регионов Краснодарского края в пакете ST: Neural Networks. С помощью интеллектуального помощника данных и самостоятельно, используя различные типы нейронных сетей. Сравнить результат. Работу представить в трех видах: печатном (реферат), мультимедийном (презентация) и программном (созданные нейронные сети в пакете ST: Neural Networks). Последние два записать на электронный носитель.

Задание 6. Решить задачу классификации социального состояния регионов Краснодарского края в пакете ST: Neural Networks. С помощью интеллектуального помощника данных и самостоятельно, используя различные типы нейронных сетей. Сравнить результат. Работу представить в трех видах: печатном (реферат), мультимедийном (презентация) и программном (созданные нейронные сети в пакете ST: Neural Networks). Последние два записать на электронный носитель.

5. GUI интерфейс для ППП NNT

Задание 1. Создать нейронную сеть для решения задачи XOR в пакете Neural Network Toolbox системы Matlab. Сравнить результат с пакетом ST: Neural Networks.

Задание 2. Создать нейронную сеть для аппроксимации функции $\sqrt{x^6 - 5x^2 + x} / x$ в пакете ST: Neural Networks.

Задание 3. Создать нейронную сеть для аппроксимации функции $x^4 / 8 - x^2 + 3x - 5$ в пакете ST: Neural Networks.

Задание 4. Создать нейронную сеть для решения задачи классификации цветов Ириса в пакете ST: Neural Networks.

Задание 5. Создать нейронную сеть для аппроксимации функции $x^3 - x^2 + 18 / x$ в пакете ST: Neural Networks.

Задание 6. Создать нейронную сеть для аппроксимации функции x^2 в пакете ST: Neural Networks.

Задание 7. Создать нейронную сеть для решения задачи регрессии цветов Ириса в пакете ST: Neural Networks.

An example of a practice-oriented project on topic 4 "Intelligent information and analytical systems in applied and fundamental research in the field of financial relations"

The purpose of the task is to demonstrate the ability to assess the resource costs of implementing and operating the hardware and information component of the financial consulting process and the use of advanced instrumental methods of economic and financial analysis in applied and (or) fundamental research in the field of financial relations, including the use of intelligent information and analytical systems. Proficiency in software (text, graphic, tabular and analytical applications, applications for visual presentation of data) for working with information at the level of an experienced user for the purpose of data analysis, as well as the ability to assess the resource costs of implementing and operating the hardware and information component of the financial consulting process. Proficiency in the ability to apply advanced instrumental methods of economic and financial analysis in applied and (or) fundamental research in the field of financial relations, including the use of intelligent information and analytical systems.

The task is given to a group of graduate students. Master's students are divided into several groups (no more than 3-4 people in each), each of the groups is engaged in the development of an intelligent information and analytical system in applied research in the field of financial relations.

In the process of developing an intelligent information and analytical system, it is necessary to use the Statistica environment, the ST: Neural Networks program, the Neural Network Toolbox, Fuzzy, Anfis packages of the Matlab system. Meetings within the framework of planning, development and presentation of the project are held in person and remotely using MS Teams.

The test is an independent abstract work of students. Each master's student completes work on one topic.

To write an abstract, it is necessary to select literature. The total number of literary sources, including texts from the Internet (publications in journals), should be at least 10 titles. Textbooks, as a rule, are not included in literary sources.

Abstracts are completed on A4 sheets. Pages of text, figures, formulas are numbered, figures are provided with figure-by-figure captions. The text should be typed in font No. 14 with a line spacing of 1.5, without unacceptable abbreviations. Conclusions should be made at the end of the abstract.

A list of references is provided at the end of the work.

The abstract should be signed by the student, indicating the date of its completion.

Works completed without observing the listed requirements are returned for revision.

The work completed by the master's student is assigned to the teacher for review within the established time frame. If the teacher has comments, the work is returned and after corrections, it is either sent back for review if the corrections are significant, or presented at the test, where it is defended.

Example of a practice-oriented project

Neural network models in economics are considered today as one of the main new directions of economic modernization, as a necessary condition and the most important method of information processing.

The main directions of fuzzy and neural network technologies in economics:

– organization of a bank of software products used by financiers, economists and regional authorities, based on fuzzy and neural network technologies in economics;

– development of fuzzy models and neural networks in economics;

– development of software based on fuzzy and neural network technologies for municipalities.

The use of fuzzy and neural network technologies in economic activity does not deny traditional technologies of analysis and evaluation, but acts as a product for decision support, which significantly improves the quality of decisions made. Conduct an analysis on one of the topics you have chosen (at least 10 slides and 20 sheets of text). It is possible to use sound, animation (audio and video material).

