PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
NAMED AFTER PATRICE LUMUMBA

Institute of Environmental Engineering

educational division - faculty/institute/academy

COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Ecologic-economical aspects of environmental projects
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction	Projects. Environmental design concept. Stages of development and implementation of the project / Feasibility study of projects. The composition of the feasibility study. Requirements for the content of sections of the feasibility study. Environmental justification of investment projects. The concept of environmental support of economic activities
Economic efficiency of investment projects	Methods for assessing the economic efficiency of investment projects. Performance indicators. Taking into account the time factor. The concept of project sustainability and its role in investment decisions
Environmental support of economic activities at the pre-project stage	Environmental support of economic activities at the pre-project stage. Basic documentation. Expertise of projects and ecological justification of projects. The concept of EIA as part of project documentation
Environmental support during the construction phase	Environmental support during the construction phase of the facility. Environmental impacts during construction of facilities and environmental optimization
Environmental support on the stages of operation and liquidation	The stage of operation of facilities and the stage of liquidation (completion of the project): the main types of environmental impact. Procedures and documentation for environmental support of economic activities.

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signature **Pinaev V.E.** name and surname

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signature **Savenkova E.V.** name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Economic aspects of natural resources management
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction	Introduction. Methods for assessing natural resources. Natural resource potential: economic assessment methods.
Economic assessment of non-renewable resources	Economic assessment of non-renewable resources: main features. Approaches to the economic assessment. Practical examples
Economic assessment of renewable resources	Economic assessment of renewable resources: main features. Approaches to the economic assessment. Practical examples.
The resource base of enterprises, methods of its assessment and analysis of the effectiveness of use	The resource base of enterprises, methods of its assessment and analysis of the efficiency of use. The concept of the natural intensity of technological processes. Possibilities of regulating the natural intensity. Environmental and economic damages as "negative resources": assessment methods. The principles of the "green economy" and the possibilities of their practical implementation at enterprises.
Multifunctional resources and the specifics of their assessment in projects	Alternative estimates of natural resources. Multifunctionality of resources and problems of ensuring the efficiency of natural resources use.

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signature **Khaustov A.P.** name and surname

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signature **Savenkova E.V.** name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Engineering ecology
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Anthropogenic processes as a factor of environmental pollution.	Modern anthropogenic activity and environmental pollution. Global and local processes and their modelling, assessment and forecast.
Self-cleaning ability of ecosystems. Parameters of ecosystem sustainability	The principles of the existence of ecosystems. Homeostasis. Types of resilience. The cycle of substances and elements. Self-cleaning ability of ecosystems. Abiotic self-purification processes. Biotic self-purification processes. Soil microbiocenosis. Microbiocenosis of water bodies. Microflora of the air. The degree and speed of self-cleaning. Assimilation capacity of the ecosystem.
Wastewater & Sewage Treatment. Sediments of Wastewater	The main sources of wastewater. Composition and Sources of Wastewater. Types of Wastewater Pollution (according to physic and chemical properties). Atmospheric Sewage or Runoff. Household Wastewater. Modern Methods of Sewage Treatment (according to the mechanism of action). Technological Treatment Schemes
Sources and types of atmospheric pollution	Sources and types of atmospheric pollution. Environmental protection technologies.
Solid Waste Treatment Technologies: Secondary Raw Materials Recycling, Thermal Processing.	Pyramid of the waste management. Waste as the “secondary resources”: recycling and “waste to energy” technologies. Norms for the assessment of the waste danger. Norms of the waste formation, accumulation, storage and processing
Landfilling	Sources of Industrial Solid Waste (ISW). Ecological Features of ISW. Methods of Industrial Nonradioactive Waste Elimination and Processing. Basic Methods of Municipal Waste Processing. Sorting and Using as Secondary Raw Materials. Rational MSW sorting scheme. “Dry" mechanical or Physical methods. The main technological indicators of the efficiency of separation of solid waste
Water bodies Remediation Technologies	Types of water bodies. Types of pollutants of water bodies. Sources of water pollution. Water restoration methods. Stages of environmental remediation of water bodies and preparatory works: technical, biological. Creation (restoration) of the coastal ecosystem. Comprehensive improvement of the surrounding area. Examples. Purification

	of water objects from oil products. Reducing the concentration of pollutants in water bodies

