PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA NAMED AFTER PATRICE LUMUMBA

Institute of Environmental Engineering

(наименование основного учебного подразделения (ОУП)-разработчика ОП ВО)

COURSE SYLLABUS

Monitoring of environmental impacts

(наименование дисциплины/модуля)

Recommended by the Methodological Council for the Education Field:

05.04.06 Ecology and nature management

(код и наименование направления подготовки/специальности)

The discipline is mastered within the framework of the main professional higher education program:

Integrated Solid Waste Managment / Комплексное управление твердыми бытовыми отходами

(наименование (профиль/специализация) ОП ВО)

2025

1. COURSE GOALS

The course goal is to familiarization with theoretical basics and practical approaches of the impact of main industrial branches on the environmental systems as well as pollution prevention technologies.

2. LEARNING OUTCOMES

The mastering of the discipline "Monitoring of environmental impacts" is aimed at the formation of the following competencies (parts of competencies) in students:

Table 2.1. List of competencies formed by students during the development of the discipline (LEARNING OUTCOMES)

Code	Competence	Indicators of competence achievement (within the framework of this discipline)
GPC -2	Able to use special and new sections of ecology, geoecology and nature management in solving research and applied problems of professional activity.	**GPC -2.1** Knows the basics of ecology, geoecology, environmental economics and circular economy, as well as environmental management
		GPC -2.2 Able to use environmental, economic and other special knowledge and algorithms to solve professional problems
		GPC -2.3 Able to find, analyze and competently use the latest information and modern techniques in the performance of research and applied tasks
PC -10	Capable of monitoring the state of the environment using environmental technologies	**PC-10.1** Capable of monitoring compliance with environmental protection requirements
		PC-10.2 Capable of developing an action plan aimed at meeting the requirements of regulatory legal acts in the field of environmental protection, taking into account best practices
		PC-10.3 Capable of analyzing large amounts of professional information
PC-11	Able to determine the structure and master the methods of zoning the assessed territory according to the types of anthropogenic load and environmental components	**PC-11.1** Knows methods of zoning the assessed territory according to the permissible anthropogenic load on environmental components
		PC-11.2 Able to determine the structure of anthropogenic load on environmental components
		PC-11.3 Able to identify areas of increased environmental hazard

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline " Monitoring of Environmental Impacts " refers to Compulsory Disciplines of the Higher Education Program.

Within the framework of the higher education program, students also master other disciplines and/or practices that contribute to expected learning outcomes of the discipline " Engineering Ecology".

Table 3.1. List of Higher Education Program components that contribute to expected learning outcomes

Code	**Competence**	Previous Disciplines (Modules)	Subsequent Disciplines (Modules)
GPC -2	Able to use special and new sections of ecology, geoecology and nature management in solving research and applied problems of professional activity.	IT in ecology and natural resources management /	State Exam Master's Thesis Defence
PC -10	Capable of monitoring the state of the environment using environmental technologies	нет	Research work in the term including projects Master's Thesis
PC-11	Able to determine the structure and master the methods of zoning the assessed territory according to the types of anthropogenic load and environmental components	нет	Master's Thesis Defence State Exam

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

Workload of the course «Monitoring of environmental impacts» is 2 ECTS.

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

Вид учебной работы		**TOTAL**	**Semesters**			
			1	**2**	**3**	**4**
Contact academic hours		*34*			*34*	
Incl.:						
Lectures		17			17	
Lab work						
Seminars		17			17	
Self-study		*47*			*47*	
Evaluation and assessment		*27*			*27*	
Total workload	Ac.hours	**108**			**108**	
	ECTS	**3**			**3**	