On the first page of the slide, be sure to indicate the full name of the author, the course. The work is assessed according to the following criteria:

– completeness of the presented material;

– design;

– presentation and defense.

Topics of presentations and reports

– Forecasting the inflation rate using neural and fuzzy-neural networks in the ST: Neural Networks package and in the Neural Network Toolbox and ANFIS packages of the Matlab system.

– Forecasting the dollar exchange rate using neural and fuzzy-neural networks in the ST: Neural Networks package and in the Neural Network Toolbox and ANFIS packages of the Matlab system.

– Forecasting the euro exchange rate using neural and fuzzy-neural networks in the ST: Neural Networks package and in the Neural Network Toolbox and ANFIS packages of the Matlab system.

– Forecasting the yuan exchange rate using neural and fuzzy-neural networks in the ST: Neural Networks package and in the Neural Network Toolbox and ANFIS packages of the Matlab system.

– Forecasting the price of LUKOIL shares using neural and fuzzy-neural networks in the ST: Neural Networks package and in the Neural Network Toolbox and ANFIS packages of the Matlab system.

– Forecasting the price of Rosneft shares using neural and fuzzy-neural networks in the ST: Neural Networks package and in the Neural Network Toolbox and ANFIS packages of the Matlab system.

Criteria for evaluating learning outcomes

Assessment criteria for offsetting:

"credited": the student has theoretical knowledge of this section, knows the terminology, knows the tools of the discipline, makes minor mistakes; the student is able to correctly explain the studied material, illustrating it with examples.

"not counted": the material is not learned or partially learned, the student finds it difficult to give examples within the framework of the studied discipline, inability to use scientific terminology, the presence of gross errors, a rather limited amount of knowledge of the studied material.

Assessment tools for the disabled and people with disabilities are selected taking into account their individual psychophysical characteristics.

– if necessary, people with disabilities and people with disabilities are given additional time to prepare an answer for the exam.;

– when carrying out the procedure for evaluating the learning outcomes of people with disabilities and persons with disabilities, it is envisaged to use the technical means necessary for them in connection with their individual characteristics;

– if necessary, for students with disabilities and people with disabilities, the procedure for evaluating learning outcomes in the discipline can be carried out in several stages.

The procedure for evaluating the learning outcomes of people with disabilities and persons with disabilities in the discipline (module) provides for the provision of information in forms adapted to the limitations of their health and perception of information:

For persons with visual impairments:

– in printed form in enlarged font,

– in the form of an electronic document.

For people with hearing impairments:

– in printed form,

– in the form of an electronic document.

For people with disorders of the musculoskeletal system:

- in printed form,

– in the form of an electronic document.

This list can be specified depending on the number of students.

5. List of educational literature, information resources and technologies

5.1. Educational literature

1. Кудрявцев, В. Б. Интеллектуальные системы : учебник и практикум для вузов / В. Б. Кудрявцев, Э. Э. Гасанов, А. С. Подколзин. — 2-е изд., испр. и доп. — Москва : Издательство Юрайт, 2025. — 165 с. — (Высшее образование). — ISBN 978-5-534-07779-7. — Текст : электронный // Образовательная платформа Юрайт [сайт]. — URL: https://urait.ru/bcode/561954 (дата обращения: 22.06.2025).

2. Болотова, Л. С. Системы поддержки принятия решений : учебник и практикум для вузов / Л. С. Болотова. — Москва : Издательство Юрайт, 2025. — 530 с. — (Высшее образование). — ISBN 978-5-534-20422-3. — Текст : электронный // Образовательная платформа Юрайт [сайт]. — URL: https://urait.ru/bcode/558120 (дата обращения: 22.06.2025).

Дополнительная:

1. Казаковцева Е.В. Нечеткие системы финансово-экономического анализа предприятий и регионов: монография / Е.В. Казаковцева, А.В. Коваленко, М.Х. Уртенов. - г. Краснодар, Издательско-полиграфический центр Кубанского государственного университета, 2013. - 266 с. (10 экз.)

2. Хайкин С. Нейронные сети [Текст]: полный курс / пер. с англ. Н. Н. Куссуль, А. Ю. Шелестова; под ред. Н. Н. Куссуль. - Изд. 2-е, испр. - М.: Вильямс, 2008. - 1103 с. (20 экз.)

3. Ярушкина Н.Г. Интеллектуальный анализ временных рядов: учебное пособие для студентов вузов / Н.Г. Ярушкина, Т.В. Афанасьева, И.Г. Перфильева. - М.: ФОРУМ:

ИНФРА-М, 2012. - 159 с. (14 экз.)
4. Внуков, А. А. Основы информационной безопасности: защита информации : учебное пособие для среднего профессионального образования / А. А. Внуков. — 3-е изд., перераб. и доп. — Москва : Издательство Юрайт, 2024. — 161 с. — (Профессиональное образование). — ISBN 978-5-534-13948-8. — Текст : электронный // Образовательная платформа Юрайт [сайт]. — URL: https://urait.ru/bcode/542340 (дата обращения: 22.06.2025).

