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

Institute of Environmental Engineering

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

WORKING PROGRAM OF THE DISCIPLINE

Regional and municipal waste management systems

(наименование дисциплины/модуля)

Recommended by MSTS for the direction of training / specialty:

05.04.06 Ecology and nature management
08.04.01 "Construction"

(код и наименование направления подготовки/специальности)

The development of the discipline is carried out within the framework of the implementation of the main professional educational program of higher education (EP HE):

Environmental Engineering in Construction

(наименование (профиль/специализация) ОП ВО)

2022 г.

1. THE PURPOSE OF MASTERING THE DISCIPLINE

The purpose and objectives of the discipline: Formation of the theoretical foundations of waste management as a source of valuable secondary material resources and energy production. The principles of drawing up territorial schemes for waste management are studied, the duties and functions of regional operators are considered, the effectiveness of the introduction of an environmental fee as a regulatory tool for extended producer responsibility is analyzed. The training uses innovative learning technologies in the format of a business game and the development and protection of an industrial project, which allows you to form practical skills in the field of effective management of production and consumption waste.

2. REQUIREMENTS FOR THE RESULTS OF MASTERING THE DISCIPLINE

Mastering the discipline "Regional and municipal waste management systems" is aimed at developing the following competencies (parts of competencies) among students: **GPC-2e; PC-4**

Table 2.1. The list of competencies formed by students in the course of mastering the discipline (the results of mastering the discipline)

Code	Competence	**Competence achievement indicators** (in the framework of discipline)
GPC-2e	Able to use special and new sections of ecology, geoecology and nature management in solving research and applied problems of professional activity.	**GPC-2e.1** Has a systematic understanding of the theoretical and methodological foundations of environmental regulation
		GPC-2e.2 Has the basic knowledge of the fundamental sections of biology in the amount necessary to master the basics in ecology and nature management
		GPC-2e.3 Owns modern methods of obtaining and evaluating geochemical information for solving theoretical and practical problems of environmental geochemistry in the field of ecology and nature management in order to protect the environment
PC-4	Able to develop design solutions and measures to ensure the safety of industrial and civil construction projects	**PC-4.1** Able to develop standard environmental measures, monitor the state of the environment to ensure the safety of industrial and civil construction projects
		PC-4.2 Possesses the skills of environmental design and preparation of special documentation at the pre-project stage of the project life cycle
		PC-4.3 Capable of carrying out the necessary calculations for planning, modeling and forecasting the development of a territorial object

3. THE PLACE OF DISCIPLINE IN THE STRUCTURE OF BP HE

The discipline "Regional and municipal waste management systems" refers to the elective component of block B1 of the OP VO.

As part of the EP VO, students also master other disciplines and / or practices that contribute to the achievement of the planned results of mastering the discipline “Regional and municipal waste management systems”.

Table 3.1. The list of components of the EP HE that contribute to the achievement of the planned results of the development of the discipline

Code	Competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
GPC-2e	Able to use special and new sections of ecology, geoecology and nature management in solving research and applied problems of professional activity.	Sustainable development of urban areas	No
PC-4	Able to develop design solutions and measures to ensure the safety of industrial and civil construction projects	Computer technologies and statistical methods in ecology and nature management	No

* - заполняется в соответствии с матрицей компетенций и СУП ОП ВО

4. VOLUME OF DISCIPLINE AND TYPES OF EDUCATIONAL WORK

The total labor intensity of the discipline "Regional and municipal systems of waste management" is **3 credit units (CE)**.

*Table 4.1. Types of educational work by periods of Program mastering for **FULL-TIME** education*

Type of study work		Total, hours.	Terms			
			1	**2**	**3**	**4**
Contact work, hours		*17*			*17*	
Lectures (**ЛК**)						
Laboratory works (**ЛР**)						
Practical/seminar classes (**СЗ**)		17			17	
Independent work of students, hours.		*66*			*66*	
Control (exam/test with assessment), hours		*25*			*25*	
The total complexity of the discipline	hours.	**108**			**108**	
	Cr.un.	**3**			**3**	

*Table 4.3. Types of educational work by periods of Program mastering for **CORRESPONDENCE** forms of education**

