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

Academy of Engineering
(name of the main educational unit (POU) - developer of the EP HE)

COURSE SYLLABUS

HISTORY AND METHODOLOGY OF SCIENCE
(name of discipline/module)

Recommended by the Didactic Council for the Education Field of :

27.04.04 CONTROL IN TECHNICAL SYSTEMS
(code and name of the area of training/specialty)

The discipline is mastered as part of the implementation of the main professional educational program of higher education:

DATA SCIENCE AND SPACE ENGINEERING
(name (profile/specialization) EP HE)

2024

1. GOAL OF DISCIPLINE MASTERING

The discipline “History and Methodology of Science” is included in the master’s program “Data Science and Space Engineering” in the direction 27.04.04 “Control in Technical Systems” and is studied in the 1st semester of the 1st year. The discipline is implemented by the Department of Mechanics and Control Processes. The discipline consists of 3 sections and 19 topics and is aimed at studying the foundations of modern technogenic civilization and global trends in changing the scientific picture of the world, types of scientific rationality, value systems that scientists are guided by, analysis of the main ideological and methodological problems arising in science at its present stage development; analysis of the basic methods for solving typical problems and familiarization with the scope of 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 activities, to increase the overall level of students’ literacy in the discipline of history and methodology of science, to form ideas about trends in the historical development of science, as well as a modern idea of the organization of research activities in selected area.

2. REQUIREMENTS FOR THE RESULTS OF MASTERING THE DISCIPLINE

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

Table 2.1. List of competencies formed in students when mastering the discipline (results of mastering the discipline)

Cipher	**Competence**	**Indicators of Competency Achievement** (within this discipline)
GC-1	Able to critically analyze problem situations based on a systematic approach and develop an action strategy	GC-1.1 Analyzes the task, highlighting its basic components;; GC-1.2 Identifies and ranks the information required to solve the task;; GC-1.3 Searches for information to solve a given problem using various types of requests;; GC-1.4 Offers options for solving a problem, analyzes the possible consequences of their use;; GC-1.5 Analyzes ways to solve 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.;
GC-2	Able to manage a project at all stages of its life cycle	GC-2.1 Formulates a problem, the solution of which is directly related to achieving the project goal;; GC-2.2 Determines the connections between the assigned tasks and the expected results of their solution;; GC-2.3 Within the framework of the assigned tasks, determines the available resources and limitations, current legal norms;; GC-2.4 Analyzes the project implementation schedule as a whole and selects the optimal way to solve the assigned tasks, based on current legal norms and available resources and limitations;; GC-2.5 Monitors the progress of the project, adjusts the schedule in accordance with the results of control.;
GC-3	Able to organize and manage the work of a team, developing a team strategy to achieve the goal	GC-3.1 Determines his role in the team based on the strategy of cooperation to achieve the goal;; GC-3.2 Formulates and takes into account in its activities the characteristics of the behavior of groups of people, identified depending on the goal;; GC-3.3 Analyzes the possible consequences of personal actions and plans their actions to achieve a given result;; GC-3.4 Exchanges information, knowledge and experience with team members;;

