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ФИО: Ястребов Олег Александрович
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**Federal State Autonomous Educational Institution for Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA NAMED AFTER PATRICE LUMUMBA
(RUDN University)**

Institute of Environmental Engineering

COURSE SYLLABUS

PHILOSOPHICAL PROBLEMS OF NATURAL SCIENCES

Recommended by the Didactic Council for the Education Field of:

05.04.06 "Ecology and Nature Management"

The course instruction is implemented within the professional education programme of higher education:

Integrated Solid Waste Management

The discipline "Philosophical Problems of Natural Sciences" is part of the Master's program "Climate Project Management" in the field of study 05.04.06 "Ecology and Environmental Management" and is studied in the 1st semester of the 1st year. The discipline is delivered by the Department of Ontology and Epistemology. The discipline consists of 9 sections and 21 topics and is aimed at studying natural science through the temporal development of current philosophical problems and the foundations of modern science, which are of paramount importance for the formation of masters' ability to engage in theoretical, methodological, and abstract scientific thinking, as well as for familiarization with the philosophical aspects of the natural sciences.

The aim of the discipline is to achieve the following objectives:

- highlighting the main stages and patterns of the development of science (natural consideration of philosophical aspects of natural science);
- revealing the history of science as a complex interaction of the accumulation of scientific knowledge and paradigm shifts, scientific revolutions, determining the forms and types of development of natural science;
- distinguishing between science and pseudoscience;
- developing the ability to apply philosophical ideas and principles in future professional activities.

• 2. REQUIREMENTS FOR LEARNING OUTCOMES

The process of studying the discipline is aimed at the formation of the following competencies:

Competence code	Competence descriptor	Competence formation indicators
GC-5	Capable of analyzing and taking into account the diversity of cultures in the course of intercultural communication.	GC-5.1 Possesses knowledge of the principal categories of philosophy, the laws governing historical development, and the foundations of intercultural communication;
		GC-5.2 Capable of engaging in communication within a context of cultural diversity and of demonstrating mutual understanding among learners representing various cultures, while adhering to ethical and intercultural norms;
		GC-5.3 Has mastery of practical skills for analyzing philosophical and historical facts and assessing cultural phenomena; as well as the ability to analyze and reconsider one's own perspectives in the event of disagreements and conflicts arising in intercultural communication.
GC-6	Able to determine and implement priorities of one's own activities and ways to improve them based on self-assessment.	GPC-6.1 Capable of evaluating one's own resources and their boundaries (personal, situational, temporal), and of employing them judiciously.
		GPC-1.2 Able to identify educational needs and ways to improve one's own (including professional) activities based on self-assessment.
GPC-1	Capable of employing philosophical concepts and the methodology of scientific cognition in the study of different levels of organization of matter, space, and time.	GPC-1.1 Possesses knowledge of philosophical concepts of natural science and the methodology of scientific inquiry;
		GPC-1.2 Capable of utilizing advanced knowledge of philosophical concepts of natural science when evaluating the consequences of one's professional activities.

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline "Philosophical Problems of Natural Sciences" is allocated to the mandatory component of Block 1 "Disciplines (Modules)" of the higher education program.

Within the context of the higher education program, students also engage with other disciplines and/or practical training activities that facilitate the attainment of the intended learning outcomes of the course "Philosophical Problems of Natural Sciences."

Table 3.1. Inventory of higher education program components that support the achievement of the planned learning outcomes of the discipline.

Competence code	Competence descriptor	Previous courses/modules, internships*	Subsequent courses/modules, internships*
GC-5	Capable of analyzing and taking into account the diversity of cultures in the course of intercultural communication.	No	History of Religions in Russia;
GPC-1	Able to use philosophical concepts and methodology of scientific creation on the various levels of matter, space and time study	no	Methodology of Scientific Creation MSW Recycling and Utilization Technics Pre-Graduation Practice
GPC 6	Able to develop measures for the economic regulation of the enterprise's environmental performance, as part of the transition to a low-carbon economy	No	Methodology of Scientific Creation Management of Environmental-economic Risks Pre-Graduation Practice

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total workload of the course is 3 credit units.

