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**Федеральное государственное автономное образовательное учреждение
высшего образования «Российский университет дружбы народов»**

Институт экологии

(наименование основного учебного подразделения (ОУП)-разработчика программы аспирантуры)

(наименование базового учебного подразделения (БУП)-разработчика программы аспирантуры)

РАБОЧАЯ ПРОГРАММА ДИСЦИПЛИНЫ

STABILITY OF NATURAL SYSTEMS/УСТОЙЧИВОСТЬ ПРИРОДНЫХ СИСТЕМ

(наименование дисциплины/модуля)

Научная специальность:

1.5.15 Экология

(код и наименование научной специальности)

Освоение дисциплины ведется в рамках реализации программы аспирантуры:

**Modern environmental studies in cooperation with Belarus State University,
Modern environmental studies in cooperation with Vytautas Magnus
University**

(наименование программы аспирантуры)

2023 г.

1. THE PURPOSE OF MASTERING THE DISCIPLINE

The formation of students' systemic ideas about the theoretical and methodological foundations of the analysis and modeling of the sustainability of natural systems;

- the formation of ideas about the mechanisms of sustainability of environmental components, approaches to their identification and regulation on this basis of anthropogenic activities;
- the formation of ideas and skills to regulate the stability of natural systems based on the theoretical knowledge gained.

To achieve this goal in the process of teaching the course, the following tasks are to be solved:

- formation of ideas about the sustainability of natural systems;
- creation of systemic ideas about the structure of environmental regulation, international experience in environmental regulation and harmonization of environmental standards;
- analysis of the current system of environmental regulation for various areas of nature management;
- formation of ideas about environmental regulation as a basis for economic regulation of environmental management.

2. REQUIREMENTS FOR THE RESULTS OF MASTERING THE DISCIPLINE

As a result of studying the discipline, the student must:

Know: the theoretical foundations of environmental regulation; international practice of development and harmonization, as well as the application of environmental standards; domestic practice of developing and applying environmental standards in the field of protecting the atmosphere, surface and underground hydrospheres, soils and lands, bioresources, industrial and municipal waste management, introducing the best available technologies, environmental and economic justification of projects based on existing and developing environmental standards.

Be able to: conduct a critical analysis of practical developments and research results on the above issues; apply the obtained theoretical knowledge to the planning, design, control and examination of environmental protection projects; to modernize the existing system of environmental regulation.

To have skills: in analyzing the need for environmental protection measures based on the application of environmental standards, skills in the selection and application of indicators for environmental impact assessment and forms of environmental control based on environmental standards.

3. VOLUME OF DISCIPLINE AND TYPES OF EDUCATIONAL WORK

The total labor intensity of the discipline "Stability of natural systems/устойчивость природных систем" is 3 credit unit.

Table 4.1. Types of educational work by periods of mastering the postgraduate program

Type of study work	Total, hours	Course			
		1	2	3	4
Contact work, hours					
including					
Lecture (LC)	30	30			
Laboratory work (LW)					
Practical/seminar classes (SW)	30	30			
Independent work of students, hours	48	48			
Control, hours					

Type of study work		Total, hours	Course			
			1	2	3	4
The total complexity of the discipline	ак.ч.	108	108			
	зач.ед.	3	3			

5. CONTENT OF THE DISCIPLINE

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

Name of the discipline section	Contents of the section (topic)	Type of study work
Part 1. General concepts of the natural systems stability <i>Part 2. Resistance of the air environment to contamination</i> <i>Part 3. Stability of the surface hydrosphere to pollution and depletion</i>	Sustainability of the natural systems and their development trajectory. Environmental norms as an instrument of nature management. Types of the standards. Nature management and environmental safety. Factors of the pollution and self-purification of the atmosphere. Main models of the atmosphere pollution. Norms of the atmospheric quality: approaches to the setting of norms and examples. Regulation of the atmospheric pollution. Factors of the pollution and self-purification of the water bodies. Basic models of the pollution of surface water flows. Norms of water quality Factors of the pollution and self-purification of the water bodies. Basic models of the pollution of surface water flows. Norms of water quality	LC
		LC
		LC, SW
<i>Part 4. Resistance of the underground hydrosphere to pollution and depletion</i> <i>Part 5. Stability of soils</i>	Based on systemic principles, the possibilities of ecological regulation of technogenic impacts on the underground hydrosphere are considered. Approaches to assessing the stability of hydrogeological systems and the main processes of transformation of pollutants in aquifers are considered. The experience of impact assessment based on limiting factors in various areas of groundwater use in industry and agriculture is generalized. Information on the most promising methods and technologies for protecting the underground hydrosphere from pollution and depletion is provided. Soil quality : assessment, models, approaches to justification of norms, types of norms, examples.	LC, SW LC, SW
<i>Part 6. Resistance of the living organisms to the environmental pollution and destruction: bioindication</i>	Basic concepts of bioindication. Practical examples: use of biotests for the development of standards and for the environmental quality control. Main opportunities, perspectives and restrictions	LC, SW
<i>Part 7. Stability of natural systems and nature management</i>	Environmental regulation system as a base of the nature management and environmental management system. Justification of environmental norms for the support of environmental systems quality.	LC, SW
Part 1. General concepts of the natural systems stability	Sustainability of the natural systems and their development trajectory. Environmental norms as an instrument of nature management. Types of the standards. Nature management and environmental safety.	LC, SW
<i>Part 2. Resistance of the air environment to contamination</i>	Factors of the pollution and self-purification of the atmosphere. Main models of the atmosphere pollution. Norms of the atmospheric quality: approaches to the setting of norms and examples. Regulation of the atmospheric pollution.	LC, SW
<i>Part 3. Stability of the surface hydrosphere to pollution and depletion</i>	Factors of the pollution and self-purification of the water bodies. Basic models of the pollution of surface water flows. Norms of water quality Factors of the pollution and self-	LC, SW

