Документ подписан простой электронной подписью Информация о владельце: ФИО: Ястребов Олег Александр Rederal State Autonomous Educational Institution of Higher Education Должность: Ректор "Peoples' Friendship University of Russia named after Patrice Lumumba" Дата подписания: 27.06.2025 11:53:16 Уникальный программный ключ: сэрб 2011 20490109240207770786120900426182

ca953a012<del>0d891083f939673078ef1a989dae18a</del> (name of the main educational unit (MEU) that developed the educational program of higher education)

## WORKING PROGRAM OF THE DISCIPLINE

#### FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

(name of discipline/module)

**Recommended for the field of study/specialty:** 

#### 27.03.04 CONTROL IN TECHNICAL SYSTEMS

(code and name of the training area/specialty)

The discipline is mastered within the framework of the implementation of the main professional educational program of higher education (EP HE):

#### DATA SCIENCE AND SPACE SYSTEMS

(name (profile/specialization) of the educational institution of higher education)

#### 1. THE GOAL OF MASTERING THE DISCIPLINE

The course "Fundamentals of Artificial Intelligence" is part of the bachelor's program "Data Science and Space Systems" in the direction 27.03.04 "Control in Technical Systems" and is studied in the 4th semester of the 2nd year. The course is implemented by the Department of Mechanics and Control Processes. The course consists of 5 sections and 13 topics and is aimed at studying the main directions in the field of artificial intelligence, methods and information technologies used to solve professional problems, the basics of developing algorithms for solving problems using machine learning, machine vision, natural language processing and assessing their quality.

The purpose of mastering the discipline is to provide students with the necessary knowledge to apply artificial intelligence methods in their professional activities, become familiar with machine learning algorithms, assess the quality of solutions to machine learning problems, machine vision and other problems in the field of artificial intelligence.

## 2. REQUIREMENTS TO THE RESULTS OF MASTERING THE DISCIPLINE

Mastering the discipline "Fundamentals of Artificial Intelligence" is aimed at developing the following competencies (parts of competencies) in students:

Cinhor	Compotoneo	Indicators of Competence Achievement		
Cipiter	Competence	(within the framework of this discipline)		
UC-11	Capable of forming an intolerant attitude towards manifestations of extremism, terrorism, corrupt behavior and counteracting them in professional activities	UC-11.1 Analyzes current legal norms that ensure the fight against corruption, terrorism and extremism in various areas of life, and also knows ways to prevent corruption, extremism and terrorism in the implementation of professional activities; UC-11.2 Plans, organizes and conducts events within the framework of professional activities aimed at forming a civic position and preventing manifestations of extremism, terrorism and corruption in society; UC-11.3 Complies with the rules of public interaction based on compliance with current legislation and an intolerant attitude towards manifestations of extremism, terrorism and corruption in society;		
UC-6	Able to manage their time, build and implement a trajectory of self-development based on the principles of lifelong education	UC-6.5 Analyzes the main opportunities and tools of continuous education in relation to one's own interests and needs, taking into account conditions, resources, personal capabilities, stages of career growth, time perspective for the development of activities and the requirements of the labor market; UC-6.6 Defines the tasks of self-development, goals and priorities of professional growth; UC-6.7 Distributes tasks into long-, medium- and short-term ones with justification of their relevance and analysis of resources for their implementation;		
GPC-5	Capable of solving problems of development of science, engineering and technology in the field of control in technical systems, taking into account legal regulation in the field of intellectual property	GPC-5.1 Knows the theoretical foundations of digital technologies, the basics of modeling objects of professional activity, the basics of data analysis and presentation of information; GPC-5.2 Able to solve problems of professional activity using existing methods of modeling, data analysis, and information presentation; GPC-5.3 Possesses skills in developing algorithms and computer programs suitable for practical application;		

*Table 2.1. List of competencies developed in students while mastering the discipline (results of mastering the discipline)* 

# **3. PLACE OF THE DISCIPLINE IN THE STRUCTURE OF THE EDUCATIONAL EDUCATION**

Discipline "Fundamentals of Artificial Intelligence" refers to the mandatory part of block 1 "Disciplines (modules)" of the educational program of higher education.

As part of the higher education program, students also master other disciplines and/or practices that contribute to the achievement of the planned results of mastering the discipline "Fundamentals of Artificial Intelligence".

Table 3.1. List of components of the educational program of higher education that contribute to the achievement of the planned results of mastering the discipline

Cipher	Name of competence	Previous courses/modules, practices*	Subsequent disciplines/modules, practices*
UC-11	Capable of forming an intolerant attitude towards manifestations of extremism, terrorism, corrupt behavior and counteracting them in professional activities		Research work / Scientific research work; Undergraduate Training; Jurisprudence;
UC-6	Able to manage their time, build and implement a trajectory of self- development based on the principles of lifelong education	Physical Education; History of Russia; Introduction to the Specialty; Fundamentals of Project Activities; Fundamentals of Engineering Economics and Control;	Research work / Scientific research work; Technological Training; Undergraduate Training; Philosophy;
GPC-5	Capable of solving problems of development of science, engineering and technology in the field of control in technical systems, taking into account legal regulation in the field of intellectual property	Theoretical Mechanics;	Research work / Scientific research work; Technological Training; Undergraduate Training; Automatic Control Theory; Analysis of Geoinformation Data;

\* - filled in in accordance with the competency matrix and the SUP EP HE

**\*\*** - elective disciplines/practices

## 4. SCOPE OF THE DISCIPLINE AND TYPES OF STUDY WORK

The total workload of the "Fundamentals of Artificial Intelligence" discipline is 2 credit units. *Table 4.1. Types of educational work by periods of mastering the educational program of higher education for full-time education.* 

