

# BUNIN YELETS STATE UNIVERSITY

"APPROVED"

Director of the Institute of Psychology  
And Pedagogy \_\_\_\_\_ /T.D.Krasova/



## THE WORK PROGRAMME OF THE DISCIPLINE

### B1.C.02.03 Basics of artificial intelligence

Direction of training: *44.03.01 Pedagogical Education*

Profile: *Primary education*

Qualification (degree): *bachelor*

Mode of study: *full-time*

*Institute of Psychology and Pedagogy*

*Department of Mathematical Modeling, Computer Technology and Information Security*

	full	-time part- shape	time correspondence
Study course	2		
Term	4		
Lectures	18		
laboratory work	18		
Seminars			
including practical training			
Form of control	Credit test		
Control			
Other forms of work			
Independent work	108		

**Total number of academic hours: 144.**

**Labor intensity: 4 credits.**

*Developer of the work programme: Ph.D., Associate Professor T. A. Shchuchka*

## 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.

**The place of the discipline in the structure of the BPEP:** implemented as part of the mandatory part of the block B1. Disciplines (modules).

### Planned learning outcomes for the course:

Code of competence	Indicators of competence achievement	Planned learning outcomes for the discipline
<b>GPC-9</b>	<b>To know:</b> – principles of operation of modern information technologies and ways to use them to solve professional problems.	<b>Knows:</b> – basic concepts, definitions, and models of artificial intelligence.
	<b>To be able to:</b> – it is reasonable to choose modern information technologies and use them to solve the problems of professional activity.	<b>Is able to:</b> – perform intelligent analysis of statistical data; – develop models using intelligent machine learning systems; – competently and reasonably evaluate information technologies for solving professionally oriented tasks.
	<b>To possess:</b> – skills of working with modern information technologies, ways of using them to solve problems of professional activity.	<b>Possesses:</b> – skills of using digital 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

№	Name of sections and topics	Total	Classroom lessons			Indep. work
			Lec.	Sem.	Lab.work	
	<b>Section 1. Artificial intelligence as a</b>	<b>48</b>	<b>6</b>		<b>2</b>	<b>40</b>

	<b>fundamental science and technology of integrated technological solutions</b>					
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
	<b>Section 2. Fundamentals and artificial intelligence</b>	<b>96</b>	<b>12</b>		<b>16</b>	<b>68</b>
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 are 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	-				
	<b>TOTAL:</b>	<b>144</b>	<b>18</b>		<b>18</b>	<b>108</b>

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

**Part-time education** (*not implemented*)

### **III. EVALUATION MATERIALS FOR CONDUCTING CURRENT AND INTERIM CERTIFICATION OF STUDENTS IN THE DISCIPLINE**

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

#### **Standard version of the test**

1 question:

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 question:

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 question:

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

Answer: The human brain

4 question:

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 question:

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 question:

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 question:

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 question:

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 question:

What are the main features 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 question:

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 question:

What is the name of the field of information technology that studies methods for 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 question:

B 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 question:

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

Possible responses:

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

14 question:

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 question:

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 question:

Specify the bit depth of the neuroprocessor?

Possible responses:

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

17 question:

Please indicate 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. Метод 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 data mining.
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. Main literature

1. Minakov A. I. Artificial intelligence and neural networks in education: textbook: [16+] / A. I. Minakov. - Moscow : Direct-Media, 2024. - 156 p.: ill., tab. - Access mode: by subscription. - URL: <https://biblioclub.ru/index.php?page=book&id=715303> (accessed: 02.09.2024). - Bibliogr. in the book-ISBN 978-5-4499-4638-6. - DOI 10.23681 / 715303. - Text: electronic.

2. Krevetskiy A.V., Ipatov Yu. A., Rozhentsova N. I. Osnovy tekhnologii iskusstvennogo intellekta : uchebnoe posobie : [Fundamentals of artificial intelligence technologies: a textbook: [16+] / A.V. Krevetskiy, Yu. A. Ipatov, N. I. Rozhentsova; under the general editorship of A.V. Krevetskiy ; Povolzhskiy gosudarstvenny tekhnologicheskii universitet. - Yoshkar-Ola: Volga State Technological University, 2023. - 272 p.: ill., tab., scheme. - Access mode: by subscription. - URL: <https://biblioclub.ru/index.php?page=book&id=714624> (accessed: 02.09.2024). - Bibliogr.: pp. 264-267. - ISBN 978-5-8158-2358-7. - Text: electronic.

##### 4.2. Additional 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: 02.09.2024).

2. 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> (date of обращение: conversion: 02.09.2024).

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

№ n/п	Link to information resource	Name of the development in electronic form	Availability
1.	<a href="http://edu.ru/">http://edu.ru/</a>	<b>Russian Education: Federal Portal. Includes</b> 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

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

## **VI. MODERN PROFESSIONAL DATABASES AND INFORMATION REFERENCE SYSTEMS**

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.