Developers:

Kharlamova M.D.

signature name and surname

HEAD
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Savenkova E.V.

signature name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Environmental accounting and reporting
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction.	Environment as an object of statistical observation. Sources of statistical data in the sphere of environmental protection, environmental safety and nature management
State statistical observation	State statistical observation. Systems of accounting and reporting. Theoretical basics of environmental statistics. Characteristics of natural resources as a part of national welfare. System of indicators of statistics of natural resources. Environment and Natural Resources Statistics
Environmental statistics for enterprises	Statistical observation in the field of environmental management and sustainable development at the level of enterprises and companies. Reporting formats. Use of Observations
Environmental accounting and reporting	International practice. Standards of non-financial reporting. Green reporting. GRI standards.
Environmental accounting and reporting as an informational base for the analyses	Environmental accounting and reporting as an informational base for the analyses. Sources oaf data and approaches to their analyses. Sustainability indicators of an organization.

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Environmental norms for sustainability
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction	Sustainability and sustainable development. Nature management and environmental safety. Sustainability of the natural systems and their development trajectory. Environmental norms as an instrument of nature management. Types of the standards.
Environmental norms and regulations for the atmosphere protection	Factors of the pollution and self-purification of the atmosphere. Main models of the atmosphere pollution. Norms of the atmospheric quality: approaches to the setting of norms and examples. Regulation of the atmospheric pollution
Environmental norms and regulations for the protection of water quality	Factors of the pollution and self-purification of the water bodies. Basic models of the pollution of water flows: the Russian experience. Norms of water quality
Environmental norms and regulations for the protection of soil	Soil quality standards: approaches to justification of norms, types of norms, examples
Waste in the nature management	Pyramid of the waste management. Waste as the “secondary resources”: recycling and “waste to energy” technologies. Norms for the assessment of the waste danger. Norms of the waste formation, accumulation, storage and processing
Specific environmental pollutants and their regulation	Oil and petroleum products in the environmental media: some regulation approaches in Russia and abroad. Polycyclic aromatic hydrocarbons and their regulation in the environments: main environmental properties of PAHs, their marker role, examples of the norms in the world
Harmonization of environmental standards in the field of impacts on soil and land resources.	The system of norms and standards in the field of assessing the quality and use of soil and land resources: basic principles and approaches. Current documents and prospects for modernization
Harmonization of environmental standards in the field of waste management	The system of norms and standards in the field of assessing the quality and use of underground hydrosphere resources: basic principles and approaches. Current documents and prospects for modernization
Best available technologies	The register of the best technologies. Prospects for the application of rationing based on the best existing technologies in Russia

Rationing of specific pollutants	POPs, hydrocarbons, heavy metals. Domestic and foreign approaches. Prospects for the modernization of domestic standards
Environmental norms and standards and economics	Environmental regulations and standards as a basis for the development of economic methods of environmental management regulation
Environmental regulation and environmental design	Environmental regulations and standards in projects. Green standards

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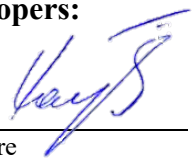

Khaustov A.P.

signature name and surname

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Savenkova E.V.

signature name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Environmental standards and nature management
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction	Modern problems of nature management. Environmental norms and standards as a base for the efficient nature management
Environmental norms and regulations for the atmosphere protection	Factors of the pollution and self-purification of the atmosphere. Main models of the atmosphere pollution. Norms of the atmospheric quality: approaches to the setting of norms and examples. Regulation of the atmospheric pollution
Environmental norms and regulations for the protection of water quality	Factors of the pollution and self-purification of the water bodies. Basic models of the pollution of water flows: the Russian experience. Norms of water quality
Environmental norms and regulations for the protection of soil	Soil quality standards: approaches to justification of norms, types of norms, examples
Environmental norms and regulations in the waste management	Pyramid of the waste management. Waste as the “secondary resources”: recycling and “waste to energy” technologies. Norms for the assessment of the waste danger. Norms of the waste formation, accumulation, storage and processing