Type of academic work	TOTAL as h		Semester(s)
Type of academic work	IOTAL,ac.1	1.	4
Contact work, academic hours	34		34
Lectures (LC)	17		17
Laboratory work (LW)	0		0
Practical/seminar classes (SC)	17		17
Independent work of students, academic hours	38		38
Control (exam/test with assessment), academic hours	0		0
General complexity of the discipline	ac.h. 72		72
	credit.ed.	2	2

## **5. CONTENT OF THE DISCIPLINE**

Section number	Name of the discipline section	Section Contents (Topics)		
		1.1	Definition of Artificial Intelligence	LC
	Artificial Intelligence: Application in Professional Activities	1.2	Intelligent applications for scientific research, manufacturing, enterprise control, quality control and business processes	LC, SC
Section 1		1.3	Modern methods of implementing artificial intelligence: Internet of things, recommender systems, data analysis, DigData, cloud technologies, additive technologies, virtual and augmented reality, blockchain	LC
		1.4	Software products	LC, SC
		2.1	Data processing	LC, SC
Section 2	Machine Learning Basics	2.2	Model building. Model quality assessment	LC, SC
		2.3	Application of Machine Learning Models	LC, SC
Section 3	Machine vision	3.1	Machine vision in professional activities. Image processing	LC, SC
		3.2	Neural networks in machine learning	LC, SC
Castian 1	Natural Language	4.1	Main tasks. Syntactic and morphological analysis	LC, SC
Section 4	Processing	4.2	Neural networks for natural language processing	LC, SC
Section 5	Artificial Intelligence	5.1	Intelligent automated and robotic systems	LC, SC
	recimologies in maustry	5.2	Additive technologies and simulation modeling	LC, SC

#### Table 5.1. Contents of the discipline (module) by types of academic work

\* - filled in only for FULL-TIME education: LC – lectures; LW – laboratory work; SC – practical/seminar classes.

## 6. LOGISTIC AND TECHNICAL SUPPORT OF DISCIPLINE

Table	61	Material	and	technical	sup	nort	of the	discipline
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Audience type	Equipping the auditorium	Specialized educational/laboratory equipment, software and materials for mastering the discipline (if necessary)
	An auditorium for conducting lecture-type	
Lecture	furniture; a board (screen) and technical means for multimedia presentations.	
Seminar	An auditorium for conducting seminar-type classes, group and individual consultations, ongoing monitoring and midterm assessment, equipped with a set of specialized furniture and technical means for multimedia presentations.	
For independent work	A classroom for independent work of students (can be used for conducting seminars and consultations), equipped with a set of specialized furniture and computers with access to the Electronic Information System.	

\* - the audience for independent work of students MUST be indicated!

#### 7. EDUCATIONAL, METHODOLOGICAL AND INFORMATIONAL SUPPORT OF THE DISCIPLINE

#### Main literature:

1. Shapiro L., Stockman J. Computer Vision: Textbook - BINOM, 2020. - 763 p.https://znanium.com/catalog/document?id=358712

2. Selyankin V.V. Computer vision. Image analysis and processing. - Publishing house "Lan", 2021. - 152 p.https://e.lanbook.com/book/173806

- OstroUCh A.V., Surkova N.E. Artificial Intelligence Systems. - Lan Publishing House, 2021. - 228 P.https://e.lanbook.com/book/176662

- Penkova T.G., Weinstein Yu.V. Models and methods of artificial intelligence: a tutorial. - Siberian Federal University, 2019. - 116 p.https://e.lanbook.com/book/157579 *Further reading:* 

1. Penkova T.G., Weinstein Yu.V. Models and methods of artificial intelligence: Textbook. - Siberian Federal University, 2016. - 116 p.https://e.lanbook.com/book/157579

2. Voronina V.V. Theory and practice of machine learning: Tutorial. - Ulyanovsk State Technical University, 2017. - 290 p.https://e.lanbook.com/book/165053

Resources of the information and telecommunications network "Internet":

1. RUDN University EBS and third-party EBSs to which university students have access on the basis of concluded agreements

- Electronic library system of RUDN - ELS RUDN

https://mega.rudn.ru/MegaPro/Web

- Electronic library system "University library online"http://www.biblioclub.ru

- EBS "Yurait"http://www.biblio-online.ru

- Electronic Library System "Student Consultant" www.studentlibrary.ru

- EBS "Znanium"https://znanium.ru/

2. Databases and search engines

- Sage https://journals.sagepub.com/

- Springer Nature Link https://link.springer.com/

- Wiley Journal Database https://onlinelibrary.wiley.com/

- Scientometric database Lens.org https://www.lens.org

3.arXiv A scientific journal featuring the latest advances in areas of artificial intelligence https://arxiv.org

- System of organizing research competitions

data https://www.kaggle.com

- Web service for hostingIT projects https://github.com

- matplotlib library https://matplotlib.org

Educational and methodological materials for independent work of students in mastering a discipline/module\*:

1. Lecture course on the subject "Fundamentals of Artificial Intelligence".

\* - all educational and methodological materials for independent work of students are posted in accordance with the current procedure on the discipline page in TUIS!

Associate Professor		Saltykova Olga Alexandrovna	
Position, Department	Signature	Surname I.O.	
HEAD OF THE DEPARTMENT:			
Head of Department		Razumny Yuri Nikolaevich	
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## HEAD OF THE EP HE:

Head of Department

Position, Department

Signature

Razumny Yuri Nikolaevich

Surname I.O.