Name of the discipline section	Contents of the section (topic)	Type of study work
	purification of the water bodies. Basic models of the pollution of surface water flows. Norms of water quality	

6. LOGISTICS AND TECHNICAL SUPPORT OF THE DISCIPLINE

Table 6.1. Logistics of discipline

Тип аудитории	Оснащение аудитории	Специализированное учебное/лабораторное оборудование, ПО и материалы для освоения дисциплины (при необходимости)
Lecture	An auditorium for lecture-type classes, equipped with a set of specialized furniture; board (screen) and technical means of multimedia presentations.	The individual workplace of a postgraduate student must be equipped with a personal device with Internet access. A mobile phone is not a device capable of technically providing access to all information resources and services for mastering modules. Computer classes/audiences should be provided with multimedia and computer equipment with Internet access.
Seminar	An auditorium for conducting seminar-type classes, group and individual consultations, current control and intermediate certification, equipped with a set of specialized furniture and technical means for multimedia presentations.	
computer class	Computer class for conducting classes, group and individual consultations, current control and intermediate certification, equipped with personal computers (in the amount of ____pcs), a board (screen) and technical means of multimedia presentations.	
For independent work of students	An auditorium for independent work of students (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with access to the EIOS.	

* - аудитория для самостоятельной работы обучающихся указывается **ОБЯЗАТЕЛЬНО!**

7. EDUCATIONAL-METHODOLOGICAL AND INFORMATION SUPPORT OF THE DISCIPLINE

b) databases, reference and search engines

www.mnr.gov.ru - website of the Ministry of Natural Resources of the Russian Federation;

<http://rpn.gov.ru/> - Federal Service for Supervision of Natural Resources Use (Rosprirodnadzor);

www.ecoindustry.ru - site of the journal "Production Ecology";

www.unep.org - website of the United Nations Environment Program;

www.wwf.ru - WWF website.

<http://burondt.ru/> - BAT website - information on the implementation of regulation based on the best available technologies

http://www.mnr.gov.ru/activity/directions/zelenye_standarty/zelenye_standarty/?sphrase_id=124597 - information on the development, application and implementation of "green standards"

http://www.mnr.gov.ru/activity/directions/natsionalnyy_proekt_ekologiya/ - information on the implementation of the Ecology National Project

www.epa.gov - United States Environmental Protection Agency | US EPA

www.eea.europa.eu - European Environment Agency's home page

a) Basic literature:

1. Khaustov A.P., Redina M.M. Regulation and reduction of environmental pollution. M.: Yurayt, 2017. - 364 p. - Presented at the UNIBC RUDN University and available on the website of the Yurayt publishing house at: https://biblio-online.ru/viewer/normirovanie-i-snizhenie-zagryazneniya-okruzhayuschey-sredy-432790?share_image_id=#page/1
2. Measuring Regulatory Performance EVALUATING THE IMPACT OF REGULATION AND REGULATORY POLICY By Cary Coglianese https://www.oecd.org/gov/regulatory-policy/1_coglianese%20web.pdf
3. **Stability of natural systems – Theory and practice** Article in *Miscellanea Geographica* 13:11-19 · January 2008
https://www.researchgate.net/publication/276418335_Stability_of_natural_systems_-_Theory_and_practice
4. *Environmental standards and norms for sustainable development*, available at <https://www.openlearning.com/courses/environmental-standards-and-norms-for-the-sustainability/HomePage>

b) Additional literature

Virtual training complex for environmental safety / Ed. V.D. Tolmacheva and A.P. Khaustov. – M.: Publishing House of MIEE, 2010. <https://docplayer.ru/92579886-Virtualnye-trenazhernye-kompleksy-po-obespecheniyu-ekologicheskoy-i-promyshlennoy-bezopasnosti.html>

Resources of the information and telecommunications network "Internet":

1. ELS of RUDN University and third-party ELS, to the materials of which graduate students of the university 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 - "Educational Platform Urayt" <http://www.biblio-online.ru>
- ELS "Student Consultant" www.studentlibrary.ru, integrated into ELS RUDN University
- EBS "Lan" <http://e.lanbook.com/>
- EBS "Troitsky Most", integrated into the ELS of RUDN University
- EBS BOOKUP - professional medical literature <http://books-up.ru/>

2. Databases*

* information about universal and specialized information bases for selection and inclusion in the program must be taken from the website of the UNIBC (NB), link to the section <https://lib.rudn.ru/8>

- SCOPUS - scientometric, abstract database with organized access to open access publications <http://www.elsevierscience.ru/products/scopus/>
- WOS - scientometric, abstract database with organized access to open access publications [webofscience.com](http://www.webofscience.com)
- Google Academy (English Google Scholar) - <https://scholar.google.ru/>
- NEB, RSCI on the platform eLibrary.ru - <https://elibrary.ru/>
- RUDN University repository - <https://repository.rudn.ru/>

3. search engines:

- electronic fund of legal and normative-technical documentation <http://docs.cntd.ru/>
- Yandex search engine <https://www.yandex.ru/>
- Google search engine <https://www.google.ru/>

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

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

8. EVALUATION MATERIALS AND SCORE-RATING SYSTEM FOR ASSESSING THE LEVEL OF FORMATION OF COMPETENCES IN THE DISCIPLINE

Evaluation materials and a point-rating system for assessing the development of the discipline 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 normative act of the Peoples' Friendship University of Russia.

Developers:

professor of the Department
environmental safety and
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MM. Redina

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A.P. Khaustov
