Federal State Autonomous Educational Institution of Higher Education
Peoples' Friendship University of Russia named after Patrice Lumumba

Academy of Engineering

(name of the main educational unit (MEU) that developed the educational program of higher education)

WORKING PROGRAM OF THE DISCIPLINE

HISTORY AND METHODOLOGY OF SCIENCE

(name of discipline/module)

Recommended for the field of study/specialty:

27.04.04 CONTROL IN TECHNICAL SYSTEMS

(code and name of the field of study/specialty)

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

Artificial Intelligence, Machine Learning, and Space Science

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

2026

1. THE GOAL OF MASTERING THE DISCIPLINE

The course "History and Methodology of Science" is part of the Master's program "Artificial Intelligence, Machine Learning, and Space Sciences" (major 27.04.04 "Control in Technical Systems") and is studied in the third semester of the second year. The course is offered by the Department of Mechanics and Control Processes. It consists of three sections and 19 topics and focuses on the foundations of modern technological civilization and global trends in the changing scientific worldview, types of scientific rationality, value systems that guide scientists, an analysis of the main ideological and methodological issues arising in science at the current stage of its development, and an analysis of the main methods for solving typical problems and an introduction to their application in professional activities.

The purpose of mastering the discipline is to develop fundamental knowledge and skills in applying problem-solving methods necessary for professional activity, to increase the general level of literacy of students in the discipline of history and methodology of science, to form an understanding of the trends in the historical development of science, as well as a modern understanding of the organization of research activities in the chosen field.

2. REQUIREMENTS FOR THE RESULTS OF MASTERING THE DISCIPLINE

Mastering the discipline "History and Methodology of Science" aimed at developing the following competencies (parts of competencies) in students:

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

Cipher	**Competence**	**Indicators of Competency Achievement** (within this discipline)
UC-1	Capable of carrying out a critical analysis of problematic situations based on a systems approach and developing an action strategy	UC-1.1 Analyzes the task, identifying its basic components; UC-1.2 Defines and ranks the information required to solve the given problem; UC-1.3 Searches for information to solve a given problem using various types of requests; UC-1.4 Suggests options for solving the problem, analyzes the possible consequences of their use; UC-1.5 Analyzes ways of solving problems of ideological, moral and personal nature based on the use of basic philosophical ideas and categories in their historical development and socio-cultural context;
UC-2	Capable of managing a project at all stages of its life cycle	UC-2.1 Formulates a problem, the solution of which is directly related to the achievement of the project goal; UC-2.2 Defines the connections between the assigned tasks and the expected results of their solution; UC-2.3 Within the framework of the assigned tasks, it determines the available resources and limitations, current legal norms; UC-2.4 Analyzes the project implementation schedule as a whole and selects the optimal way to solve the assigned tasks, based on current legal regulations and available resources and constraints; UC-2.5 Monitors the progress of the project, adjusts the schedule in accordance with the monitoring results;
UC-3	Able to organize and manage the work of a team, developing a team strategy to achieve the set goal	UC-3.1 Defines his role in the team based on the strategy of cooperation to achieve the set goal; UC-3.2 Formulates and takes into account in its activities the behavioral characteristics of groups of people, identified depending on the set goal; UC-3.3 Analyzes the possible consequences of personal actions and plans their actions to achieve a given result; UC-3.4 Exchanges information, knowledge and experience with team members;

Cipher	Competence	Indicators of Competency Achievement (within this discipline)
		UC-3.5 Argues his point of view regarding the use of ideas of other team members to achieve the set goal; UC-3.6 Participates in teamwork to carry out assignments;
UC-5	Able to analyze and take into account cultural diversity in the process of intercultural interaction	UC-5.1 Interprets the history of Russia in the context of world historical development; UC-5.2 Finds and uses information about cultural characteristics and traditions of various social groups in social and professional communication; UC-5.3 Takes into account, in social and professional communication on a given topic, the historical heritage and socio-cultural traditions of various social groups, ethnic groups and faiths, including world religions, philosophical and ethical teachings; UC-5.4 Collects information on a given topic, taking into account the ethnic groups and religions most widely represented at the research sites; UC-5.5 Substantiates the specifics of project and team activities with representatives of other ethnic groups and (or) faiths; UC-5.6 Adheres to the principles of non-discriminatory interaction in personal and mass communication in order to fulfill professional tasks and strengthen social integration;
UC-7	Able to search for relevant sources of information and data, perceive, analyze, memorize, and transmit information using digital tools, as well as algorithms when working with data obtained from various sources in order to effectively use the information obtained to solve problems; evaluate information, its reliability, and draw logical conclusions based on incoming information and data	UC-7.1 Searches for the necessary sources of information and data, perceives, analyzes, remembers and transmits information using digital means, as well as with the help of algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; UC-7.2 Conducts an assessment of information, its reliability, builds logical conclusions based on incoming information and data; UC-7.3 Has a command of modern digital technologies, methods of searching, processing, analyzing, storing and presenting information (in the field of management in technical systems) in the context of the digital economy and modern corporate information culture;

3. PLACE OF THE DISCIPLINE IN THE STRUCTURE OF THE EDUCATIONAL EDUCATIONAL INSTITUTION

Discipline "History and methodology of science" 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 "History and Methodology of Science".

