

WORKING PROGRAM OF THE DISCIPLINE
B1.C.02.03 Fundamentals of Artificial Intelligence

Training area: 38.03.02 Management
Focus (profile): Organization Management and Logistics
Qualification (degree): Bachelor
's degree Form of study: *Full*

-time training: Department of Economics, Management and Service Technologies
: mathematical modeling, computer technologies and information security

	full	-time part- shape	time correspondence
Course	2		
Semester / trimester	4		

Lectures	18		
Laboratory classes	18		
Practical (seminar) classes			
including practical training Form			
(s) of intermediate certification	credit		
Control			
Other forms of work			
Independent work	108		

Total hours: 144

Labor intensity: 4 credits

Developers of the work program: Candidate of Pedagogical Sciences, Associate Professor Gnezdilova N. A.,
 assistant Andropova O. Yu.

I.ORGANIZATIONAL AND METHODOLOGICAL SECTION

The purpose of studying the discipline:

- formation of elements of a scientific worldview based on the study of the commonality of information processes;
- formation of a basic understanding of the main areas of artificial intelligence, artificial intelligence tasks and ways to solve them.

Objectives of studying the discipline:

- study of basic concepts and definitions in the field of artificial intelligence;
- study of the main directions of artificial intelligence, principles of organization of modern intelligent systems;
- acquisition of skills in the application of artificial intelligence models in professional activities;
- acquisition of computer modeling skills using intelligent systems.

Place of the discipline in the structure of the OPOP: implemented as part of the mandatory part of the block B1. Disciplines (modules).

Planned results of training in the discipline:

Code of competence	Indicators of achievement of competence	Planned results of training in the discipline
UC-1	Know: <ul style="list-style-type: none">– methods of searching for information and working with it;– consistency of a systematic approach.	Knows: <ul style="list-style-type: none">– mechanisms and methods of information search, analysis and synthesis, including a systematic approach in the field of management;– methods of goal setting and ways to achieve it, scientific understanding of the results of information processing.
	Be able to: <ul style="list-style-type: none">– analyze the problem, identify the stages of its solution, perform actions to solve it;– find various options for solving the problem, evaluate their advantages and risks.	Can do: <ul style="list-style-type: none">– find and critically analyze the information needed to solve the problem;– consider possible solutions to the problem, assessing their advantages and disadvantages.
	Own: <ul style="list-style-type: none">– skills of assessing the practical consequences of possible solutions to the problem;– skills of competent, logical, reasoned formulation of their own judgments and assessments.	Proficient in: <ul style="list-style-type: none">– methods of establishing cause-and-effect relationships and determining the most significant among them;– information search mechanisms, including the use of modern information and communication technologies.
GPC -5	Should Know: <ul style="list-style-type: none">– methods of information and communication technologies and innovative technologies used in the modern economy for solving professional problems;– principles of solving standard prob-	Knows: <ul style="list-style-type: none">– basic management methods and models and information and communication technologies for developing measures to improve the efficiency of the organization.

	lems of professional activity; search for scientific and technical information on the Internet and specialized databases.	
	Be able to: – choose and apply information and innovative technologies, software tools for solving professional problems; – search for scientific and technical information using general and specialized databases.	Can do: – use modern information technologies and software tools in your professional activities, including managing large amounts of data and their intellectual analysis, to develop measures to improve the organization's efficiency.
	Possess: – skills of using information systems and technologies to solve professional problems; – skills of innovation management to solve professional problems.	Proficient in: – methodological tools for applying modern information technologies and software tools, including managing large data sets and their intellectual analysis.
GPC - 6	Should Know: – modern information technologies and principles of their operation.	Knows: – principles of work of modern information technologies and ways of their use for solving problems of professional activity; – basic concepts, definitions and models of artificial intelligence.
	Be able to: – choose modern information technologies based on an understanding of the principles of their work for solving professional tasks activities.	Can do: – perform intelligent analysis of statistical data; – develop models using intelligent machine learning systems; – competently and reasonably evaluate information technologies for solving professionally oriented tasks.
	Own: – skills of using modern information technologies to solve problems of professional activity.	Possesses: – skills of using modern information technologies of data mining; – methods of simulation modeling of an intelligent system.