Developers:

signature **Khaustov A.P.** name and surname

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signature **Savenkova E.V.** name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Environmental standards and nature management
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction	Modern problems of nature management. Environmental norms and standards as a base for the efficient nature management
ISO 14001 and Environmental management system	Main requirements and steps of the EMS development. Environmental aspects and their identification. Environmental polisy
ISO 14030 standards	Indicators of the environmental performance. Development of environmental indicators as a base of environmental policy
Environmental life cycle analyses: ISO 14040 group	Concept of a life cycle of the product. Organization boarders. Production system. Assessment cycle and it's interpretation and improvement. Practical approaches
Environmental norms for climate protection and decarbonization	ISO 14060+ group: requirements to the carbon footprint assessment, regulation of GHG-reporting, validation of projects, verification of reporting and projects.
International environmental norms on emvironmental monitorng	Main monitoring procedures, their regulation. Requirements to the instrumental control of environmental impacts.

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Environmental statistics
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction.	Environment as an object of statistical observation. Sources of statistical data in the sphere of environmental protection, environmental safety and nature management
State statistical observation	State statistical observation. Systems of accounting and reporting. Theoretical basics of environmental statistics. Characteristics of natural resources as a part of national welfare. System of indicators of statistics of natural resources. Environment and Natural Resources Statistics
Environmental statistics for enterprises	Statistical observation in the field of environmental management and sustainable development at the level of enterprises and companies. Reporting formats. Use of Observations
Methods of statistical data processing and analyses	Methods of statistical processing and data analysis. Correlation-regression analysis. Basic concepts of correlation and regression analysis. The main tasks and prerequisites for the use of the correlation-regression method. Correlation-regression analysis of natural resources of the Russian Federation
Applied data analyses	Statistical methods and data analysis for processing the results of environmental monitoring. Classifications in ecological geochemistry. Data analysis in environmental economics

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Estimations of natural resources
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction	Natural resources in the nature management. Classifications of natural resources
Qualitative and quantitative evaluations of mineral resources	Qualitative and quantitative evaluations of mineral resources, main criteria, indicators, approaches, problems and practice in the countries of the world
Qualitative and quantitative evaluations of water resources	Qualitative and quantitative evaluations of water resources, main criteria, indicators, approaches, problems and practice in the countries of the world
Qualitative and quantitative evaluations of biological resources	Qualitative and quantitative evaluations of biological resources, main criteria, indicators, approaches, problems and practice in the countries of the world
Qualitative and quantitative evaluations of energy resources	Qualitative and quantitative evaluations of energy resources, main criteria, indicators, approaches, problems and practice in the countries of the world

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	History and methodology of ecology and natural resources management
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Modern environmental science	Development of environmental sciences. Ecology and a system of environmental disciplines.
18th and 19th century Ecological studies	Arcadian and Imperial Ecology Carl Linnaeus and Systema Naturae The botanical geography and Alexander von Humboldt The notion of biocoenosis: Wallace and Möbius Foundation of ecology as discipline Malthusian influence Darwinism and the science of ecology
20th century	Expansion of ecological though The biosphere – Eduard Suess and Vladimir Vernadsky The ecosystem: Arthur Tansley Ecological succession – Henry Chandler Cowles Animal Ecology - Charles Elton G. Evelyn Hutchinson - father of modern ecology 20th century transition to modern ecology
Ecological Influence on the Social Sciences and Humanities	Human ecology History and relationship between ecology and conservation and environmental movements
Modern nature management	Modern nature management and the development of ecological science. Sustainability theory.

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Industrial nature management and economics
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction to the industrial nature management	Concept of nature management. Evolution and features of the industrial nature management. Modern problems of nature management in the industrial sector of the economy. Modern tendencies
Sectoral problems of industrial nature management	Problems of industrial nature management in mining industry.Problems of industrial nature management in fuel and energy complex Problems of industrial nature management in chemical industry. Problems of industrial nature management in the transport industry
Environmental and economic consequences of sectoral problems of industrial nature management	Concept of the environmental damage. Approaches to the calculation of damages in different sectors of economy. Evaluation of natural environmental damage and its economic equivalents. Environmental damage calculation as a base for the evaluation of economic efficiency of nature protection
Best available technologies in the industrial nature management	Concept of BATs. Development of the system of regulation in the industrial nature management. Actual European experience and national features of BAT standardization
Economic efficiency of environmental protection projects	Basics of economic assessment of the efficiency of environmental protection projects. Components of the environmental and economic efficiency and their calculation.

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signature name and surname

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Savenkova E.V.

