



**FACULTY
OF ECOLOGY**



INTEGRATED SOLID WASTE MANAGEMENT

in English

MASTER'S PROGRAMME DEGREE



PROGRAM ADVANTAGES

- ✓ Acquisition of professional competencies, in accordance with a professional standard, for the successful solution of problems in the field of production and consumption waste management.
- ✓ Taking into account the specifics of the regions (climatic, geographic, social characteristics) in the formation of regional programs for waste management.
- ✓ The opportunity to acquire practical skills in the production of sorting, heat treatment and storage of waste.
- ✓ The possibility of conducting scientific research in the field of advanced technologies for waste management, production and use of secondary raw materials and energy, processing of bioorganic waste.
- ✓ Study of the basics of commercial management of production and consumption waste, justification of investments in waste processing enterprises.
- ✓ Systematic study of the foundations of a circular economy and climate neutral waste management.



STUDYING PROCESS

120 credit.

Lectures, practical and laboratory classes, several types of practices, and is designed for 2 years of study. The training courses taught as part of the educational program include the study of a complex of basic and professional disciplines, including optional disciplines



METHODOLOGY OF SCIENTIFIC CREATION

- Mastering by students of knowledge and methods of scientific research in ecology.
- Formation of students' ideas about planning scientific work; methods and approaches to collecting materials, conducting experiments and processing results.
- Formation of skills in choosing the optimal methods for analyzing data obtained during observations and experiments.
- Mastering the methods of presenting scientific information for scientific research in the field of ecology.



SOLID WASTE MANAGEMENT (SWM) AND CLIMATE CHANGE

- Familiarization of students with ways to minimize the impact of waste on the climate and the air, with modern strategies for adaptation and climate mitigation.
- Climate change issues associated with an increase in the concentration of greenhouse gases in the atmosphere, formed during the decomposition of bioorganic waste, during thermal processing of waste; use of modern software for estimating greenhouse gas emissions and assessing their energy potential.



ENVIRONMENTAL PROTECTION BIOTECHNOLOGY

- Application of biological systems and processes for solving problems of environmental protection and rational nature management.
- The laws of ecosystem functioning.
- The main biotechnological methods used to protect the environment: bioremediation, biodegradation of xenobiotics, bioconversion of waste; theoretical foundations and methods of biotesting and bioindication.



NATURE PROTECTION AND ACCUMULATED ENVIRONMENTAL DAMAGE (AED) ELIMINATION TOOLS

- Formation of knowledge, skills and abilities in the field of elimination of accumulated environmental harm (IEE).
- Study of the sources of formation of objects of accumulated harm.
- The main types of objects, their brief description, principles of classification and subsequent reclamation.
- Reclamation technologies for accumulated harm objects (soil, water bodies).
- In situ and ex situ methods.
- Mechanical processing.
- Thermal methods.
- Biological methods.



HAZARDOUS WASTE MANAGEMENT & PROCESSING

- Formation of theoretical foundations for the management of hazardous waste, a source of valuable secondary material resources and energy production.
- Principles of classification and treatment (collection and accumulation, transportation, processing, storage) with hazardous industrial and municipal waste, duties and functions of enterprises - producers of hazardous waste, assessment of the effectiveness of the introduction of environmental tax as a regulatory instrument of extended producer responsibility.
- During the training, innovative teaching technologies are used 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 hazardous waste management.



ENVIRONMENTAL CONTROL AND MSW MONITORING PROGRAMS

- Familiarization of students with modern physicochemical methods of research of waste components.
- Theoretical foundations of modern physical and chemical methods used in environmental research; general laboratory and special methods for studying waste components (including hazardous and toxic substances); operating principles of modern analytical equipment; fundamentals of setting up an experiment and processing research materials; features of sampling and qualitative and quantitative analysis of chemicals, bioorganic wastes, leachate components and landfill gas.
- Routine research.
- Environmental monitoring programs for waste management facilities: hazardous waste landfills, landfills and MSW landfills, waste thermal treatment plants, sedimentation tanks and sewage sludge storage tanks.



BASICS OF CIRCULAR ECONOMICS

- Students gaining comprehensive theoretical and applied knowledge about circular economics (circular economy), developing skills in the field of economic mechanisms for environmental protection, as well as studying the conditions and possibilities for transforming a technogenic type of economic development into a circular economy.
- Introduction of low-waste and resource-saving technologies in industrial production.



METHODS OF REMOTE SENSING AND INFORMATION PROCESSING OF MSW MANAGEMENT OBJECTS

- Studying the theoretical foundations and features of the use of remote control methods in waste management, acquiring practical skills in working with satellite images and performing tasks for processing and analyzing remote sensing information in GIS, developing the ability to correctly use GIS methods to assess the impact of objects on the environment, multivariate analysis and justification of the location of waste management facilities (MSW landfills, hazardous waste landfills, MSW thermal treatment plants, hazardous waste disposal plants, etc.)

In total, the curriculum provides for the study of 16 disciplines, including 4 blocks of optional disciplines, two types of practices and research work.



HEAD OF THE PROGRAMME

KHARLAMOVA MARIANNA DMITRIEVNA



PhD in Environmental Science (Chemistry), Associate Professor, Head of the Department of Environmental Monitoring and Forecasting, member of the Scientific Council on global environmental problems of the Russian Academy of Sciences, member of the Scientific and Technical Council of the Federal Service for Natural Resources Supervision (ROSPRIRODNADZOR).

Kharlamova M.D. is the author and head of two basic training programs of the magistracy in the direction 05.04.06 Ecology and environmental management, specialization “Recycling of production and consumption waste” (in Russian) and “Integrated Solid Waste Management” (in English), author of more than 10 textbooks and teaching aids, including those with the ULV stamp, more than 50 scientific articles in the field of waste management.

Kharlamova M.D. is the author of MOOC distance courses and implements the principles of Blended Learning in practice. The course “Practical Tools of Solid Waste Management & Environmental Damage Reducing” prepared by her has been hosted and has been successfully operating since 2020 on the Educational platform I-versity, Springer Nature.

Kharlamova M.D. is an authoritative specialist and expert in the field of environmental protection, effective management of solid waste production and consumption, the organization of resource-saving and low-waste industries, environmental diagnostics and sustainable development of natural and technogenic ecosystems. She has repeatedly acted as an expert-analyst in the field of environmental protection and sustainable development of RIA Novosti, the newspaper “Argumenty i Fakty”, TV channels RBC, Izvestia, OTR and other well-known Russian newspapers and TV channels. In January 2020, at the request of the deputy of the State Duma of the Russian Federation of the Federal Assembly A.I. Fokin, she prepared a resolution on the draft amendments to Federal Law No. 89-FZ “On Production and Consumption Waste” with regard to improving the mechanism of extended producer responsibility (EPR).