

*Federal state autonomous educational institution of higher professional education
“People’s Friendship University of Russia”*

Faculty of ecology
Recommended by MSSN

DISCIPLINE PROGRAM

Title of the discipline Waste management

Recommended for the direction of training / specialty

05.06.01 Earth Sciences

Direction of the program (profile)

Ecology: modern environmental studies

1. Main tasks 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

2. Place the discipline in the structure of the Concentration program:

The course is designed to provide knowledge on the implementation of activities for the collection, use, transportation and disposal, decontamination and disposal of hazardous waste, the existing material and technical base and normative documents.

The course has a scientific-theoretical and practical purpose: physical and chemical bases of processing and recycling of waste, and a basis for licensing hazardous waste management activities.

Course duration - 1 semester. The course is based on the knowledge gained in the study courses "Geochemistry", "System Environment", "Environmental design of industrial and urban facilities", "Resource-saving technologies", the course is logically correlated with discipline "Environmental impact assessment".

The course is theoretical, required for the study. The complexity of 4 credits (144 hours).

Table 1 shows the previous and subsequent disciplines aimed at the formation of discipline competencies in accordance with the competence matrix of EP HE.

Table No. 1

Prior and subsequent disciplines aimed at the formation of competencies

| № п/п | Code and name of competence | Preceding disciplines | Subsequent disciplines (groups of disciplines) |
|--|-----------------------------|---------------------------------------|--|
| General professional competencies | | | |
| | GPC-1 | Methodology of scientific research | preparation of the thesis |
| | GPC-2 | Pedagogics of higher school | Teaching practice |
| Basic competencies | | | |
| | BC-1 | Methodology of scientific research | preparation of the thesis |
| | BC-2 | History and philosophy of science | |
| | BC-3 | Foreign language | |
| | BC-5 | Methodology of scientific research | |
| Professional competencies | | | |
| | PC-1 | Pedagogics of higher school | Teaching practice |
| | PC-2 | Regulation of natural systems quality | Preparation of the thesis |
| | PC-3 | Regulation of natural systems quality | |
| | PC-4 | Methodology of scientific research | |

3. Requirements for the results of the examination of the discipline:

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

| General professional competencies | |
|--|-------|
| Ability to realize the self-directed research activity | GPC-1 |
| Readiness to teaching activity on the field of higher education educational programs | GPC-2 |

| Basic competencies | |
|---|--------------|
| Ability to the stocktaking and present-day scientific achievement evaluation, modern ideas generation in solving investigative and practical tasks, including cross-disciplinary fields | BC-1 |
| Ability to project and realize complex studies, including cross-disciplinary, based on the integral systematic scientific world outlook by the aid of History and Philosophy of Science knowledge | BC-2 |
| Readiness to take part in the Russian and international study personnel scientific missions resolution. | BC-3 |
| Ability to plan and solve the tasks of professional and personal enhancement | BC-5 |
| | PC-1 |
| To be able to diagnose issues of environmental protection, to make the impact assessment of building projects and other forms of anthropogenic activities to give recommendations on nature preserving and sustainable development maintenance. | PC -2 |
| To be able to make analysis and assessment of nature influence on health and human livelihood | PC -3 |
| To be able to organize and control scientific, research and manufacturing, expert and analytical work and educational work with the use of deepen knowledge in the field of program track | PC -4 |

As a result of studying the discipline PhD student must:

know The types of hazardous wastes and their classification, certification, types of toxicity and how to assess the impact of waste on the environment and humans;

- The main approaches to the valuation impact of hazardous waste on the environment and humans;

- Existing regulations on valuation effects on the OPS and the person;

- Existing methods of recycling industrial and household waste;

- The prospects for the direction of ways of processing and disposal of hazardous waste.

be able to - Risk assessment of the different types of waste in the OPS and the person;

- Work with the normative documents of different levels, with the normative legal acts;

- The development of draft norms on the basis of a complex of existing materials;

- Assessment of the prospects, advantages and disadvantages of the methods of processing and recycling of waste;

- The development of consolidated projects of processing and recycling of various wastes.