Cipher	Competence	Indicators of Competency Achievement (within this discipline)
		GC-3.5 Argues his point of view regarding the use of ideas of other team members to achieve the goal;; GC-3.6 Participates in team work to carry out assignments.;
GC-5	Able to analyze and take into account the diversity of cultures in the process of intercultural interaction	GC-5.1 Interprets the history of Russia in the context of world historical development;; GC-5.2 Finds and uses information about the cultural characteristics and traditions of various social groups in social and professional communication;; GC-5.3 During social and professional communication on a given topic, takes into account the historical heritage and sociocultural traditions of various social groups, ethnic groups and faiths, including world religions, philosophical and ethical teachings;; GC-5.4 Collects information on a given topic, taking into account ethnic groups and confessions that are most widely represented at the points where the research is being conducted;; GC-5.5 Justifies the features of project and team activities with representatives of other ethnic groups and (or) religions;; GC-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.;
GC-6	Able to determine and implement priorities of own activities and ways to improve them based on self-assessment	GC-6.1 Controls the amount of time spent on specific activities;; GC-6.2 Develops tools and methods of time management when performing specific tasks, projects, goals;; GC-6.3 Analyzes one's resources and their limits (personal, situational, temporary, etc.) to successfully complete the assigned task;; GC-6.4 Distributes tasks into long-, medium- and short-term ones with justification of relevance and analysis of resources for their implementation.;
GC-7	Able to search for the necessary sources of information and data, perceive, analyze, remember and transmit information using digital means, as well as using algorithms when working with data received from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data	GC-7.1 Searches for the necessary sources of information and data, perceives, analyzes, remembers and transmits information using digital means, as well as using algorithms when working with data received from various sources in order to effectively use the received information to solve problems;; GC-7.2 Evaluates information, its reliability, builds logical conclusions based on incoming information and data;; GC-7.3 Proficient in modern digital technologies, methods of searching, processing, analyzing, storing and presenting information (in the field of management in technical systems) in the conditions of the digital economy and modern corporate information culture.;
GPC-10	Able to manage the development of methodological and regulatory documents, technical documentation in the field of automation of technological processes and production, including the life cycle of products and their quality	GPC-10.1 Familiar with the main approaches to the development of methodological and regulatory documents, technical documentation in the field of automation of technological processes and production;; GPC-10.2 Possesses approaches to managing the development of technical documentation and regulatory documents in the field of automation of technological processes and production, including the life cycle of products and their quality.;
GPC-4	Able to evaluate the effectiveness of the results of developing control systems using mathematical methods	GPC-4.1 Knows the basic mathematical methods used to assess the effectiveness of the results of control systems;; GPC-4.2 Able to apply mathematical methods to assess the effectiveness of the results of control systems;; GPC-4.3 Knows methods for assessing the effectiveness of the results of management systems.;
GPC-8	Able to select methods and develop control systems for complex technical objects and technological processes	GPC-8.1 Knows the basic methods used to develop control systems for complex technical objects and technological processes;;

Cipher	Competence	Indicators of Competency Achievement (within this discipline)
		GPC-8.2 Able to develop control systems for complex technical objects and technological processes;; GPC-8.3 Has the skills to select methods and develop control systems for complex technical objects and technological processes.;
PC-2	Able to apply modern theoretical and experimental methods for developing mathematical models of objects and processes under study in the field of aerospace systems control	PC-2.1 Knows modern theoretical and experimental methods used to develop mathematical models of studied objects and processes of professional activity;; PC-2.2 Able to determine the effectiveness of the methods used for the development of mathematical models of the objects and processes under study;; PC-2.3 Masters modern theoretical and experimental methods for developing mathematical models of objects and processes of professional activity in the field of training.;
PC-4	Capable of participating in scientific research and development of design solutions in the field of ballistics, dynamics and spacecraft flight control	PC-4.1 Familiar with the basic methods and approaches used to solve problems in the field of artificial intelligence and robotic systems;; PC-4.2 Knows methods for solving professional problems in the field of artificial intelligence and robotic systems;; PC-4.3 Able to apply mathematical methods and modern information technologies when conducting scientific research.;

3. PLACE OF DISCIPLINE IN THE STRUCTURE OF HE EP

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 educational program of higher education, students also master other disciplines and/or practices that contribute to achieving the planned results of mastering the discipline “History and Methodology of Science”.

Table 3.1. List of components of EP HE that contribute to achieving the planned results of mastering the discipline

Cipher	Name of competency	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
GC-7	Able to search for the necessary sources of information and data, perceive, analyze, remember and transmit information using digital means, as well as using algorithms when working with data received from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data		*Artificial Neural Networks (Reinforcement Learning)***; *Artificial Neural Networks (Reinforcement Learning)***; Research work / Scientific research work; Undergraduate practice / Pre-graduate practice;
GC-3	Able to organize and manage the work of a team, developing a team strategy to achieve the goal		*Undergraduate practice / Pre-graduate practice;*