5. COURSE CONTENTS

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

Name of the discipline section	**Content of the section (topics)**	**Type of academic activity***
Introduction.	The impact of enterprises on the environment:	Seminars

	classifications and indicator substances. The subject and object of industrial environmental monitoring (IEM). Main tasks.	
PEM in the structure of the environmental monitoring system.	ESSM, departmental environmental monitoring of IEM in the structure of the environmental monitoring system. ESSM, departmental environmental monitoring. Legislative and regulatory-technical base of the organization of IEM	Seminars
Instruments and systems for monitoring the atmosphere and air of the working area	Instruments and systems for monitoring the atmosphere and air of the working area. Regulatory support for monitoring. The main types of devices. Approaches to the organization of monitoring of the atmosphere in production conditions. GIS technologies and remote methods. Use of IEM data of the state of the atmosphere	Seminars
Instruments and systems for monitoring the quality of water bodies.	Devices and systems for monitoring the quality of water bodies. Regulatory support for monitoring. Surface water monitoring system. Monitoring of groundwater. Geodynamic monitoring. GIS technologies and remote methods	Seminars
Soil quality monitoring devices and systems	Soil quality monitoring devices and systems. Regulatory support for monitoring. Methods of selection and indicators of soil and soil quality. GIS technologies and remote methods	Seminars
Devices and systems for monitoring the quality of biological resources	Devices and systems for monitoring the quality of biological resources. Regulatory support for monitoring. Monitoring of the state of biological objects. Bioindication. GIS technologies and remote methods	Seminars

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom equipment and technology support requirements

Classroom for Academic Activity Type	**CLASSROOM EQUIPMENT**	**Specialized learning, laboratory equipment, software and materials for the mastering the course**
Lecture	An auditorium for conducting lecture-type classes, equipped with a set of specialized furniture; a board (screen) and technical means of multimedia presentations.	A set of specialized furniture; chalk board; technical equipment: HP PRO system unit, HP-V2072A monitor, LUMIEN retractable projection screen, Internet access. Microsoft Windows 7 corporate. License No.
Seminars	Classroom, equipped with a set of specialized furniture; whiteboard; a set of devices includes portable multimedia projector, laptop, projection screen, Stable wireless Internet	

Classroom for Academic Activity Type	CLASSROOM EQUIPMENT	Specialized learning, laboratory equipment, software and materials for the mastering the course
	connection. Software: Microsoft Windows, MS Office / Office 365, MS Teams, Chrome (latest stable release), Skype	5190227, date of issue 03/16/2010 MS Office 2007 Prof, License No. 6842818, issue date 09/07/2009
Self-studies	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 an electronic information and educational environment.	-

7. RECOMMENDED SOURCES FOR COURSE STUDIES

- *Main reading:*

1. Environmental Monitoring Handbook for the Food and Beverage Industries, 2019. URL: https://multimedia.3m.com/mws/media/1684575O/environmental-monitoring-handbook.pdf

Additional sources:

1. Wiersma G.B. (Ed.) Environmental Monitoring. CRC Press, 2004, 1566706416, 767 p.
2. Belyuchenko I.S., Smagin A.V. Fundamentals of Environmental Monitoring. KubGAU press. 2012.

Internet-sources:

1. Electronic library system of the RUDN and third-party electronic library systems, to which university students have access on the basis of concluded contracts:

- electronic library system of the RUDN University http://lib.rudn.ru/MegaPro/Web
- electronic library system «Университетская библиотека онлайн» http://www.biblioclub.ru
- electronic library system Юрайт http://www.biblio-online.ru
- electronic library system «Консультант студента» www.studentlibrary.ru
- electronic library system «Лань» http://e.lanbook.com/
- electronic library system «Троицкий мост»

2. Databases and search engines:

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

*Educational and methodological materials for independent work of students during the development of the discipline/ module *:*

1. A course of lectures on the discipline " Monitoring of environmental impacts ".

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

8. MID-TERM ASSESSMENT AND EVALUATION TOOLKIT

Evaluation materials and a point-rating system* for assessing the level of competence formation (part of competencies) based on the results of mastering the discipline " Monitoring of environmental impacts " are presented in the Appendix to this Work Program of the discipline.

* - evaluation toolkit and ranking system are formed on the basis of the requirements of the relevant local regulatory act of the RUDN (regulations / order).