More competence prescribed on the main themes of the course (see. Annex 1)

Be familiar with the basic laws of natural science for the understanding of the world and natural phenomena; have knowledge in ecology, nature exploitation .

4. The volume of disciplines and types of training work

Total labor discipline is 4 credits.

| Type of study | Hours | Semesters | | | |
|--------------------------|----------|-----------|-----|---|---|
| | | | | | |
| Class hours (total) | 60 | 4 | | | |
| <i>Including:</i> | - | - | - | - | - |
| Lectures | 20 | 20 | | | |
| Practical training | 40 | 40 | | | |
| Seminars | | | | | |
| Laboratory works | | | | | |
| Independent work (total) | 66 | 66 | | | |
| Credit system | час | 144 | 144 | | |
| | зач. ед. | 4 | 4 | | |

5. Contents

5.1. Contents sections

Topic 1. The problem of waste. Stability and safety of the environment, the concept of waste. 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.

Topic 2. Waste in 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.

Topic 3. Ensuring environmental safety in waste management. Documenting waste management activities. Modern methods of providing analytical control and waste identification. Determination of the toxicity class and the degree of hazard of waste. Standardization of the impact of waste on the environment. Classification of quality standards for OPS and the principles of their determination. Documenting waste management activities. Certification and certification of waste. Certification of hazardous waste. Licensing of waste management activities. Medical, environmental and social aspects in the waste management system.

Topic 4. Processing, recycling and disposal of industrial waste. 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..

Topic 5. Additional sources of solid waste generation. Wastewater. Gas-air emissions. Sources and types of pollution of the hydrosphere. Industrial, domestic and atmospheric effluents. Types of industrial wastewater pollution. Modern methods of wastewater treatment from industrial pollution. Agricultural and domestic wastewater and methods of their treatment. Gas-air emissions. Dry and wet cleaning methods. Methods for processing and disposal of sludge and sludge. Thermal methods. Biological methods. Methane digestion. Aerobic oxidation (composting). Vermiculation.

Topic 6. Sources of formation and methods of processing waste with a high content of organic substances. The main sources of waste generation containing organic matter. Specificity of processing methods. Waste-based bioenergy (chemical oxidation, thermal gas generation, biological fermentation). Recycling of agricultural waste. Biogas power plants. Aerobic and anaerobic methods of disinfection of agricultural waste. Biocomposting.

Topic 7. Technologies for sorting and processing household waste. Solid waste separation processes and solid waste processing complexes. Technological indicators of the process of separating solid waste. Technological schemes for separating solid waste. Magnetic, electrodynamic and electrical separation. Process principles, types of separators. Aeroseparation. Types of separators. Crushing of solid waste. Types of crushers. Screening of solid waste. Types of screens. Manual sorting. Flotation and gravity processing. Solid waste incineration methods. Getting energy. Environmental aspects of incineration. Technologies of biothermal aerobic composting. Integrated processing of solid waste. Basics of designing processing complexes.

Topic 8. Landfills for waste disposal. Hygienic requirements for the selection of the territory - the location of the landfill. Layout and arrangement of polygons. Processes with solid waste at landfills landfill reclamation. Ensuring control over the safety of landfills. Hygienic requirements for the choice of methods for burying industrial waste (solid, dusty, pasty). Features of disposal of water-soluble, liquid and combustible waste. Preventive and routine supervision of landfills. Landfill passport.