Type of study work		Total, hours.	Terms			
			1	2	3	4
Contact work, hours		*4*			*4*	
Lectures (**ЛК**)						
Laboratory works (**ЛР**)						
Practical/seminar classes (**СЗ**)		4			4	
Independent work of students, hours.		*95*			*95*	
Control (exam/test with assessment), hours		*9*			*9*	
The total complexity of the discipline	hours.	**108**			**108**	
	Cr.un.	**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*
1. World experience in the waste management. Possible management scenarios	Indicators of sustainable development in the field of waste management. Basic principles of waste management. Stages of development of the waste management system in developed countries. Experience of Sweden, France, Japan. Peculiarities of rationing in waste incineration. The main methods of integrated waste processing in the world. World trends in the field of waste management.	
2. Waste as a source of secondary resources and energy	Waste composition. Morphological, fractional, chemical, energy composition. Analysis of the resource and energy potential of waste. Thermal methods of waste disposal. Ecological aspects of direct waste incineration. Use of RDF fuel.	
3. Mechanisms for improving the waste management system in the regions of the Russian Federation. Waste management Legal basis	Goals and objectives of regional waste management programs, indicators of program implementation used, results of implementation. Short and long term programs. Improving the legal framework in the field of waste management. Environmental levy and extended liability of producers and importers of goods. Waste disposal fee.	
4. Hierarchical order of waste management. Principles of waste classification.	Hierarchy of waste management. Minimization of waste generation - resource saving and low-waste technologies. Classification of solid municipal waste. Waste fractions and waste separation systems. Organization of a separate collection system. Dual flow waste collection system.Hierarchy of waste management. Minimization of waste generation - resource saving and low-waste technologies. Classification of solid municipal waste. Waste fractions and waste separation systems. Organization of a separate collection system. Dual flow waste collection system.	
5. Territorial (regional) waste management schemes. The role of	Territorial waste management schemes. Regional Operator Institute. Determination of waste streams generated in various industries and utilities. Directions of the waste	

Name of the discipline section	Contents of the section (topic)	Type of study*
municipal government	management strategy: creating conditions for reducing the amount of waste; ensuring the growth of waste use volumes; creation of environmentally safe conditions for storage and disposal of waste.	
6. Waste management tools and best available techniques (BAT) for waste treatment, disposal and storage	Technical reference books on BAT. Criteria for selecting BAT. Modern technologies for processing, sorting, disposal of waste. Databases and expert systems for waste management. State Waste Cadastre (SWC). Federal Classification Catalog of Waste (FCCW). State Register of Waste Disposal Facilities (RWDF). Information mapping	
7. Integrated schemes for municipal solid waste processing	Complex of various waste processing methods, focused on regional and industry applications. Integrated waste management schemes. Flexibility of the waste management structure. Integrated use of organizational, managerial, legal, regulatory, methodological, technical and economic means for waste management	
8. Principles of economic regulation and incentives in the field of waste management	Payment for waste disposal (a form of compensation for damage to the environment), payment for waste disposal within the established limits and payment for over-limit disposal - from the profit of the enterprise. Economic stimulation of activities in the field of waste management. Tax and credit benefits	

6. LOGISTICS AND TECHNICAL SUPPORT OF THE DISCIPLINE

Table 6.1. Logistics of discipline

Auditorium type	**Auditorium equipment**	**Specialized educational / laboratory equipment, software and materials for mastering the discipline** (if necessary)
Лекционная	An auditorium for lecture-type classes, equipped with a set of specialized furniture; board (screen) and technical means of multimedia presentations.	No
Семинарская	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.	No
Для самостоятельной работы обучающихся	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 IETS.	No

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

7. EDUCATIONAL-METHODOLOGICAL AND INFORMATION SUPPORT OF THE DISCIPLINE

Required Literature

1. Sokolov L.I. Waste management, -M: Infra-Engineering, 2018, ISBN: 978-5-9729-0246-0; Electronic resource: https://avidreaders.ru/book/upravlenie-othodami-waste-management.html

2. Kharlamova M.D., Kurbatova A.I. Solid Wastes: Recycling Technologies, Control Methods, Monitoring, Ed. M. D. Kharlamova, 2nd ed., corrected. and additional - M .: Yurayt Publishing House, 2018, -311 p. (RUDN electronic library)

Additional literature

1. I. N. Zhmykhov, A. A. Chelnokov, K. K. Yurashchik, L. F. Yushchenko Waste management. Textbook, -465 C. Electronic resource: https://www.litres.ru/a-a-chelnokov/obraschenie-s-othodami-37392195/

Resources of the information and telecommunications network "Internet":

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/
- 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 when mastering the discipline are located on the discipline page in the TUIS RUDN University system:*https://esystem.rudn.ru/course/

1. A course of lectures with electronic presentations and video materials on the discipline "Regional and municipal waste management systems".
2. Guidelines for completing assignments for seminars
3. Test materials for milestone certification
4. Questions to prepare for the exam

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 level of competencies (parts of competencies) based on the results of mastering the discipline "Regional and municipal waste management systems" are presented in the Appendix to this Work Program of the discipline.