Table 4.1. Types of academic activities during the period of the HE program(me) mastering

Types of academic activities	Total hours	Semester(s)			
		1	2	3	4
<i>Contact academic hours</i>	36	36			
Lectures	18	18			
Lab works					
Seminars (workshops/tutorials)	18	18			
<i>Self-study</i>	57	57			
<i>Evaluation and assessment (exam; pass/fail grading)</i>	15	15			
The total course workload	hours	108	108		
	credits	3	3		

5. COURSE CONTENTS

Table 5.1. The content of the discipline (module) by type of educational work

Title of Course Modules	Content	Types of academic activities
Module 1: Science as a historical form of cognition of the world.	Topic 1.1. The nature of scientific knowledge of the world. Knowledge of the world in its objective laws. Science as a special form of knowledge, as a cognitive activity and as a social institution.	L, S
	Topic 1.2. Scientific information and scientific method. The object, subject, and subject of science.	L, S
	Topic 1.3 The unity of cognitive, value and socio-cultural aspects in the development of science. The natural science picture of the world. The scientific method.	L, S
Module 2. The main historical stages of the development of natural science.	Topic 2.1. The emergence of science. Science and "protoscience".	L, S
	Topic 2.2. The main historical stages of the development of natural science. Ancient, classical and nonclassical periods.	L, S
	Topic 2.3 A panorama of modern natural science and its main features. The problem of subjectivity in cognition. Ethics of science.	L, S
Module 3. Philosophical problems of physics.	Topic 3.1. Physics as an experimental science about the structure of matter. Three physical worldviews- antique, classical and non-classical. Philosophical problems of classical physics. Philosophical problems of the theory of relativity.	L, S
	Topic 3.2. The activity of the subject of physical cognition. Philosophical issues of the general theory of relativity. The unity of matter, space and time.	L, S
Module 4 Philosophical issues of quantum mechanics	Topic 4.1 Principles of quantum mechanics. Quantum-wave dualism. Mechanistic and probabilistic statistical patterns. Probabilistic and statistical laws of quantum mechanics. The uncertainty principle. The role of the device in quantum mechanics.	L, S
	Topic 4.2 The activity of the subject in quantum mechanics. The problem of reality in quantum mechanics and in the science of the twentieth century.	
Module 5: The problem of completeness of the description of the microcosm.	Topic 5.1 The principle of complementarity by N. Bohr. The concept of interaction in physics.	L, S
	Topic 5.2 The fundamental physical interactions. The "great unification" Model as an effort to describe the world as a unity within the framework of a single gauge theory.	L, S
Module 6: Quantum mechanics as a theoretical basis of chemistry.	Topic 6.1 Physics and Chemistry. General ideas about the conceptual systems of chemistry.	L, S
	Topic 6.2 Paradigms of inorganic and organic chemistry. The role of catalysis The concept of chemical evolution Biogenesis.	L, S
Module 7 Philosophical problems of astronomy.	Topic 7.1 Features of astronomical knowledge. The observational nature of astronomy Classical and nonclassical astronomy. The revolution in astronomy	L, S

Title of Course Modules	Content	Types of academic activities
	in the middle of the 20th century was the creation of means for all-wave observation of the Universe. Astronomy and Cosmology. The historical development of cosmological views. Classical cosmology of Newton. The significance of the discovery of non-Euclidean geometries in classical science and relativistic physics.	
	Topic 7.2 The creation of relativistic cosmology by A. Einstein. Models of nonstationary relativistic cosmology by A. Friedman. The anthropic principle in cosmology. The Big Bang theory, its philosophical significance. The Big Bang and global cosmic evolution The evolution of the Universe. The concept of global evolutionism. The problem of the multiplicity of Universes. The problem of extraterrestrial civilizations, its philosophical aspects.	L, S
Module 8 Philosophical problems of biology.	Topic 8.1 Features of biological cognition. Topic 8.2 The problem of synthesis of structural and evolutionary aspects of biological cognition. The synthetic theory of evolution. The concept of structural levels in biology is the molecular genetic level. The ontogenetic level. The population-biocenotic level is the biosphere level. Biosphere and noosphere Philosophical problems of ecology. Interdisciplinary and complex nature of environmental knowledge.	L, S
Module 9 Philosophical aspects of synergetics.	Topic 9.1 Theory of development: philosophical and specifically scientific. Subject-centered and system-centered philosophical methodologies. Topic 9.2 Synergetic vision of the world. Self-organizing dynamics of scientific cognition. Synergetics as a new interdisciplinary field of scientific research. Topic 9.3 The laws of evolution and self-organization of complex systems. Contradictions and difficulties of synergetics. The creation of a system-historical methodology as a task of the modern philosophical theory of development..	L, S

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom equipment and technology support requirements

Classroom for Academic Activity Type	Classroom equipment	Specialized educational / laboratory equipment, software and materials for mastering the course (if necessary)
Lecture	Classroom, equipped with a set of specialized furniture; whiteboard; a set of devices includes	Classroom, equipped with a set of specialized furniture;