DEVELOPER:

Professor of the Department of Environmental Safety and Product Quality Management		**Redina M.M.**
Position, Department	Signature	Name

HEAD OF THE DEPARTMENT:

Head of the Department of Environmental Safety and Product Quality Management		**Savenkova E.V.**
Department	Signature	Name

HAED OF THE HIGHER EDUCATION PROGRAM:

Assosiate Professor of the Department of Environmental Management		**Kapralova D.O.**
Position, Department	Signature	Name

Department Environmental Safety and Product Quality Management
educational department to be specified

APPROVED
Department meeting protocol No_____,
Dated _____
day, month, year
Head of Educational Department
_____(Savenkova E.V.)
signature

ASSESSMENT TOOLKIT

for the course

Monitoring of Environmental Impacts

05.04.06 "Ecology and nature management"
field of studies / speciality code and title

«Integrated Solid Waste Management
higher education programme profile/specialisation title

Master
graduate's qualification (degree)

Passport to Assessment Toolkit for Course Monitoring of Environmental Impacts

Field of Studies / Speciality 05.04.06 "Ecology and nature management"/ «Integrated Solid Waste Management»
Course: Monitoring of Environmental Impacts

Competences (competences in part) under assessment	**Course module under assessment**	**Course topic under assessment**	**Tools to assess higher education programme mastering level**										**Points for topic**	**Points for module**
			Class work					**Self-studies**				**Exam/Pass-fail assessment**		
			Quiz	**Test**	**Work with lecture materials**	**Work at the seminars**	**Lab work**	**Report**	**Research essay/ Library research paper**	**Calculation and graphic work**	**Group work project**			
GPC-2	Introduction.	The impact of enterprises on the environment: classifications and indicator substances.	2					+			+		***2-52***	4-54
		The subject and object of industrial environmental monitoring (IEM). Main tasks.	2					+			+		***2-52***	
GPC-2 PC-10 PC 11	PEM in the structure of the environmental	ESSM, departmental environmental monitoring of IEM in the structure of the environmental monitoring system.	2					+			+		***2-52***	4-54

	monitoring system.	ESSM, departmental environmental monitoring.	2					+			+		***2-52***	
		Legislative and regulatory-technical base of the organization of IEM	2					+			+		***2-52***	
	Instruments and systems for monitoring the atmosphere and air of the working area	Instruments and systems for monitoring the atmosphere and air of the working area. Regulatory support for monitoring.	2					+			+		***2-52***	
		The main types of devices. Approaches to the organization of monitoring of the atmosphere in production conditions.	2					+			+		***2-52***	
		GIS technologies and remote methods. Use of IEM data of the state of the atmosphere	2					+			+		***2-52***	
GPC-2 PC-10 PC 11	Soil quality monitoring devices and systems	Soil quality monitoring devices and systems. Regulatory support for monitoring.	2					+			+		***2-52***	
		Methods of selection and indicators of soil and soil quality. GIS technologies and remote methods	2					+			+		***2-52***	
GPC-2 PC-10 PC 11	Devices and systems for monitoring the quality of biological resources	Devices and systems for monitoring the quality of biological resources. Regulatory support for monitoring.	2					+			+		***2-52***	
		Monitoring of the state of biological objects. Bioindication. GIS technologies and remote methods	2					+			+		***2-52***	
		TOTAL	28	8				25			25	14		**10**

2. ASSESSMENT MATERIALS FOR CURRENT CONTROL OF STUDENTS' ACHIEVEMENT AND INDEPENDENT WORK IN THE DISCIPLINE

Solving practical tasks is used to assess the quality of students' mastery of part of the educational material of the discipline and the level of development of the relevant competencies (parts of the competence). The content and form of the case report are given in the relevant Guidelines posted on the discipline page in TUIS. The contents of the report, the scale and criteria for evaluating the report (Table 2.1.) are brought to the attention of students at the beginning of each lesson. The report is assessed as "passed" or "failed". The grade is announced to the student immediately after defending the report.