DEVELOPER:

Ass. Professor		**Kharlamova M.**

BASIC TRAINING UNIT LEADER:

Department Chef		**Savenkova E.**

PROGRAM SUPERVISOR:

Department Chef		**Kucher D.**

Application No. 1

VALUATION FUND
by academic discipline

"Regional and municipal waste management systems"

Direction 05.03.06 Ecology and nature management
08.04.01 "Construction"

Profile: Environmental engineering in construction

Graduate Qualification: Master

Guidelines for students on mastering the discipline (module)

The milestone certification is carried out in the form of testing for the completed course. In the middle and at the end of the semester, final testing is carried out, the number of points is registered in the BRS. Passing the exam (final scores) is included in the total score based on a maximum of 100 points.
Project work is carried out during the semester by groups of students, the number of students in the group depends on the number of stages in the project. Self-preparation for a seminar lesson includes the collection of the necessary material and is prepared in accordance with the stage of the general task using Internet resources and factual data provided by the teacher. The defense of the project work is carried out in stages at each lesson, in the presence of all students of the study group. An electronic presentation illustrating the results obtained should be prepared for defense. The report must be performed orally, the student must be fluent in the prepared material and answer questions from the teacher and other students. At each stage, the student responsible for the preparation of the stage performs, so by the end of the semester, each student in the group passes his stage of defense.
The final assessment of the project work is carried out by summing up the scores received in the semester by groups.

EXAMPLE TOPICS FOR DESIGN WORKS

1. Indicators (indicators) of the level of economic development of the country in accordance with the UN sustainable development indices in the field of waste management
2. Baseline indicators of UN SD in the field of waste management
3. Reasons for the low efficiency of processing raw materials into products (on average around the world about 8%)
4. Stages and tasks of the municipal waste management system
5. Formation of the global waste management system
6. Prospects for improving the methodology for calculating the environmental fee
7. Advantages, disadvantages and opportunities for improving the institution of regional operators
8. Analysis of the regional waste management system: advantages and disadvantages
9. Analysis of the specialization of the region of the Russian Federation (optional) and related problems of waste management
10. Prospects for the use of thermal processing of MSW in the region (optional)
11. Solving the problem of sewage sludge disposal in the region (optional)

Evaluation Fund passport for the discipline (module) "Regional and municipal waste management systems"

Code of controlled competence or its part	Controlled discipline section	Name of the evaluation tool							final examination
		Work in class	Delivery of the colloquium (work on a given topic)	Protection of design tasks (by stages)		Intermediate testing	Abstract protection	Final testing	
GPC- 2э PC- 4	World experience in the waste management. Possible management scenarios	4		3		4			2
GPC- 2э PC- 4	Waste as a source of secondary resources and energy	4		3		4			1
GPC- 2э PC- 4	Mechanisms for improving the waste management system in the regions of the Russian Federation. Waste management Legal basis	4		3		4			2
GPC- 2э PC- 4	Hierarchical order of waste management. Principles of waste classification.	4		3		4			2
GPC- 2э PC- 4	Territorial (regional) waste management schemes. The role of municipal government	4		3				4	2
GPC- 2э PC- 4	Waste management tools and best available techniques (BAT) for waste treatment, disposal and storage	4		3				4	2
GPC- 2э PC- 4	Integrated schemes for municipal solid waste processing	4		3				4	1
GPC- 2э PC- 4	Principles of economic regulation and incentives in the field of waste management	5						4	2
	Total	**33**		**21**		**16**		**16**	**14**

Materials for self-training in the discipline "Regional and municipal waste management systems”