5.2. Periodical literature

1. Company databases «Ист Вью» http://dlib.eastview.com
2. Electronic Library GREBENNIKON.RU https://grebennikon.ru/

5.3. Online resources, including modern professional databases and information reference systems

Electronic library systems (ELS):

1. ELS «ЮРАЙТ» https://urait.ru/
2. ELS «УНИВЕРСИТЕТСКАЯ БИБЛИОТЕКА ОНЛАЙН» www.biblioclub.ru
3. ELS «BOOK.ru» https://www.book.ru
4. ELS «ZNANIUM.COM» www.znanium.com
5. ELS «ЛАНЬ» https://e.lanbook.com

Professional databases:

1. Web of Science (WoS) http://webofscience.com/
2. Scopus http://www.scopus.com/
3. ScienceDirect www.sciencedirect.com
4. Publishing house magazines Wiley https://onlinelibrary.wiley.com/
5. Scientific Electronic Library (SEL) http://www.elibrary.ru/
6. Full-text archives of leading Western scientific journals on the Russian Scientific Journal platform НЭИКОН http://archive.neicon.ru
7. National Electronic Library (access to the Electronic Library of Dissertations of the Russian State Library (RSL) https://rusneb.ru/
8. Boris Yeltsin Presidential Library https://www.prlib.ru/
9. Electronic collection of the Oxford Russian Foundationhttps://ebookcentral.proquest.com/lib/kubanstate/home.action
10. Springer Journals https://link.springer.com/
11. Nature Journals https://www.nature.com/siteindex/index.html
12. Springer Nature Protocols and Methods https://experiments.springernature.com/sources/springer-protocols
13. Springer Materials http://materials.springer.com/
14. zbMath https://zbmath.org/
15. Nano Database https://nano.nature.com/
16. Springer eBooks: https://link.springer.com/
17. "Лекториум ТВ" http://www.lektorium.tv/
18. University Information System РОССИЯ http://uisrussia.msu.ru

Information reference systems:

1. Консультант Плюс - legal reference system (LAN access from library computers)

Free access resources:

1. American Patent Database http://www.uspto.gov/patft/
2. Full texts of Canadian theses http://www.nlc-bnc.ca/thesescanada/

3. КиберЛенинка (http://cyberleninka.ru/);
4. Ministry of Science and Higher Education of the Russian Federation https://www.minobrnauki.gov.ru/;
5. Федеральный портал "Российское образование" http://www.edu.ru/;
6. Информационная система "Единое окно доступа к образовательным ресурсам" http://window.edu.ru/;
7. Единая коллекция цифровых образовательных ресурсов http://school-collection.edu.ru/ .
8. Федеральный центр информационно-образовательных ресурсов (http://fcior.edu.ru/);
9. Проект Государственного института русского языка имени А.С. Пушкина "Образование на русском" https://pushkininstitute.ru/;
10. Справочно-информационный портал "Русский язык" http://gramota.ru/;
11. Служба тематических толковых словарей http://www.glossary.ru/;
12. Словари и энциклопедии http://dic.academic.ru/;
13. Образовательный портал "Учеба" http://www.ucheba.com/;
14. Законопроект "Об образовании в Российской Федерации". Вопросы и ответы http://xn--273--84d1f.xn--p1ai/voprosy_i_otvety

Kuban State University own electronic educational and information resources:

1. Modular Dynamic learning environment http://moodle.kubsu.ru
2. Database of curricula, educational and methodical complexes, publications and conferences http://mschool.kubsu.ru/
3. Library of Information Resources of the Department of Information Educational Technologies http://mschool.kubsu.ru;
4. Electronic archive of documents KubSU http://docspace.kubsu.ru/
5. Electronic educational resources of the Department of Information Systems and Technologies in Education of KubSU and the scientific and Methodological journal "ШКОЛЬНЫЕ ГОДЫ" http://icdau.kubsu.ru/

6. Methodological guidelines for students on mastering the discipline (module)

The course provides lectures, which provide basic theoretical material, laboratory classes, allowing students to fully familiarize themselves with system analysis and decision-making in the financial and investment sphere and get used to solving practical problems.

The most important stage of the course is independent work on the discipline "System analysis and decision-making in the financial and investment sphere".

The aim of the master's independent work is to deepen the knowledge gained as a result of classroom activities. Independent work skills are being developed. The experience and knowledge gained during laboratory classes are consolidated.