Topic 9. General principles and procedure for the design of industrial facilities for waste processing. Comparison and selection of the best available processing technologies. Features of

the ecological design of incineration plants (MSZ). Principles for Environmental Impact Assessment (EIA) for Waste Recycling and Utilization Enterprises. Mathematical modeling of waste processing and disposal processes

5.2. Sections of disciplines and occupations

| № п/п | Sections of disciplines and occupations | lections | PT | LW | Semina rs | IW | hours |
|----------|---|----------|----|----|--------------|----|-------|
| 1. | The problem of waste | 2 | 6 | | | 7 | 15 |
| 2. | Waste in the environment | 3 | 4 | | | 7 | 14 |
| 3 | Sources of solid waste. Wastewater. | 2 | 6 | | | 7 | 15 |
| 4 | Processing, recycling and disposal of industrial waste | 3 | 4 | | | 7 | 14 |
| 5 | Additional sources of solid waste generation | 2 | 4 | | | 7 | 13 |
| 6 | Sources of formation and methods of processing waste with a high content of organic substances. | 2 | 4 | | | 7 | 13 |
| 7 | Technologies for sorting and processing household waste | 2 | 4 | | | 8 | 14 |
| 8 | Landfills for waste disposal | 2 | 4 | | | 8 | 14 |
| 9 | General principles and procedure for the design of industrial facilities for waste processing | 2 | 4 | | | 8 | 14 |
| | | 20 | 40 | | | 64 | 144 |

6. Practical trainings (seminars)

| № п/п | Sections of disciplines and occupations | In This section | Hours |
|----------|---|---|-------|
| 1 | 1 | Analysis of municipal programs "Waste" and funding sources. Development of an investment concept for the "Waste recycling plant" project | 6 |
| 2 | 2 | Analysis of the impact of leachate from solid waste landfills on ground and surface waters. Determination of the degree of wastewater treatment by the content of dissolved oxygen» | 4 |
| 3 | 3 | Development of a program for an environmental monitoring system for waste disposal " | 6 |
| 4 | 4 | "Determination of the toxicity class of industrial waste" | 4 |
| 5 | 5 | "Analysis of the impact of an incineration plant on atmospheric air. Calculation of maximum permissible emissions (MPE) and analysis of the results obtained " | 4 |
| 6 | 6 | "Technological schemes for anaerobic digestion of organic waste (animal waste, organic component of solid waste, domestic wastewater sludge). | 4 |
| 7 | 7 | Calculation of the metatank. " | 4 |
| 8 | 8 | "Determination of damage from unauthorized waste disposal" | 6 |
| 9 | 9 | "Assessment of the state of the natural environment in the area of the incineration plant (at a given address) using cartographic and fund materials" | 6 |

8. Material and technical support of the discipline:

Projector, interactive board

9. Information support of the discipline

database, information and search engines

www.e-library.ru

www.science-direct.com

www.google.ru

9. The educational-methodical and informational support of the discipline:

a) Main literature

1. Hazardous Waste Management, Treatment and Disposal Timothy G. Townsend
2. Федеральный закон «Об отходах производства и потребления» № 89-ФЗ (с изменениями и дополнениями):
4. LECTURE NOTES For Environmental Health Science Students Takele Tadesse
- 5 Hazardous Waste Disposal Guide Michael B . Blayney, 2015
7. ГОСТ Р 54205-2010 Ресурсосбережение. Обращение с отходами. Наилучшие доступные технологии повышения энергоэффективности при сжигании. 2012
8. Waste Management Practices: Literature Review Dalhousie University Office of Sustainability Gary Davidson, 2011
9. One aim-several goals: from stem cell to the biofuel production. The new background method for zero waste and high efficiency biodiesel production from microalgae *Chlorella vulgaris* [Электронный ресурс] / E.V. Orlova [и др.]
// Journal of Materials Science and Engineering A & B (JMSE). - 2014, A4(7). - P. 234-240.