QUESTIONS FOR SELF TRAINING

1. Waste management strategy in the light of the concept of sustainable development. Current Position Indicators
2. Procedure for identifying waste components
3. Quantitative and qualitative composition of MSW. Factors affecting the generation of waste. Composition of urban MSW.
4. Production control in the field of waste management
5. Basic principles of strategic waste management, waste management hierarchy. Waste Program, implementation levels.
6. Determination of the waste hazard class. Calculation and empirical methods.
7. Integrated schemes for MSW processing. Mandatory components. Stages of implementation.
8. Production control of waste components. Control methods. Integral and specific indicators.
9. Experience of waste management in developed countries: experience and comparison of management methods.
10. Federal catalog of waste. Decryption of the FKKO code.
11. Hazardous municipal waste: list, organization of separate collection, disposal methods. Russian and foreign experience.
12. Requirements for the development of draft standards for waste generation.
13. Peculiarities of rationing in the thermal processing of waste. Ecological aspects of direct waste incineration. Alternative thermal processing methods.
14. Resource characteristics of waste. Recycling technologies.
15. State cadastre of waste. Purpose, main blocks.
16. Landfill. Environmental aspects and requirements for the organization of sanitary landfills for waste disposal.
17. Legislation of Russia in the field of waste management. Goals, objectives and methods of implementation.
18. Product life cycle and waste generation. Waste as a source of secondary resources and energy
19. Federal Law No. 458 "On Amendments ...". Main innovations and amendments to Federal Law No. 89 “On Production and Consumption Waste”.
20. Methods of economic incentives for the collection and processing of waste.
21. Territorial scheme for handling production and consumption waste.
22. Extended Producer Responsibility Institute. Ecological fee
23. Regional operator - functions, rights and obligations.
24. Assessment and selection of technologies for rational sorting of MSW (preparation for complex processing).
25. Modern technologies for the neutralization and utilization of the organic waste fraction.
26. Approaches and types of waste classification.
27. Thermal methods of solid waste disposal. Ecological and economic aspects of thermal processing
28. Federal classification catalog of waste. Purpose, principles of compilation, code structure.
29. Integrated schemes for sorting and recycling MSW. Principles and approaches.
30. Certification of hazardous waste as a tool for effective management

31. Material balances at the enterprise. Accounting for waste generation at all stages of production.

EXAMPLES OF TESTS

1. 1. The information system for maintaining the State Cadastre of Wastes includes the following main blocks:

   a. data bank on the presence of restrictions on the location of the waste management facility

   b. FCCO databank
   c. data bank of GIS technologies and cartographic materials
   d. vehicle data bank
   e. investor data bank
   f. data bank on waste and technologies for their processing
   g. state register of waste disposal facilities

2. 2. To determine the resource characteristics of waste, it is necessary to take into account (add the missing physical and chemical parameters):

   a. waste composition (name and formula of the substance)
   b. hazardous waste properties
   c. technological processes in which waste can be used…..
   d. ….
   e. ……

3. Waste that can be used as SMR and SER is generated mainly at the following stages of the product (product) life cycle:

   a. product development

   b. production

   c. sales of products

   d. product operation

   e. product repair

   f. waste disposal

Evaluation criteria

The assessment of all results of mastering competencies is carried out in accordance with the scale of the international point-rating system ECTS. In accordance with the calculated grading system (*see FOS passport), the student gains the required points.

Work in class (for one hour of classes): max 1 point. The grade is given for attendance and active work at a seminar or lecture (lectures are held in an interactive form) - answers to current questions, notes, discussion.

Self-preparation for the lesson: max 3 points for each topic. The topic is prepared, there is a presentation, the results of calculations, the student freely answers questions - 2 points; the student is present at the lesson, participates in the discussion, but finds it difficult to answer questions - 1 point. The student is absent or the task is not prepared - 0 points

Frontier and final certification:

The assessment is made as a percentage of the total number of checked tasks, with the subsequent transfer of percentages into points in accordance with the approved BRS. For example, a student answered 10 test questions out of 15 correctly, therefore, he scored 67%. The maximum score for foreign certification is 9, multiply 0.67 by 9, we get 6 points. This score is put into the general statement and added to the rest of the scores. A student is considered to have successfully passed the milestone or final certification if the total score for all activities at the time of certification exceeds 50% of the maximum possible score.

The final grade for the semester is added up as the sum of points for all types of student activities (*see FOS passport) and can reach a maximum of 86 points, that is, the lower limit of the “excellent” grade, category B.

The final exam is taken by the student voluntarily, if he scored the minimum possible score for certification - 51 points. In other cases, the exam is mandatory and is estimated at a maximum of 14 points, as a result, the total score is derived taking into account the result of passing the exam and the final grade corresponds to the international ECTS scale. If the student scores less than 7 points in the exam, then the exam is considered not passed and the student can take it again (take a re-examination).