II. CONTENT AND SCOPE OF THE DISCIPLINE

**with an indication of the number of hours allocated for students ' contact work
with a teacher (by type of training sessions) and for independent work**

Full-time education

n /	a Name of sections and	topics Total	Classroom classes			Sam. rab.
			LK	PZ	LB	
	Section 1. Artificial intelligence as a fundamental science and technology of integrated technological solutions	48	6		2	40
1.	Topic 1. Artificial intelligence: basic concepts and history of its origin.	14	2		-	12

2.	Topic 2. Basic theoretical problems of artificial intelligence. Areas of application of artificial intelligence methods	18	2		2	14
3.	Topic 3. National strategy in the field of AI. Classification of AI systems. Risks and benefits. Ethics of AI	16	2-14		-	14
	Section 2. Fundamentals of artificial intelligence.	96	12		16	68
7.	Topic 4. Expert systems	16	2		2	12
8.	Topic 5. Models of knowledge representation in expert systems	21	3		4	14
	Topic 6. Models of finding solutions in expert systems	20	2		4	14
9.	Topic 7. Artificial intelligence systems based on neural networks	18	2		2	14
	Topic 8. Neural network training	21	3		4	14
	<i>Reporting form</i>	credit				
	<i>Total for the 4th semester</i>	<i>144</i>	<i>18</i>		<i>18</i>	<i>108</i>
	including practical training	-				
	TOTAL:	144	18		18	108

Full-time and part-time education
(not implemented)

Part-time education
(not implemented)

III. EVALUATION MATERIALS FOR THE CURRENT AND FUTURE EVALUATION OF THE PROJECT.

INTERMEDIATE CERTIFICATION OF STUDENTS IN THE DISCIPLINE

Current certification is conducted in the form of a test or abstract.

Standard version of the test

1. Artificial intelligence is -

Possible responses:

- 1) the direction that allows you to solve complex mathematical problems in programming languages;
- 2) the direction that allows you to solve intellectual problems in a subset of natural language;
- 3) the direction that allows you to solve statistical problems in programming languages;
- 4) the direction that allows you to solve complex mathematical problems in the languages of knowledge representation;

2. Who created the fundamental works in the field of artificial intelligence-cybernetics?

Possible responses:

- 1) Raymond Lully
- 2) Norbert Wiener
- 3) Leibniz
- 4) Descartes

3. What is the main "thinking" device of the research area in the field of artificial intelligence?

Answer: The human brain

4. What approaches to the definition of "artificial intelligence" exist?

Answer: There are three approaches to defining the concept of "artificial intelligence": by functions performed, by mechanisms of operation, and by branches of knowledge.

5. What artificial intelligence systems (AI) are included in language-based systems?

Possible responses:

- 1) expert systems
- 2) Intelligent IFRSs
- 3) neurosystems
- 4) robotic systems
- 5) communication systems
- 6) game systems

6. What artificial intelligence systems (AI) are included in heuristic search systems?

Possible responses:

- 1) neurosystems
- 2) game systems
- 3) recognition systems
- 4) expert systems

7. What artificial intelligence systems (AI) are included in language-based systems?

Possible responses:

- 1) expert systems
- 2) neurosystems
- 3) Intelligent IFRSs
- 4) communication systems
- 5) game systems
- 6) recognition systems

8. What object of study are the terms "intelligence" and "computer science" closely related to?

Answer:

The comparison of these terms indicates their proximity and interconnectedness in the sense of the commonality of the subject of study-knowledge of information and the field of application.

9. What are the characteristics of artificial intelligence systems?

Possible responses:

- 1) processing data in symbolic form
- 2) processing data in numeric format
- 3) presence of a clear algorithm
- 4) the need to choose between many options

10. The scientific direction associated with attempts to formalize human thinking is called ...

Possible responses:

- 1) knowledge representation
- 2) neural network
- 3) the expert system
- 4) artificial intelligence

11. What is the name of the field of information technology that studies methods of turning knowledge into an object of processing on a computer?