Table 2.1. Scale and criteria for evaluating laboratory reports

Scale	**Grading Criteria**
The grade is "passed" (all points planned for a specific laboratory work of the BRS are awarded)	- the presentation of the material is logical and competent; - fluency in terminology; - the ability to express and justify your judgments when answering test questions; - ability to describe the phenomena and processes being studied; - ability to resolve specific situations (minor errors or insufficiently complete disclosure of the content of the question or unprincipled errors in answering questions are allowed).
Score "failed" (no points awarded)	- lack of necessary theoretical knowledge; errors were made in defining concepts and describing the phenomena and processes being studied, their meaning was distorted, and measurement results were not assessed correctly; - ignorance of the basic material of the curriculum, gross errors in presentation are made.

ASSESSMENT MATERIALS FOR INTERMEDIATE CERTIFICATION IN A DISCIPLINE Interim certification in the discipline "Monitoring of environmental impacts" is carried out in the form of a certification test based on the results of studying the discipline/at the end of the autumn and summer semester.

Types of certification test – TEST WITH ASSESSMENT (in accordance with the approved curriculum). The certification test is carried out on tickets containing three questions on the discipline course. Based on the results of the certification test, a student can receive from 1 to 14 points.

The set of exam question cards is complemented by the assessment criteria developed by the teacher and approved at the department meeting.

Assessment criteria:
(*in compliance with the legal regulations in force*)

EXAM QUESTIONS

Concept of environmental monitoring of the natural environment.
Environmental monitoring: definition, main goals and objectives.
Classification of basic systems and subsystems of environmental monitoring.
Local, regional, global environmental monitoring.
Forecasting the state of the natural environment in environmental monitoring.
Basic criteria for assessing the state of the natural environment.
Sanitary and hygienic standards (MPC).
Monitoring of natural waters.
Basic principles of organizing monitoring of natural waters.
Ecological criteria for the quality of natural waters.

Features of water pollution.
Contribution of industrial sectors to the discharge of pollutants into water bodies.
Main sources of natural water pollution.
Sanitary and bacteriological characteristics of natural waters.
Hydrobiological indicators.
Standardization of water quality.
Sanitary and hygienic standards (MSC).
Methods for comprehensive assessment of the quality of natural waters.
Monitoring of atmospheric air pollution processes.
Condition and protection of atmospheric air.
Distribution of pollutants in the atmosphere.
Influence of meteorological factors on the dispersion of pollutants.
Soil monitoring. Features of regulation of pollutants in soils.
Classification of soils according to their resistance to pollution.
Methods for identifying sources of soil pollution.

Abstract topics:

Monitoring the condition of plants in cities
Ensuring the necessary condition and quantity of green spaces in cities
Soil monitoring in cities
Monitoring of surface and groundwater in cities monitoring of atmospheric pollution in cities

Tentative list of assessment tools

No	Assessment tool	Brief features	Assessment tool representation in the kit
Class work			
1	Survey/Quiz	A tool of control, organised as a special conversation between a teacher and students on topics related to the course under study, and designed to clarify the amount of students' knowledge in a particular section, topic, problem, etc.	Questions on the course topics /modules
2	Test	A system of standardised tasks that allows the teacher to automate the procedure for measuring the student's level of knowledge and skills	Tests bank
3	Control work	A tool of control organised as a classroom lesson, at which students need to independently demonstrate the acquisition and mastering of the educational material of the course topic, section, or sections.	Questions on the course topics /modules
4	Round table, discussion, polemic, dispute, debate, (class work)	Evaluation tools that allow the teacher to engage students in the process of discussing controversial issues, problems and assess their ability to argue their own point of view.	List of themes for round tables, discussions, polemics, disputes, debates.