The independent work of students in the course of studying the discipline consists in performing individual tasks set by the teacher conducting laboratory classes, preparing theoretical material for laboratory classes, based on lecture notes and educational literature, according to the calendar plan and preparing theoretical material for the test, according to the questions.

Instructions for the design of works:

- Laboratory work and lecture notes can be done on separate sheets or directly in a workbook.;

- registration of individual tasks (reports) preferably in the form of files in MS Word or MS Excel format. The result of the student's independent work is a report in which, based on the original table of source data, the student independently analyzes the data using all the methods studied during the course and submits it for verification in electronic form.

Verification of individual assignments on topics discussed in laboratory classes is carried out a week later in the current laboratory lesson, or within a week after this lesson for consultation.

To clarify unclear issues, the lecturer and the assistant hold weekly consultations, the time of which the groups are notified in advance.

Individual educational work (consultations), which is an additional explanation of the educational material, is of great importance in the development of the discipline by people with disabilities and persons with disabilities.

Individual consultations on the subject are an important factor contributing to the individualization of learning and the establishment of educational contact between a teacher and a student with a disability or a person with disabilities.

7. Logistical support for the discipline (module)

Name of special premises	Equipment of special rooms	List of licensed software
Classrooms for lecture-type classes	Furniture: educational furniture Technical training facilities: screen, projector, laptop	Microsoft Windows 8, 10, Microsoft Office Professional Plus
Classrooms for seminar-type classes, group and individual consultations, ongoing monitoring and intermediate certification	Furniture: educational furniture Technical training facilities: screen, projector, laptop	Microsoft Windows 8, 10, Microsoft Office Professional Plus
Classrooms for laboratory work	Furniture: educational furniture Technical training facilities: screen, projector, laptop	Microsoft Windows 8, 10, Microsoft Office Professional Plus 1C: Предприятие 8 SPSS Statistics
Laboratory of Information and Control Systems 201H	Equipment: PC, Terminal stations, Wireless stand-alone amplifier	Microsoft Windows 8, 10, Microsoft Office Professional Plus
Laboratory of Economic Informatics 202H		Microsoft Windows 8, 10, Microsoft Office Professional Plus 1C: Предприятие 8
Laboratory of management in Technical systems 207H	Standard set of educational equipment "Theory of automatic control", Presentations and posters Stand-alone Wireless Amplifier with Microphone	
Laboratory of organizational and technological support of trade and marketing activities 201A	Interactive panel, Conference system, Mixer-amplifier, Acoustic feedback suppressor, Wall speaker, Radio system, Microphone on a flexible holder, HP monoblock, Document camera, Wireless access point, Video display system, LCD panel, Splitter, Multimedia lectern lecturer, Video conferencing system, Posters	Microsoft Windows 8, 10, Microsoft Office Professional Plus
Laboratory of Economics and Management 212H	Presentations and posters, Multifunctional professional video detector of banknotes and	Microsoft Windows 8, 10, Microsoft Office Professional Plus

Laboratory of Life Safety 105A	securities, Banknote counters, Infrared Banknote and Securities detector, Universal Banknote and securities detector, Banknote Authenticity Detector, Cash drawer, Tablet Imprinter, The amplifier is self-contained wireless Laboratory stands, Standard set of educational equipment, Simulator stands, Tablet stand, A training complex for the use of primary fire extinguishing equipment, a simulator complex for first aid, A simulator robot, a set of posters, a set of demonstration manuals, a set of audiovisual manuals	Microsoft Windows 8, 10, Microsoft Office Professional Plus
Classrooms for course design (course work)	Furniture: educational furniture Technical training facilities: screen, projector, computer	Microsoft Windows 8, 10, Microsoft Office Professional Plus

For students to work independently, there are rooms equipped with specialized furniture, equipped with computer equipment with the ability to connect to the Internet and provide access to the electronic information and educational environment of the university.

The name of the premises for independent work of students	Facilities for independent work of students	List of licensed software
A room for students to work independently (the reading room of the Scientific Library)	Furniture: educational furniture Set of specialized furniture: computer desks Equipment: computer equipment with connection to the Internet information and communication network and access to the electronic information and educational environment of the educational organization, webcams, communication equipment providing access to the Internet (wired connection and wireless connection using Wi-Fi technology)	Microsoft Windows 8, 10, Microsoft Office Professional Plus
A room for students to work independently (ауд.213 А, 218 А)	Furniture: educational furniture Set of specialized furniture: computer desks	Microsoft Windows 8, 10, Microsoft Office Professional Plus

	Equipment: computer equipment with connection to the Internet information and communication network and access to the electronic information and educational environment of the educational organization, webcams, communication equipment providing access to the Internet (wired connection and wireless connection using Wi-Fi technology)	