Possible responses:

- 1) theory of automated control systems
- 2) theory of database management systems
- 3) knowledge engineering

12. What is the main purpose of knowledge engineering ...

Possible responses:

- 1) development of methods for acquiring and using knowledge for implementation on a computer
- 2) study of intellectual metaprocedures of a person in solving problems
- 3) development of database management systems

13. What is the name of knowledge about a particular situation in the form of numerical, textual data or simple statements ...

Possible responses:

- 1) facts
- 2) meta-knowledge
- 3) rules

14. What are the names of computer programs that have competence, symbolic reasoning, depth, and self-awareness ...

Possible responses:

- 1) problem solvers
- 2) database management systems

3) expert systems

15. What is the name of an artificial system that simulates the solution of complex tasks by a person in the process of his life ...

Possible responses:

- 1) the inference engine
- 2) database management system
- 3) artificial intelligence

16. Specify the bit depth of the neuroprocessor?

Possible responses:

- 1) 32 digits
- 2) 64 digits
- 3) 16 digits
- 4) 128 bits

17. What are the main concepts for the development of SII?

Possible responses:

- 1) Intelligence – ability to solve complex problems
- 2) Intelligence – the ability of systems to learn
- 3) Intelligence – ability to interact with the outside world
- 4) Intelligence – the ability to solve complex problems and intelligence - the ability of systems to learn

Approximate topics of research papers

1. Development of research in the field of artificial intelligence (stages; areas of application; research directions; problems and prospects).
2. Expert systems are the main type of applied intelligent systems. Knowledge engineering. Characteristics of the ES.
3. Image recognition using neural network algorithms.
4. Comparative analysis of modern expert system shells.
5. Intellectual games.
6. Knowledge and data in expert systems.
7. Evolution models and genetic algorithms.
8. Thinking and artificial intelligence.
9. Theory of artificial intelligence.
10. Philosophical problems of artificial intelligence and artificial life.

Intermediate certification of students is carried out in the form of a test using the following assessment materials: questions for the test.

Questions for the test (4th semester, full-time study)

1. The concept of artificial intelligence.
2. Basic theoretical problems of artificial intelligence.
3. Modern areas of artificial intelligence research.
4. Artificial intelligence as an interdisciplinary field of research.
5. Traditional tasks of artificial intelligence.
6. Structure and classification of expert systems.
7. Knowledge bases and knowledge representation models.
8. The mechanism of working with knowledge.
9. Classification of knowledge engineering methods.
10. Neural networks. Possibilities of artificial neural networks for information processing.
11. Main areas of research in the field of AI.
12. Modeling of heuristic methods.
13. Neurons and their modeling.
14. Active and passive methods of acquiring knowledge.
15. Delphi method of studying a subject area.
16. Knowledge system. Knowledge representation models: logical models. The concept of fuzzy logic.
17. Knowledge system. Knowledge representation models: frame-based and production-based.
18. Knowledge system. Knowledge representation models: semantic networks. Thesaurus and its use in AI.
19. Machine representation of knowledge.
20. The task of pattern recognition in AI. Linguistic and geometric approach.
21. The task of pattern recognition in AI. Classification methods.
22. The task of pattern recognition in AI. Clustering methods.
23. Representation of domain knowledge in the form of facts and rules in the Prolog knowledge base.
24. Training a neural network.
25. Expert systems. General characteristics, structure and main elements of expert systems.
26. Intelligent information systems. The concept of IAD.
27. Classification of ES by purpose. The main directions of the ES application. Classification of ES by construction methods.
28. Knowledge engineering. The brainstorming method.
29. Classification of computer tools for developing AI systems. The role of programming in the development of knowledge representation methods.

IV. LIST OF LITERATURE REQUIRED FOR MASTERING THE DISCIPLINE

4.1. Basic literature

1. Barsky A. B. Artificial intelligence and logical neural networks : [16+] / A. B. Barsky. Saint-Petersburg: IC "Intermedia", 2019, 360 p. [Electronic resource]. - URL: <https://biblioclub.ru/index.php?page=book&id=616435> (accessed: 18.04.2024).

