

**Federal State Autonomous Educational Institution of Higher Education
"Peoples' Friendship University of Russia"**

Institute of Environmental Engineering

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

COURSE SYLLABUS

Wastes: Landfills, Processing and Recycling

(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:

Economics of natural resources management

(наименование (профиль/специализация) ОП ВО)

1. COURSE GOALS

The course is aimed on forming of following competencies: to possess the modern field of knowledge and to be able to use it in scientific, practical and educational purposes. To know modern methods of environment condition impact on human health and ecosystems assessment of the world and natural phenomena; have knowledge in ecology, nature exploitation. The course is designed to provide knowledge on the implementation of activities for the collection, use, transportation and disposal, decontamination and disposal of hazardous and household waste, the existing material and technical base.

2. LEARNING OUTCOMES

The mastering of the discipline "Wastes: Landfills, Processing and Recycling" 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-3	Able to apply environmental research methods to solve research and applied problems of professional activity	GPC -3.1 Knows the principles and methods of environmental monitoring of environmental components
		GPC -3.2 Owns analytical methods for monitoring pollutants and physical impacts and processing the information received
		GPC -3.3 Able to develop systems for environmental monitoring and control in production and solve applied problems in professional activities
SPC -4	Able to use modern methods of processing and interpreting environmental information in scientific and industrial research.	SPC-4.1 Able to apply modern methods of processing and interpreting environmental information when conducting industrial research
		SPC-4.2 Able to interpret the results of studies in terms of compliance with safety and performance indicators
		SPC-4.3 Has the skills to conduct control and supervisory activities based on modern methods of processing environmental information
SPC-5	Able to develop standard environmental measures and assess the impact of planned facilities or other forms of economic activity on the environment	SPC-5.1 Able to develop and plan the implementation of standard environmental measures, taking into account international practice and the requirements of national legislation
		SPC-5.2. Has the skills to assess the impact of planned structures or other forms of economic activity on the environment
		SPC-5.3 Knows the requirements for the preparation and implementation of programs for the environmental modernization of enterprises, the introduction of BAT, the organization of environmental monitoring, accounting and reporting

Code	Competence	Indicators of competence achievement (within the framework of this discipline)
SPC-6	Able to develop standard environmental measures and assess the impact of planned facilities or other forms of economic activity on the environment	SPC-6.1 Capable of detecting inconsistencies in the state of environmental components with the requirements of national and international standards
		SPC-6.2 Able to develop programs for monitoring natural complexes under conditions of technogenic loads and programs for environmental rehabilitation of territories

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline "Wastes: Landfills, Processing and Recycling" 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 "Wastes: Landfills, Processing and Recycling".

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

Code	Competence	Previous Disciplines (Modules)	Subsequent Disciplines (Modules)
GPC-3	Able to apply environmental research methods to solve research and applied problems of professional activity	Estimations of natural resources / Оценки природных ресурсов Modern technologies for nature protection / Современные технологии защиты окружающей среды Modern remediation technologies / Современные технологии ремедиации Economic aspects of natural resources management / Экономические аспекты природопользования Management of energy resources / Менеджмент ресурсов энергетики Management of water resources / Управление водными ресурсами Environmental-economic aspects of environmental projects / Эколого-экономические аспекты экологических проектов Environmental norms for sustainability / Экологические	Производственная практика / Production practice НИР / Research work Преддипломная практика / Pre-graduate practice

Code	Competence	Previous Disciplines (Modules)	Subsequent Disciplines (Modules)
		<p>нормы для устойчивого развития Standards of environmental management and occupational safety / Стандарты экологического менеджмента и охраны труда Occupational safety and HSE-audit / Охрана труда и HSE-аудит Учебная практика / Educational practice Научно-исследовательская работа / Research work</p>	
SPC -4	Able to use modern methods of processing and interpreting environmental information in scientific and industrial research.	<p>Industrial nature management and economics / Промышленное природопользование и экономика Standards of environmental management and occupational safety / Стандарты экологического менеджмента и охраны труда Occupational safety and HSE-audit / Охрана труда и HSE-аудит Учебная практика / Educational practice Научно-исследовательская работа / Research work</p>	<p>Вариативная компонента Производственная практика / Production practice НИР / Research work Преддипломная практика / Pre-graduate practice</p>
SPC-5	Able to develop standard environmental measures and assess the impact of planned facilities or other forms of economic activity on the environment	<p>Estimations of natural resources / Оценки природных ресурсов Management of environmental-economic risks / Управление эколого-экономическими рисками Учебная практика / Educational practice Научно-исследовательская работа / Research work</p>	<p>Modern remediation technologies / Современные технологии ремедиации Management of water resources / Управление водными ресурсами Environmental-economic aspects of environmental projects / Эколого-экономические аспекты экологических проектов Производственная практика / Production practice НИР / Research work</p>