Cipher	Name of competency	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
GC-2	Able to manage a project at all stages of its life cycle		*Research work / Scientific research work;* *Undergraduate practice / Pre-graduate practice;*
GC-5	Able to analyze and take into account the diversity of cultures in the process of intercultural interaction		*Undergraduate practice / Pre-graduate practice;*
GC-1	Able to critically analyze problem situations based on a systematic approach and develop an action strategy		*Artificial neural networks (Deep learning)**;* *Artificial Neural Networks (Reinforcement Learning)**;* *Artificial Neural Networks (Deep Learning)**;* *Artificial Neural Networks (Reinforcement Learning)**;* *Research work / Scientific research work;* *Undergraduate practice / Pre-graduate practice;*
GC-6	Able to determine and implement priorities of own activities and ways to improve them based on self-assessment		*Undergraduate practice / Pre-graduate practice;*
GPC-4	Able to evaluate the effectiveness of the results of developing control systems using mathematical methods		*Dynamics and Control of Space Systems;* *Advanced Methods of Earth Remote Sensing;* *Undergraduate practice / Pre-graduate practice;*
GPC-8	Able to select methods and develop control systems for complex technical objects and technological processes		*Undergraduate practice / Pre-graduate practice;*
GPC-10	Able to manage the development of methodological and regulatory documents, technical documentation in the field of automation of technological processes and production, including the life cycle of products and their quality		*Research work / Scientific research work;* *Undergraduate practice / Pre-graduate practice;* *Advanced Methods of Space Flight Mechanics;*
PC-2	Able to apply modern theoretical and experimental methods for developing mathematical models of objects and processes under study in the field of aerospace systems control		*Research work / Scientific research work;* *Undergraduate practice / Pre-graduate practice;* *Artificial neural networks (Deep learning)**;* *Artificial Neural Networks (Reinforcement Learning)**;* *Advanced Methods of Space Flight Mechanics;*

Cipher	Name of competency	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
			*Artificial Neural Networks (Deep Learning)**;* *Dynamics and Control of Space Systems;* *Geoinformation Systems and Applications;*
PC-4	Capable of participating in scientific research and development of design solutions in the field of ballistics, dynamics and spacecraft flight control		*Research work / Scientific research work;* *Undergraduate practice / Pre-graduate practice;* *Artificial Neural Networks (Reinforcement Learning)**;* *Dynamics and Control of Space Systems;* *Advanced Methods of Earth Remote Sensing;*

* - to be filled out in accordance with the competency matrix and SUP EP VO
** - elective disciplines/practices

4. SCOPE OF DISCIPLINE AND TYPES OF STUDY WORK

The total labor intensity of the "History and Methodology of Science" 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 study.

Type of educational work	**TOTAL,**ac.ch.		**Semester(s)**
			1
Contact work, ac.ch.	*34*		*34*
Lectures (LC)	0		0
Laboratory work (LR)	0		0
Practical/seminar sessions (SZ)	34		34
Independent work of students, ac.ch.	*38*		*38*
Control (exam/test with assessment), academic degree.	*0*		*0*
Total labor intensity of the discipline	**ac.ch.**	***72***	*72*
	credit units	***2***	*2*

5. CONTENT OF DISCIPLINE

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

Section number	Name of the discipline section	Contents of the section (topic)		Type of educational work*
Section 1	Introduction to the theory of scientific research in computer science and computer science. Statement of the scientific problem, goals and objectives of the research. Methods of scientific research.	1.1	Theory and genesis of its development. Conceptual apparatus: theory, scientific research. Thinkers of the Ancient World and their development of basic worldview concepts and approaches to analyzing the world around them.	LC, NW
		1.2	Theoretical sources as the basis for the development of thought. Genesis of the theory. Theory and science.	LC, NW
		1.3	Types of scientific research. Theoretical postulates and their representatives. Choosing the main direction of theory development. Priority of analysis among and unsolved problems.	LC, NW
		1.4	Possibilities of theoretical forecasting of processes and phenomena. Formation of an evidence base for theoretical forecasting.	LC, NW
		1.5	Comparative analysis of theoretical approaches to science of Western and Eastern cultures.	LC, NW
		1.6	Similarities, differences, and uniqueness in the choice of research topic, methods of approaching it, and the ultimate goal.	LC, NW
Section 2	Main types of scientific results in research. Approbation of research results. Rules for registration of scientific research works.	2.1	The main stages of scientific research in physical and mathematical sciences. Observation and its features. Observation as a basis for choosing a research topic.	LC, NW
		2.2	Types of observation. Determining the relevance of the choice of topic in the physical and mathematical sciences. Search for an innovative niche. Proof of the practical significance of the chosen topic. Determining the purpose and objectives of the study. Search for monographs, materials of scientific conferences, round tables, articles in specialized scientific publications to form a general picture in the area of proposed scientific research.	LC, NW
		2.3	Working with Internet resources and statistical sources. Techniques for collecting theoretical and empirical data. Formation of the database and verification of its reliability. Formatting quotes.	LC, NW
		2.4	The role of hypothesis in scientific research in physical and mathematical sciences. Hypothesis as a form of forecasting in scientific research in the field of physical and mathematical sciences.	LC, NW
		2.5	Evidence and experimental basis to confirm the hypothesis. PEST analysis as a method of researching the scientific environment for the development of new technologies.	LC, NW
		2.6	Types of models. Innovative approaches to the formation of models in physical and mathematical sciences. Formation of graphs, diagrams, tables. Data comparability.	LC, NW
Section 3	Reviewing, opposing and other forms of evaluation of scientific research works. Implementation	3.1	Structure of the dissertation.	LC, NW
		3.2	Articles. Presentations at regional, national and international conferences.	LC, NW
		3.3	Testing the results of scientific research.	LC, NW