2. Stankevich L. A. Intellektual'nye sistemy i tekhnologii : uchebnik i praktikum dlya vuzov [Intellectual systems and technologies: textbook and practice for universities]. Moscow: Yurayt Publishing House, 2023, 495 p – (Higher education). – ISBN 978-5-534-16238-7. - Text : electronic // Educational platform Yurayt [website]. - URL: <https://urait.ru/bcode/530657> (accessed: 18.04.2024).

4.2. Additional literature

1. Bayuk D. A., Popova A.V. Legal and ethical problems of artificial intelligence : textbook for magistracy : [16+] / D. A. Bayuk, A. V. Popova ; Financial University under the Government of the Russian Federation. - Moscow: Prometheus, 2022. - 300 p.: table- (Higher education: Master's degree). - Access mode: by subscription. - URL: <https://biblioclub.ru/index.php?page=book&id=701038> (accessed: 24.04.202.2024). - Bibliogr. in the book-ISBN 978-5-00172-253-3. - Text: electronic.
2. Pavlov S. I. Sistemy iskusstvennogo intellekta : uchebnoe posobie [Artificial Intelligence Systems: a textbook]. - Tomsk : Tomsk State University of Control Systems and Radioelectronics, 2011. - Part 1. - 175 p. - Access mode: by subscription. - URL: <https://biblioclub.ru/index.php?page=book&id=208933> (accessed: 24.04.202.2024). - ISBN 978-5-4332-0013-5. - Text: electronic.
3. Sotnik S. L. Proektirovanie sistem iskusstvennogo intellekta : kurs : uchebnoe posobie [Designing artificial Intelligence systems: course: textbook]. Moscow: Internet University of Information Technologies (INTUIT), 2007, 204 p. (in Russian). - Access mode: by subscription. - URL: <https://biblioclub.ru/index.php?page=book&id=234802> (accessed: 24.04.202.4.2024). - Text : electronic.
4. Furman Ya. A., Sevastyanov V. V., Ivanov K. O. Technologies of artificial intelligence in biotechnical systems : [16+] / Ya. A. Furman, Sevastyanov V. V., Ivanov K. O.; Volga State Technological University. - Yoshkar-Ola: Volga State Technological University, 2020. - 65 p.: [Electronic resource]. - URL: <https://biblioclub.ru/index.php?page=book&id=612626> (accessed: 24.04.202.4.2024).

V..LIST OF RESOURCES OF THE INFORMATION AND TELECOMMUNICATION NETWORK "INTERNET" REQUIRED FOR MASTERING THE discipline

№ Item No	. Link to the information resource	Name of the development in electronic form	Availability
1.	http://edu.ru/	Russian Education: Federal Portal. Includes links to portals and websites of educational institutions; state educational standards; regulatory documents; a catalog of excursions and training programs.	Free access

VI.MODERN PROFESSIONAL DATABASES AND INFORMATION REFERENCE SYSTEMS

1	http://www.biblioclub.ru.biblioclub.ru	Electronic Library System (EBS) University Library online	Registration via any university computer. In the future, unlimited individual access is provided from any point where there is access to the Internet
2	www.elibrary.ru	Russian information portal in the field of science, technology, medicine and education	Free access

VII. LICENSED AND FREELY DISTRIBUTED SOFTWARE

When implementing an academic discipline, the following licensed and freely distributed software is used:

- Microsoft Windows;
- Microsoft Office;
- LibreOffice, etc..

VIII. EQUIPMENT AND TECHNICAL MEANS OF TRAINING NECESSARY FOR THE IMPLEMENTATION OF THE EDUCATIONAL PROCESS IN THE DISCIPLINE

Training sessions are held in classrooms equipped with specialized furniture, including stationary or portable teaching equipment (projector, screen, computer / laptop).

Laboratory classes, group and individual consultations, current and intermediate attestations are conducted in specialized classrooms equipped with automated workstations with computers.

Independent work is carried out in classrooms 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.