b) Additional literature

1. Харламова М.Д., Курбатова А.И., под. ред Харламовой М.Д.(гриф УМО) Твердые отходы: технологии утилизации, методы контроля, мониторинг. Издательство «ЮРАЙТ», 2015. -231 с.
2. Your practical guide . Working safely with hazardous substances. Environmental protection Authority.
3. Agency for Toxic Substances and Disease Registry Division of Toxicology and Human Health Sciences Atlanta, GA 30333 Support document to the priority list of hazardous substances that will be candidates fir toxicological profiles 2015,
4. Air pollution: currient and future challenges
5. Canan Cengiz Urban Ecology
6. Jianguo Wu, Chunyang He, Ganlin Huang and Deyong Yu Urban Landscape Ecology: Past, Present, and Future
7. Roedder Edwin. Problems in the disposal of acid aluminum nitrate high-level radioactive waste solutions by injection into deeplying

- 1) <http://www.allconfs.org/img1/201374161447505.pdf>
- 2) http://base.garant.ru/12125350/1/#block_100
- 3) https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/env_health_science_students/ln_sol_id_haz_waste_final.pdf
- 4) <http://www.research.northwestern.edu/ors/forms/purplogue.pdf>
- 5)
- 6) [https://www.dal.ca/content/dam/dalhousie/pdf/sustainability/Waste%20Management%20Literature%20Review%20Final%20June%202011%20\(1.49%20MB\).pdf](https://www.dal.ca/content/dam/dalhousie/pdf/sustainability/Waste%20Management%20Literature%20Review%20Final%20June%202011%20(1.49%20MB).pdf)
- 7) ЭБС РУДН
- 8) .
- 9) ЭБС РУДН
дополнительная
- 1) ЭБС РУДН
- 2) http://www.hazardoussubstances.govt.nz/media/13982/epa_your_practical_guide_2.pdf
- 3) https://www.atsdr.cdc.gov/spl/resources/atsdr_2015_spl_support_document.pdf
- 4) <https://www.epa.gov/clean-air-act-overview/air-pollution-current-and-future-challenges>

permeable formations [Текст] / E. Roedder. - Книга на английском языке. - Washington : U.S. Government printing office, 1959. - 65 p. : il. - (U.S. Geological survey. Bulletin 1088).

5) <http://dx.doi.org/10.5772/56314> На портале ЭБС РУДН

11. Methodical instructions for students on mastering the discipline (module)

The assessment of all the results of the development of competencies is carried out in accordance with the scale of the international point-rating system ECTS. In accordance with the calculated grading system (* see the passport of the FOS), the student gains the necessary points. Work in class: depends on the complexity of the topic.

The mark is given for the presence and active work at a seminar or at a lecture (lectures are conducted in an interactive form) - answers to current questions, note-taking, discussion. The graduate student is present at the lesson, participates in the discussion, does not hesitate to answer the questions with the maximum score. The graduate student is absent or the task is not prepared - 0 points. A postgraduate student is considered to have successfully passed the midterm or final certification if the sum of points for all types of activities at the time of certification exceeds 50% of the maximum possible score (work at a lecture, practical lesson, control work).

The final grade for the semester is the sum of the points for all the student's activities (* see the passport of the FOS), The final exam is surrendered by a graduate student voluntarily, if he scored the minimum possible score for attestation - 51 points. In other cases, the test is mandatory, 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.

12. Fund of assessment tools for intermediate certification of students in the discipline (module)

Materials for assessing the level of mastering the educational material of the discipline "Waste management" (evaluation materials), including a list of competencies indicating the stages of their formation, a description of indicators and criteria for evaluating competencies at various stages of their formation, a description of the assessment scales, typical control tasks or other materials necessary to assess knowledge, skills, skills and (or) experience of activity, characterizing the stages of the formation of competencies in the process of mastering the educational program, methodological materials that determine the procedures for assessing knowledge, skills, skills and (or) experience of activities that characterize the stages of the formation of competencies are developed in full and are available for students on the discipline page at TUIS RUDN.

The program has been drawn up in accordance with the requirements of the ES of HE RUDN University.

Developer:

Head. of the Department
"Environmental Monitoring and Forecasting



Kharlamova Marianna D.

Head of the program

Head of the Department of
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