Section number	Name of the discipline section	Contents of the section (topic)		Type of educational work*
	and effectiveness of scientific research. Dissertation research, its structure and defense.	3.4	Participation in innovative projects in the field of physical and mathematical sciences.	LC, NW
		3.5	Requirements for writing an abstract. Mailing deadlines.	LC, NW
		3.6	Requirements for reviews internal and external. Search for reviewers.	LC, NW
		3.7	Requirements for PowerPoint presentations. Diagrams and tables in presentations. Requirements for presenting a dissertation defense. Presentations in PowerPoint.	LC, NW

* - to be filled out only for full-time education: LC – lectures; LR – laboratory work; SZ – practical/seminar classes.

6. MATERIAL AND TECHNICAL SUPPORT OF DISCIPLINE

Table 6.1. Material and technical support of the discipline

Audience type	Auditorium equipment	Specialized educational/laboratory equipment, software and materials for mastering the discipline (if necessary)
Lecture	An auditorium for conducting lecture-type classes, equipped with a set of specialized furniture; board (screen) and technical means of multimedia presentations.	
Seminar	An auditorium for conducting seminar-type classes, group and individual consultations, ongoing monitoring and intermediate certification, equipped with a set of specialized furniture and technical means for multimedia presentations.	
For independent work	An auditorium for independent work by students (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with access to EIOS.	

* - the audience for independent work of students is MANDATORY!

7. EDUCATIONAL, METHODOLOGICAL AND INFORMATIONAL SUPPORT OF DISCIPLINE

Main literature:

1. Dreshchinsky, V. A. Methodology of scientific research: a textbook for universities / V. A. Dreshchinsky. — 2nd ed., revised. and additional - Moscow: Yurayt 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: textbook for universities / V. S. Mokiy, T. A. LGCyanova. — 2nd ed., revised. and additional - Moscow: Yurayt Publishing House, 2022. - 229 p. - (Higher education). —ISBN 978-5-534-13916-7.

3. Mokiy M. S., Nikiforov A. L., Mokiy V. S.; Ed. Mokiya M. S. Methodology of scientific research. Textbook for master's degree Scientific school: State University of Management (Moscow).P.255. 2017 Grif 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: Yurayt Publishing House, 2022. - 392 p. - (Higher education). —ISBN 978-5-534-02637-5.

Additional literature:

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

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

3. Polkovnikov, A.V. Project management. Full MBA course / A.V. Polkovnikov, M.F. Dubovik. - M.: Olimp-Business, 2013. - 552c.

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

Resources of the information and telecommunications network “Internet”:

1. EBS of RUDN University and third-party EBS, to which university students have access based on concluded agreements

- Electronic library system of RUDN University - EBS RUDN Universityhttp://lib.rudn.ru/MegaPro/Web
- EBS “University Library Online”http://www.biblioclub.ru
- EBS Lawhttp://www.biblio-online.ru
- EBS “Student Consultant”www.studentlibrary.ru
- EBS “Trinity Bridge”

2. Databases and search engines

- electronic fund of legal and regulatory technical documentationhttp://docs.cntd.ru/
- Yandex search enginehttps://www.yandex.ru/
- search systemGoogle https://www.google.ru/
- abstract databaseSCOPUS http://www.elsevierscience.ru/products/scopus/

Educational and methodological materials for students’ independent work when mastering a discipline/module:*

1. A course of lectures on the discipline “History and methodology of science.”

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

8. ASSESSMENT MATERIALS AND POINT-RATING SYSTEM FOR ASSESSING THE LEVEL OF COMPETENCIES FOR A DISCIPLINE

Evaluation materials and point-rating system* for assessing the level of development of competencies (parts of competencies) based on the results of mastering the discipline“History and methodology of science” are presented in the Appendix to this Work Program of the discipline.

* - OM and BRS are formed on the basis of the requirements of the relevant local regulatory act of RUDN University.

DEVELOPER:

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Position	*Signature*	*Last name I.O.*

HEAD OF DEPARTAMENT:

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