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Industrial safety
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction to Industrial Safety. Hazardous production facilities. Threats to industrial safety: accidents and emergencies.	Industrial safety concept. Russian legislation in the field of industrial safety. Relevance of industrial safety issues. Understanding of hazardous production facilities, their functioning and identification methods. Regulation of hazardous production facilities. International cooperation and foreign experience in industrial safety management. International documents in the field of industrial safety management. International organizations. Russia's commitments
State regulation in the field of industrial safety. Critical objects of the economy. International cooperation and foreign experience in industrial safety management	State bodies for ensuring industrial safety. Their functions and powers. Industrial safety management methods. Critical objects of the economy: methods of their identification and methods of ensuring their functioning. Normative base. Security techniques
Industrial safety risks. Emergency events and procedures for their investigation	Understanding the risks and dangers. Risk identification and management methods. Industrial safety insurance. Software for risk analysis at hazardous production facilities. Information Systems. Software complexes. Domestic and foreign practice
Planning and prevention of emergency situations at chemically hazardous facilities Planning and prevention of emergencies with oil spills	Planning and prevention of emergency situations at chemically hazardous facilities in Russia. PLAS formation: main sections, the order of their filling; procedures for approval and implementation of the plan. Russian and foreign practice. Planning and prevention of emergencies with oil spills. Formation of OSRP: main sections, the order of their filling; procedures for approval and implementation of the plan. Major planning mistakes. Russian and foreign practice

Industrial safety declaration and examination of hazardous industrial facilities	Industrial safety declaration for hazardous industrial facilities. Industrial safety expertise. Normative base. Emergency events and procedures for their investigation. Normative base. Practical examples of accident investigation procedures

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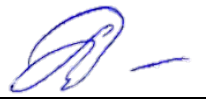

Redina M.M.

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	International collaboration
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction	General ideas about the necessity and methods of implementing international cooperation in the field of nature protection Absolute dependence of man on flora and fauna. The biosphere as a human habitat that has no state borders. The necessity and contradictory nature of international cooperation in the protection and rational use of flora and fauna. The main forms of international cooperation in the field of environmental protection and nature management. International cooperation in the field of wildlife protection and nature management, as a compromise of nature management. The main mechanisms of international cooperation.
Examples of the implementation of international cooperation	Examples of the implementation of international cooperation in the field of nature protection on the example of the main global conventions. Rio Declaration on Environment and Development. The UN Framework Convention on Climate Change. The UN Convention on Biological Diversity. The Kyoto Protocol as an implementation of the UN Framework Convention on Climate Change. UNESCO, United Nations Educational, Scientific and Cultural Organization. UNESCO Program "Man and the Biosphere" (MAB). The Rome Convention. International trade in endangered species of wild fauna and flora as one of the main factors in reducing species diversity. plants and animals on planet Earth (CITES Convention). Berne Convention.
International non-governmental environmental organizations	International non-governmental environmental organizations and their role in international cooperation in the field of OS protection International Whaling Commission (IWC).

	International Union for Conservation of Nature (IUCN). World Wildlife Fund (WWF

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Redina M.M.

signature name and surname

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Savenkova E.V.

signature name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	IT in ecology and nature management
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction. Application of computer technologies in the work of an ecologist	Computational methods for assessing environmental impact, risk assessment, etc. Application of computer tools (Excel) for economic and environmental calculations. Specialized programs for complex calculations for environmental impact assessment, risk analysis. Graphics processing software
Primary processing of statistical data in Excel	Distribution characteristics, their interpretation and methods of finding them in a given sample. Compilation of interval series and determination of characteristics for a series. Visualization of statistical data
Assessment of the characteristics of the general population. Observation errors	Observation errors and confidence intervals for characteristics of large and small samples. Determination of the required sample size
Testing statistical hypotheses	Statistical hypotheses and their application to solving real problems. Parametric criteria and conditions for their application. Testing the hypothesis about the distribution law. Comparison of two samples by mean value and comparison of variances of two samples using parametric tests. Nonparametric tests. Computing consistent ranks. Comparison of two samples by the mean and comparison of variances of two samples using nonparametric tests. Data consistency assessment.
ANOVA	Comparison of averages in more than two objects. Analysis of variance. Nonparametric ANOVA
Correlation-regression analysis	Statistical connection and methods of its study. Correlation coefficient: graphical assessment, Pearson, Spearman, Kendall coefficients. Linear regression analysis. Pairwise linear regression. Multiple Linear Regression. Non-linear regression models. Correlation ratio
Time series analysis	Dynamic (time) series, their classification, structure, tasks and conditions of study. Indicators of the analysis of the series of dynamics.