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, practical training*	Subsequent disciplines/modules, practices*
UC-7	Able to search for relevant sources of information and data, perceive, analyze, memorize, and transmit information using digital tools, as well as algorithms when working with data obtained from various sources in or-	Research work / Scientific research work (acquiring primary skills in scientific research work);	Undergraduate practice / Pregraduation practice;

Cipher	Name of competence	Previous courses/modules, practical training*	Subsequent disciplines/modules, practices*
	der to effectively use the information obtained to solve problems; evaluate information, its reliability, and draw logical conclusions based on incoming information and data		
UC-3	Able to organize and manage the work of a team, developing a team strategy to achieve the set goal		Undergraduate practice / Pre-graduation practice;
UC-2	Capable of managing a project at all stages of its life cycle	Research work / Scientific research work (acquiring primary skills in scientific research work);	Undergraduate practice / Pre-graduation practice;
UC-5	Able to analyze and take into account cultural diversity in the process of intercultural interaction		Undergraduate practice / Pre-graduation practice;
UC-1	Capable of carrying out a critical analysis of problematic situations based on a systems approach and developing an action strategy	Research work / Scientific research work (acquiring primary skills in scientific research work);	Undergraduate practice / Pre-graduation practice;

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

** - elective courses/practices

4. SCOPE OF THE DISCIPLINE AND TYPES OF EDUCATIONAL WORK

The total workload of the discipline “History and Methodology of Science” 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,**academic hours		**Semester(s)**
			3
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*
Total complexity of the discipline	**academic hours**	***72***	*72*
	credit	***2***	*2*

5. CONTENT OF THE DISCIPLINE

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

Section number	Name of the discipline section	Topic Title		Topic Contents	Type of academic work*
Section 1	Introduction to the theory of scientific research in computer science and computing. Statement of the scientific problem, goals, and objectives of the study. Research methods.	1.1	Theory and the genesis of its development. Conceptual framework: theory, scientific research. Thinkers of the ancient world and their development of fundamental worldview concepts and approaches to analyzing the surrounding world.	A definition of theory as a system of generalized knowledge that explains patterns in a specific field. A description of the genesis of a theory as the process of its origin, formation, and development. A description of the conceptual framework: theory, scientific research, methodology. An analysis of the contributions of ancient thinkers: Aristotle, Plato, Socrates, and their development of ideological concepts and approaches to analyzing the surrounding world.	LC, SC
		1.2	Theoretical sources as the basis for the development of thought. The genesis of theory. Theory and science.	Defining theoretical sources as a collection of previously accumulated knowledge, works, and scientific schools. Describing the genesis of theory as an evolutionary process from simple generalizations to complex systems. Characterizing the relationship between theory and science: theory as the highest form of scientific knowledge.	LC, SC
		1.3	Types of scientific research. Theoretical postulates and their representatives. Selecting the main direction of theoretical development. Priority of analysis among and unsolved problems.	Description of scientific research types: fundamental, applied, exploratory, descriptive, and explanatory. Characterization of theoretical postulates and their representatives in the field of computer science and engineering. Description of the procedure for selecting the main direction of theoretical development. Determining the priority of analysis among current and unresolved problems.	LC, SC
		1.4	Potential for theoretical forecasting of processes and phenomena. Developing an evidence base for theoretical forecasting.	Definition of theoretical forecasting as a method for predicting the future states of a research object. Description of forecasting capabilities in computer science and computing. Characteristics of the formation of an evidence base for theoretical forecasting: logical justifications, mathematical models, simulation modeling.	LC, SC
		1.5	Comparative analysis of theoretical approaches to science in Western and Eastern cultures.	A description of the characteristics of the Western scientific tradition: rationalism, analytical approach, experimental confirmation. Characteristics of the characteristics of the Eastern scientific tradition: contemplation, holistic perception, connection with philosophy and spiritual practices. A comparative analysis of approaches to the organization of science and the conduct of research.	LC, SC