Classroom for Academic Activity Type	Classroom equipment	Specialized educational / laboratory equipment, software and materials for mastering the course (if necessary)
	portable multimedia projector, laptop, projection screen, stable wireless	whiteboard; a set of devices includes portable multimedia projector, laptop, projection screen, stable wireless
Seminars	Classroom, equipped with a set of specialized furniture; whiteboard; a set of devices includes portable multimedia projector, laptop, projection screen, stable wireless	Internet connection. Software: Microsoft Windows, MS Office / Office 365, MS Teams, Chrome (latest stable release), Skype. Microsoft Windows 7 corporate. License No. 5190227, date of issue March 16, 2010 MS Office 2007 Prof, License # 6842818, date of issue 09/07/2009
For Self-Study	Classroom for self-study (can be used for seminars and consultations), equipped with a set of devices includes laptop, stable wireless.	No

7. RESOURCES RECOMMENDED FOR COURSE STUDY

Main reading:

1 . Shutaleva, A.V. Philosophical problems of natural science : a textbook for universities / A. V. Shutaleva. Moscow : Yurait Publishing House, 2025. 153 p. (Higher education). — ISBN 978-5-534-21168-9. — Text : electronic // Educational platform Yurayt [website]. - URL: <https://urait.ru/bcode/559483>

2 . Philosophy of Science : a textbook for universities / A. I. Lipkin [et al.] ; edited by A. I. Lipkin. — 2nd ed., revised and add. Moscow : Yurait Publishing House, 2024. 512 p. (Higher education). — ISBN 978-5-534-01198-2. — Text : electronic // The Yurite educational platform [website]. — URL: <https://urait.ru/bcode/536004>

3 Naidysh V.M. Concepts of modern natural science + Application.

4 Additional materials. Textbook. - 4th ed., revised and dop.. - M.: Knorus, 2024. – ISBN - 978-5-06-07556-2.

Additional reading:

1 . Concepts of modern natural science : a textbook for universities / edited by V. N. Lavrinenko. — 5th ed., revised and add. Moscow : Yurait Publishing House, 2025. 360 p. (Higher education). — ISBN 978-5-534-21242-6. — Text : electronic // The Yurite educational platform [website]. — URL: <https://urait.ru/bcode/569361>

2 . M. Babayeva, N.A. N. Concepts of modern natural science: a textbook for universities / M. N.A. N. Babayeva. -3rd ed., erased. -Saint Petersburg: Lan Publishing House, 2025.- 436 p. ill. - ISBN 78-5-8114-8564-2

3. Huseykhonov, M. N. Book Concepts of modern natural science: textbook - and practical course for universities / M. N. BOOK Huseykhonova. -8th ed., revised and add. - Moscow : Yurait Publishing House, 2023. - 442 p. ill. - (Higher education). — ISBN 978-5-9916-6772-2. - Text : electronic // Yurayt educational platform [website — URL: https://urait.ru/bcode/510657_2

4. Valyansky, S. N. I. N. Concepts of modern natural science : textbook and practical course for universities / S. N. I. N. Valyansky. Moscow : Yurait Publishing House, 022. 367 p. ill. (Higher education). — ISBN 978-5-9916-5885-0. — Text : electronic // The Yurite educational platform [website URL: <https://urait.ru/bcode/489329>]

5. I. Karpenko, A. N. Philosophy of Physics: towards new principles of scientific knowledge. The monograph. Infra-M Publishing House, 2021. -203 p.

6. Radjabov, Huseykhanov: History and philosophy of natural sciences. Textbook. Canon+ Publishing House, 2021. - 496 p. - ISBN 978-5-88373-678-9.

Internet-based sources

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

- RUDN Electronic Library System - RUDN EBS <http://lib.rudn.ru/MegaPro/Web>
- ELS "University Library Online" <http://www.biblioclub.ru>
- EBS Yurayt <http://www.biblio-online.ru>
- ELS "Student Consultant" www.studentlibrary.ru
- EBS "Lan" <http://e.lanbook.com/>
- EBS "Trinity Bridge"

2. Databases and search engines:

- electronic fund of legal and normative-technical documentation <http://docs.cntd.ru/>
- Yandex search engine [https:// www .yandex.ru/](https://www.yandex.ru/)
- Google search engine <https://www.google.ru/>
- abstract database SCOPUS [http:// www .elsevierscience.ru/ products / scopus /](http://www.elsevierscience.ru/products/scopus/)

8. ASSESSMENT TOOLKIT AND GRADING SYSTEM FOR EVALUATION OF STUDENTS' COMPETENCES LEVEL UPON COURSE COMPLETION

The assessment toolkit and the grading system to evaluate the level of competences (competences in part) formation as results of mastering the discipline are specified in the Appendix to the syllabus.

DEVELOPER:

Senior Lecturer		Naidysh V.M.
_____	_____	_____
Position	Signature	Name, Surname

HEAD OF DEPARTMENT:

Director of the Department		Belov V.N.
_____	_____	_____
Position	Signature	Name, Surname

HEAD OF PROGRAMME:

Associate Professor of the NM Department		Kapralova D.O.
_____	_____	_____
Position	Signature	Name, Surname