	Time series trend analysis. Making forecasts. Revealing seasonal irregularities in time series

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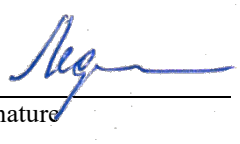

Ledascheva T.N.

signature name and surname

HEAD
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Savenkova E.V.

signature name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Professional foreign language
Course Workload	6 ECTS (216 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Translation of scientific literature in the specialty. Scientific style of natural science disciplines in Russian and the studied foreign language	Interferences in scientific speech at the level of translation. Translation of scientific terms, units of measurement, formulas, graphs, proper names, geographical names, names of organizations. Ways to achieve adequacy and equivalence in the translation of scientific literature. Work with dictionaries and reference books. The use of computer technology in translation
Annotating, summarizing and compiling reviews. Primary and secondary texts	Fundamentals of scientific text compression. Conventions and strategies for creating secondary texts of varying degrees of compression: abstracts, annotations, analytical reviews of foreign-language scientific literature in the specialty
Writing and presentation of scientific work in the specialty. Scientific text	Definition of scientific text. Types of scientific texts, their structure, paragraphing, division into paragraphs. Stratification of scientific literature vocabulary. Term classes. Features of functioning in scientific texts of categories of parts of speech of a foreign language in comparison with Russian. Features of punctuation. Means of communication of the text, expressing the sequence of thoughts, explanation, clarification or argumentation of thought; adversarial-restrictive relations; final value. Unions and compound turns and their corresponding unions in the Russian language. Syntax of scientific speech. Preparation of written works. Rules for citing, designing footnotes, rules for compiling a bibliography. Scientific message. Scientific article: principles of writing and presentation. Master's research work.

	Rules for construction, writing and presentation
Business communication.	Norms of etiquette of oral business communication. Situations of oral business communication: meetings, negotiations, reception of delegations, conversation with clients, telephone conversations. Etiquette in business correspondence. Phraseology in the language of written professional and business communication, speech patterns, clichés, politeness formulas. Types of business letters, documents. Business communication on the phone.

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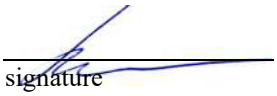

Valeeva N.G.

signature name and surname

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Savenkova E.V.

signature name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Management of environmental-economic risks
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction	The concept of environmental risks. Enterprise risks and their assessment. Project risks, their minimization and the need to take into account in the analysis of the sustainability of investment projects
Analysis and assessment of risk	Environmental and economic risks and methods of their analysis and assessment. Risk identification. Risk factors. Economic characteristics of environmental risks
Environmental risk and environmental projects	Environmental and industrial safety risks in investment projects. Climatic risks.
Management of risks in nature management	Management of risks. Environmental insurance. Minimization of environmental risks for the sustainable operation of enterprises
Minimization of environmental risks	Minimization of environmental risks and implementation of environmental management systems

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Management of energy resources
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction	Sustainable energy development as a base of the global sustainability. Sustainable development goals and trajectory of the energy sector. Global strategies
Energy resources: basic assessments	Energy resources: distribution of different energy sources, availability and sustainability issues. Energy poverty as a global challenge. Global tendencies
Energy security and energy efficiency:	Levels of evaluation, models, management instruments. State regulation and social initiatives. Energy management. "Green standards". Best practices.
Green energy.	Energy sector as a source of environmental damages. Models and assessments. Green vs renewable energy
Management of the environmental risk in energy sector	Concept of environmental risk. Environmental risk of energy sources: renewables and non-renewables. Environmental damages and risk management: main approaches. Energy management. Waste as the "secondary resources": recycling and "waste to energy" technologies
Energy sector and the global climate policy	Greenhouse gases emissions: modern assessments and scenarios. Standards for the emissions. International collaboration

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educational division - faculty/institute/academy

COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Management of natural resources
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction to natural resources management	Theoretical basics of natural resources management.
Assessment of the resource base of nature management	Systems of nature use and management: structure, descriptions. management
State management of natural resources	State regulation of natural resources management. International practice. Efficiency and problems of the state regulation
Methods of natural resources management	Administrative, economic and informational approaches and their combination. International practice.
"Green economy" and tools for its regulation	Concept of “green economy”. Modern problems of the waste in industry and household and their regulation in the “Green economy” strategy

Developers:

signature **Redina M.M.** name and surname

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signature **Savenkova E.V.** name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Methodology of scientific creation
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Concept of science	Concept of Science. The big fields of the Science. Divisions and branches of the sciences. Basic Sciences. Applied Sciences
Development of the Science across the time	Historical - scientific frame. The Genesis of the scientific thought. Types prescientific of knowledge. Rational speculation and origin of the natural science
The scientific method	Methods of the Science: analysis and synthesis, induction and deduction. Characteristics and limitations of the scientific method. Formal systems, models and interdisciplinary knowledge
Information	Quality & quantity features. Classification of information. Categories of articles in scientific journals. Bradford's law. Duplication of researches. Subsequent steps of a literature search. Key Words. Relevant and pertinent documents. Types of search with searching machines
Introduction to the research; Variables	Independent, dependent & confounding variables. Choosing the Measurement. Types of validity. Reliability. Sampling Groups to Study
Creating the Design of research	Qualitative versus Quantitative. Empirical methods. Observation. Experiment
The observation as a source of the science	The observation and the empirical science. Features of scientific observation. Intersubjectivity and objectivity. Can an Observation Be Wrong? Repeatability. Types of observations. Design a system for data collection. Disadvantages of observation
Diffusion of reports and works of research	Scientific spreading (divulgation) and specialized means. Criteria of choice of the way of diffusion. Scientific magazines. Quality indicators. Advance of a publication of research in poster
Experiments	Typical Designs and Features in Experimental Design. Central Tendency and Normal Distribution. Calculating Experimental Errors. Probability and Statistics. Mean and Standard Deviation. Reporting the Results of an

	Experimental Measurement. Current contents and limitations
Research, development and scientific innovation	Concept. Big inventions and inventors. Development. Innovation. Patents. Economic aspects
Social responsibility of the scientist	Responsibility in the application of the scientific method. Scientific fraud. The scientist like driving force of the progress of the knowledge
Studies of postdegree and centers of research	Project curricular. Studies of degree. Postdegree. Doctorate. National and international centers of research

Developers:

Kapralova D.O.

signature name and surname

HEAD
OF EDUCATIONAL DEPARTMENT

Savenkova E.V.

signature name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Management of water resources
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction	Specific features of water resources. Biospheric functions and current problems. Water resources: distribution of different energy sources, availability and sustainability issues. Energy poverty as a global challenge. Global tendencies
Water resources: basic assessments	Quality of water resources: quantitative and qualitative assessments. Main requirements. Global tendencies
Water strategies	Global strategies: SDG and international collaboration. International standards. Global and regional water policy.
Economic assessment of water resources	Main methods. Factors of economic evaluation. Internationalpratice
Water management	Water uses: agriculture and other irrigation; industries; drinking water and domestic use (households); environmental consequences. Sustainable water management. Managing water in urban settings

Developers:

signature **Redina M.M.** name and surname

HEAD
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signature **Savenkova E.V.** name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Modern problems of ecology
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction	Ecology as a complex science direction. Stages of the development of the ecological knowledge and science. System of the ecological disciplines. Ecology and nature management. Ecology and sustainability
Concept of the nature (use) management	Main directions and types of nature management. Laws and rules in ecology. Modern ecological problems of nature management: environmental consequences of gaps in nature management.
Human ecology	Stages of human development as a biological species. Dependence on natural conditions and factors. Periods of the noosphere development
Crises in the history of mankind	Crises in the historical development: sources and consequences. Modern stage of the development: difficulties in the functioning of ecosystems. Demographic crisis. Social crisis. Energy crisis
Strategies for overcoming the environmental crisis	Sustainable development strategies and goals. Solving environmental and social problems. Solving the problems of resource availability. Modern ecological research.