Section number	Name of the discipline section	Topic Title		Topic Contents	Type of academic work*
		1.6	Similarities, differences and uniqueness in the choice of research topic, methods of its consideration and the ultimate goal.	A description of the similarities in research topic selection in Western and Eastern cultures: relevance, novelty, and practical significance. A description of the differences in research methods: the analytical methods of the West versus the synthetic methods of the East. Uniqueness is defined as the uniqueness of the topic, research methods, and ultimate goal in a specific cultural context.	LC, SC
Section 2	Main types of scientific results in research. Validation of research results. Rules for the presentation of scientific research papers.	2.1	The main stages of scientific research in the physical and mathematical sciences. Observation and its characteristics. Observation as the basis for choosing a research topic.	Description of the stages of scientific research: problem statement, literature review, selection of methods, conducting the research, processing the results, and formulating conclusions. Definition of observation as the purposeful perception of objects and phenomena. Characterization of the characteristics of observation in the physical and mathematical sciences. Description of observation as the basis for selecting a research topic.	LC, SC
		2.2	Types of observation. Determining the relevance of the chosen topic in the physical and mathematical sciences. Finding an innovative niche. Proving the practical significance of the chosen topic. Defining the research goals and objectives. Searching for monographs, scientific conference materials, roundtables, and articles in specialized scientific journals to form a general picture of the proposed research area.	Characteristics of observation types: direct and indirect, continuous and selective, participatory and non-participatory. Description of determining the relevance of a topic as its degree of importance for the development of science and practice. Characteristics of the search for an innovative niche as the identification of an area with unsolved problems. Description of evidence of the practical significance of the chosen topic. Definition of the research goals and objectives. Characteristics of the search for monographs, scientific articles, and dissertations on the topic.	LC, SC
		2.3	Working with internet resources and statistical sources. Methods for collecting theoretical and empirical data. Database creation and verification. Citation formatting.	Description of methods for working with online resources: use of scientific databases, electronic libraries, and search engines. Characteristics of theoretical data collection methods: document analysis, content analysis, and systematization. Description of empirical data collection methods: experiment, measurement, and questionnaires. Characteristics of the research base formation and verification: validity, reliability, and representativeness. Description of citation formatting rules: accuracy, source attribution, and bibliographic references.	LC, SC
		2.4	The role of hypothesis in scientific research in the physical and mathematical sciences. Hypothesis as a form of prediction in scientific research in the physical and mathematical	Definition of a hypothesis as a scientifically based assumption requiring confirmation. Characterization of the role of a hypothesis in scientific research in the physical and mathematical sciences: it guides the search, determines the structure of the work, and allows	LC, SC

Section number	Name of the discipline section	Topic Title		Topic Contents	Type of academic work*
			sciences.	for the prediction of results. Description of a hypothesis as a form of forecasting: probabilistic knowledge of as-yet-unestablished patterns.	
		2.5	An evidentiary and experimental basis for hypothesis validation. PEST analysis as a method for studying the scientific environment for the development of new technologies.	A description of the evidence base as a set of arguments, facts, and logical reasoning. A description of the experimental base as the material basis for conducting experiments and measurements. A definition of PEST analysis as a method for studying the external environment: political, economic, social, and technological factors. A description of the application of PEST analysis to the development of new technologies in information technology.	LC, SC
		2.6	Model types. Innovative approaches to model development in the physical and mathematical sciences. Generating graphs, charts, and tables. Data comparability.	Definition of a model as a simplified representation of an object or phenomenon. Characterization of model types: physical, mathematical, simulation, graphical, and computer. Description of innovative approaches to model development in the physical and mathematical sciences: neural network models, agent-based models, and digital twins. Creation of graphs, charts, and tables for data visualization. Description of data comparability as a prerequisite for valid comparison.	LC, SC
Section 3	Peer review, opposition, and other forms of research evaluation. Implementation and effectiveness of research. Dissertation research, its structure, and defense.	3.1	Structure of the dissertation.	Description of the dissertation structure: title page, table of contents, introduction, literature review, main theoretical and experimental section, conclusion, bibliography, appendices. Description of the content of each section. Definition of length and formatting requirements.	LC, SC
		3.2	Articles. Presentations at regional, national, and international conferences.	Description of the structure of a scientific article: title, abstract, keywords, introduction, methods, results, discussion, conclusion, bibliography. Description of the requirements for publication in peer-reviewed journals. Description of the preparation of conference papers at various levels: abstract, oral presentation, poster presentation.	LC, SC
		3.3	Testing the results of scientific research.	Definition of validation as the presentation and discussion of research results in the scientific community. Description of validation forms: presentations at conferences and seminars, publications in collections and journals, deposition of manuscripts. Characteristics of validation goals: obtaining feedback, testing novelty, recognizing priority.	LC, SC
		3.4	Participation in innovative projects in the field	Definition of an innovation project as a set of activities aimed at	LC, SC