5	Business game and/or role play	Joint activities of a student group under the teacher's control to solve educational and professionally oriented tasks through the simulation of a real-world problem; this activity allows the teacher to assess the students' ability to analyse and solve typical professional challenges.	Topic (problem), concept, roles and expected results for each game
6.	Presentation (defence) of project/report/ Library research paper /briefs *	A tool for monitoring the students' ability to present the work results to the audience.	Themes for projects/reports/ Library research paper/ briefs
7	Pass/Fail assessment	A tool for checking the quality of students' performance of laboratory work, acquisition and mastering of the practice training and seminar educational material, successful completion of the advanced field internship and pre-graduate internship and fulfillment of all training assignments in the course of these internships in accordance with the approved programme.	Tasks examples
8	Exam	The evaluation of the student's work during the semester (year, the entire period of study, etc.); it is designed to identify the level, soundness and systematic nature of theoretical and practical knowledge gained by the student, formation of independent work skills, development of creative thinking, ability to synthesise the acquired knowledge and apply it to solve practice tasks	Examples of tasks/questions/exam question cards
9	Case	A problem-solving task in which the student is asked to comprehend the real work-related (occupational) situation necessary to solve the problem.	Assignments to solve the case

10	Multi-level tasks and assignments with varying difficulty	The tasks and assignments differ in terms of the following levels: a) reproductive level allows the teacher to evaluate and diagnose the students' knowledge of factual material (basic concepts, algorithms, facts) and the students' ability to correctly use special terms and concepts, recognize objects of study within a certain section of the discipline, b) reconstructive level allows the teacher toevaluate and diagnose the students' abilities to synthesise, analyse, generalise factual and theoretical material and formulate specific conclusions, establish cause-and-effect relationships, c) creative level allows to evaluate and diagnose students' skills to integrate knowledge of various fields, argue their own point of view.	Set of multi-level tasks and assignments with varying difficulty
Self- studies			
1	Calculation and graphic work	A tool for checking students' skills in applying the acquired knowledge according to a predetermined methodology in task solving or fulfilling assignments for a module or discipline as a whole.	Set of tasks for calculation and graphic work
2	Course work/project	A type of independent written work aimed at the creative development of general professional and specialised professional disciplines (modules) and the development of relevant professional competences	Course assignment themes
3	Project	The final "product" that results from planning and performance of educational and research tasks set; it allows the teacher to assess the students' ability to independently shape their knowledge in the course of solving practice tasks and problems, navigate in the information environment and the students' level of analytical, research skills, skills of practical and creative thinking; it can be implemented individually or by a group of students.	Themes for team-based or individual projects
4	Research essay (Library research paper)	The student's independent work in writing that summarises the results of the theoretical analysis of a certain scientific (educational and research) topic, where the author reveals the essence of the problem under study, considers different points of view, as well as argues his/her views on the material under consideration.	Themes for research essay (library research papers)

5	Reports, briefs	The product of the student's independent work, which is a public performance on the presentation of the results of solving a specific educational, practical, research or scientific topic.	Themes for reports, briefs
6	Essay and other creative assignments	A partially regulated assignment that has a nonstandard solution and allows the teacher to diagnose students' skills in integrating knowledge from various fields and arguing their own point of view; it can be prepared individually or by a group of students.	Themes for team-based or individual creative assignments
7	Standard calculations	A tool to test skills in applying the acquired knowledge, according to a predetermined methodology, solving tasks or fulfilling assignments for a module or discipline as a whole.	Set of tasks for standard calculations
8	Homework	The tasks and assignments differ in terms of the following levels: a) reproductive level allows the teacher toevaluate and diagnose the students' knowledge of factual material (basic concepts, algorithms, facts) and the students' ability to correctly use special terms and concepts, recognize objects of study within a certain section of the discipline, b) reconstructive level allows the teacher toevaluate and diagnose the students' abilities to synthesise, analyse, generalise factual and theoretical material and formulate specific conclusions, establish cause-and-effect relationships, c) creative level allows the teacher to evaluate and diagnose students' skills to integrate knowledge of various fields, argue their own point of view.	Set of multi-level tasks and assignments with varying difficulty