Code	Competence	Previous Disciplines (Modules)	Subsequent Disciplines (Modules)
			Преддипломная практика / Pre-graduate practice
SPC-6	Able to develop standard environmental measures and assess the impact of planned facilities or other forms of economic activity on the environment	Management of natural resources / Менеджмент природных ресурсов Modern technologies for nature protection / Современные технологии защиты окружающей среды Industrial nature management and economics / Промышленное природопользование и экономика Economic aspects of natural resources management / Экономические аспекты природопользования Standards of environmental management and occupational safety / Стандарты экологического менеджмента и охраны труда Occupational safety and HSE-audit / Охрана труда и HSE-аудит Учебная практика / Educational practice Научно-исследовательская работа / Research work	Modern remediation technologies / Современные технологии ремедиации Management of energy resources / Менеджмент ресурсов энергетики Environmental norms for sustainability / Экологические нормы для устойчивого развития Industrial safety / Промышленная безопасность Simulation and prevention of accidents / Моделирование и предупреждение аварий Производственная практика / Production practice НИР / Research work Преддипломная практика / Pre-graduate practice

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

Workload of the course «Wastes: Landfills, Processing and Recycling» 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
<i>Contact academic hours</i>	17				
Incl.:					
Lectures					
Lab work					
Seminars	17			17	
<i>Self-study</i>	43			43	
<i>Evaluation and assessment</i>	12			12	
Total workload	Ac.hours	72		72	
	ECTS	2		2	

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*
The problem of waste	The concept of waste. Stability and safety of the environment. Stability and sustainability of ecosystems to pollution. The concept of ecosystem's stability. Cycling of matter - the important principle of sustainable ecosystems. Biogeochemical cycles of carbon, hydrogen, oxygen, sulfur, phosphorus and metals. Self-purification capacity of the ecosystem: biotic and abiotic processes. The parameters of ecosystem stability	Seminars
Waste in the environment	The main types of waste, a brief description of the principles of waste classification. Processes for waste management (life cycle management). Organization of waste management. Documenting the activities of waste management. Certification of waste. Certification of hazardous waste	Seminars
Sources of solid waste. Wastewater	Processing of non-radioactive waste. Warehousing. Heat treatment. Sludge processing (electroplating, oil). Features recycling by industry. Integrated waste management system. Sources and processing of radioactive waste. Features of radioactive waste	Seminars
Processing, recycling and disposal of industrial waste.	Sources and types of pollution of the hydrosphere. Types of wastewater. Types of pollution of industrial waste water. Modern methods of treatment of waste water from industrial pollution. Agricultural and domestic effluents and methods of cleaning. Sewage sludge and methods of treatment and disposal. Biological methods. Methane fermentation. Composting. Vermiculation. Thermal methods. Hygiene requirements for the selection of the territory - the location site. The layout and arrangement of polygons. Ensuring security control polygons. Hygienic requirements to choosing disposal of industrial waste (solid, powdered, pasty). Features dumping water soluble, liquid and combustible waste. Preventive and routine supervision of the polygons. Passport site	Seminars
Transportation of hazardous waste.	The main hazards during transportation. Prevention and management of emergencies involving dangerous goods. Technical and organizational measures	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
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	-
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 Kharlamova M.D. Kurbatova A.I. Modern Technologies of Waste Management, Recycling and Environmental Protection. Moscow, RUDN University Publishing 2017 – 98 p. (RUDN library)

Additional sources:

1. MOOCs Course on I-versity Platform University and Dr. Marianna Kharlamova: Practical Tools of Solid Waste Management & Environmental Damage Reducing <https://iversity.org/en/courses/practical-tools-of-solid-waste-management-environmental-damage-reducing>

2. MOOCs Course on Coursera Platform, by Federal Polytechnic School of Lausanne: Municipal Solid Waste Management in Developing <https://www.coursera.org/learn/solid-waste-management>

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

1. A course of lectures on the discipline "Wastes: Landfills, Processing and Recycling".

* - 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 "Wastes: Landfills, Processing and Recycling" 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:

Assoc. Prof. of the ESandPQM
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