Section number	Name of the discipline section	Topic Title		Topic Contents	Type of academic work*
			of physical and mathematical sciences.	creating and implementing a new product or technology. Description of the researcher's role in innovation projects: testing results in real-world conditions, obtaining funding, and team building. Characterization of the stages of work on an innovation project.	
		3.5	Abstract writing requirements. Submission deadlines.	Definition of an abstract as a summary of a dissertation. Description of the abstract's structure: general characteristics of the work, chapter contents, conclusion, and list of publications. Description of requirements for length, formatting, and style. Description of the deadlines for submitting the abstract to leading organizations and opposing organizations in accordance with regulatory documents.	LC, SC
		3.6	Internal and external review requirements. Reviewer search.	An internal review is defined as an assessment by a supervisor or leading organization. An external review is defined as an assessment by a peer reviewer or third-party expert. Requirements for review content include relevance, novelty, credibility, practical significance, and comments. A description of the reviewer and peer review process includes scholars with relevant publications and independence from the organization.	LC, SC
		3.7	PowerPoint presentation requirements. Diagrams and tables in presentations. Dissertation defense presentation requirements. PowerPoint presentations.	Description of PowerPoint presentation requirements. Characteristics of the use of diagrams and tables in presentations to clearly demonstrate results. Description of dissertation defense presentation requirements: timeline, report structure, clear articulation of originality and significance. Characteristics of PowerPoint presentations: synchronization of speech and slides, audience attention management, and answering questions.	LC, SC

* - to be completed only for FULL-TIME education: LC – lectures; LW – laboratory work; SC – practical/seminar classes.

6. LOGISTIC AND TECHNICAL SUPPORT OF DISCIPLINE

Table 6.1. Material and technical support for the discipline

Audience type	Equipment of the auditorium	Specialized educational/laboratory equipment, software and materials for mastering the discipline (if necessary)
Lecture	A lecture hall equipped with specialized furniture, a whiteboard (screen), and multimedia presentation equipment.	
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 student work (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with access to the Electronic Information System.	

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

7. EDUCATIONAL, METHODOLOGICAL AND INFORMATIONAL SUPPORT OF THE DISCIPLINE

Main literature:

1. Dreshchinsky, V. A. Methodology of scientific research: textbook for universities / V. A. Dreshchinsky. - 2nd ed., revised. and enlarged. - Moscow: Yurait Publishing House, 2022. - 274 p. - (Higher education). - ISBN 978-5-534-07187-0.

2. Mokiy, V. S. Methodology of scientific research. Transdisciplinary approaches and methods: a textbook for universities / V. S. Mokiy, T. A. Lukyanova. - 2nd ed., revised. and enlarged. - Moscow: Yurait Publishing House, 2022. - 229 p. - (Higher education). - ISBN 978-5-534-13916-7.

3. Mokiy M. S., Nikiforov A. L., Mokiy V. S.; Ed. Mokiy M. S. Methodology of scientific research. Textbook for master's degree program Scientific school: State University of Management (Moscow). P. 255. 2017 Published by UMO VO ISBN: 978-5-9916-1036-0.

4. Ushakov, E. V. Philosophy and Methodology of Science: Textbook and Workshop for Universities / E. V. Ushakov. - Moscow: Yurait Publishing House, 2022. - 392 p. - (Higher Education). - ISBN 978-5-534-02637-5.

Further reading:

1. National standard of the Russian Federation GOST R 54869-2011 "Project management. Requirements for project management"

2. Novikov D.A., Sukhanov A.L. Models and mechanisms for managing scientific projects in universities. - M.: Institute of Education Management RAO, 2005. - 80 p.

3. Polkovnikov, A.V. Project Management. Complete MBA Course / A.V. Polkovnikov, M.F. Dubovik. - M.: Olimp-Business, 2013. - 552 p.

4. Newton, R. Project management from A to Z / R. Newton. - M.: Alpina Publisher, 2016. - 180 p.

Resources of the information and telecommunications network "Internet":

1. RUDN University Electronic Library System and third-party electronic library systems to which university students have access based on concluded agreements

- Electronic library system of RUDN - ELS RUDN http://lib.rudn.ru/MegaPro/Web
- Electronic Library System "University Library Online" http://www.biblioclub.ru
- EBS Yurayt http://www.biblio-online.ru
- Electronic Library System "Student Consultant" www.studentlibrary.ru
- Electronic Library System "Troitsky Bridge"

2. Databases and search engines

- electronic fund of legal and regulatory documentation http://docs.cntd.ru/
- Yandex search engine https://www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

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

1. Lecture course on the subject "History and Methodology of Science".

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

DEVELOPER:

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