Developers:

signature **Redina M.M.** name and surname

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signature **Savenkova E.V.** name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Modern remediation technologies
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Remediation technologies: main tasks and characteristics; classification	Remediation technologies: main tasks and characteristics; classification: physical methods; chemical methods; biological methods; in situ and ex situ technologies
Soil remediation technologies	Soil remediation technologies: practical examples, efficiency, standards. Efficiency and risks
Remediation of wastewater	Remediation of wastewater: practical examples, efficiency, standards. Efficiency and risks
Remediation of waste landfills	Remediation of waste landfills: practical examples, efficiency, standards. Efficiency and risks

Developers:

signature **Redina M.M.** name and surname

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signature **Savenkova E.V.** name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Modern technologies for nature protection
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Environmental hazard of waste. The concept of ecosystem sustainability. Cycle of substances and elements	Features of interaction of xenobiotics with adiabatic components of the environment. Features of the impact of pollutants on living organisms. Environmental, physicochemical and toxicological features of priority persistent organic pollutants (POPs). The cycle and biogeochemical cycles: carbon, nitrogen, sulfur, phosphorus, metals.
Self-cleaning ability of ecosystems. Parameters of ecosystem sustainability	The principles of the existence of ecosystems. Homeostasis. Types of resilience. The cycle of substances and elements. Self-cleaning ability of ecosystems. Abiotic self-purification processes. Biotic self-purification processes. Soil microbiocenosis. Microbiocenosis of water bodies. Microflora of the air. The degree and speed of self-cleaning. Assimilation capacity of the ecosystem.
Wastewater & Sewage Treatment. Sediments of Wastewater	The main sources of wastewater. Composition and Sources of Wastewater. Types of Wastewater Pollution (according to physic and chemical properties). Atmospheric Sewage or Runoff. Household Wastewater. Modern Methods of Sewage Treatment (according to the mechanism of action). Technological Treatment Schemes
Gas Emissions Treatment: Modern Approaches	Classification of gas emissions based on the aggregative state. Dispersion of systems (particle sizes). Particulate matter - aerosols: dust, fumes. Methods of the air protection. Methods for cleaning of gas & dust emissions from aerosols. "Wet" cleaning of gas and dust emissions from aerosols
Solid Waste Treatment Technologies: Secondary Raw Materials Recycling, Thermal Processing.	Pyramid of the waste management. Waste as the “secondary resources”: recycling and “waste to energy” technologies. Norms for the assessment of the waste danger. Norms of the waste formation, accumulation, storage and processing
Landfilling	Sources of Industrial Solid Waste (ISW). Ecological Features of ISW. Methods of Industrial Nonradioactive Waste Elimination and Processing. Basic Methods of Municipal Waste Processing. Sorting and Using as Secondary Raw Materials. Rational MSW sorting scheme.

	“Dry" mechanical or Physical methods. The main technological indicators of the efficiency of separation of solid waste
Water bodies Remediation Technologies	Types of water bodies. Types of pollutants of water bodies. Sources of water pollution. Water restoration methods. Stages of environmental remediation of water bodies and preparatory works: technical, biological. Creation (restoration) of the coastal ecosystem. Comprehensive improvement of the surrounding area. Examples. Purification of water objects from oil products. Reducing the concentration of pollutants in water bodies

Developers:

Kharlamova M.D.

signature name and surname

HEAD
OF EDUCATIONAL DEPARTMENT

Savenkova E.V.

signature name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Monitoring of environmental impacts
Course Workload	2 ECTS (72 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Introduction.	The impact of enterprises on the environment: 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 .
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
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.
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.

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.

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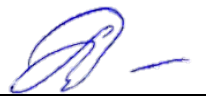

Redina M.M.

signature name and surname

HEAD
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Savenkova E.V.

signature name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Occupational safety and HSE-audit
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Place in the profession	Ensuring occupational safety at various stages of the project cycle
Engineering and environmental surveys	Organization and conduct of environmental surveys to assess the current state of the environment
Environmental impact assessment	Conducting an environmental impact assessment, including the organization of public discussions
Environmental audit	Conducting an environmental audit is a modern practice in the Russian Federation
Fire safety audit	Conducting a fire safety audit within the HSE audit
Occupational safety audit	Conducting an occupational safety audit
Industrial safety audit	Conducting an industrial safety audit
First aid in case of an accident at the enterprise	Methods of first aid – legal requirements. The procedure for providing assistance and training requirements. First aid kits

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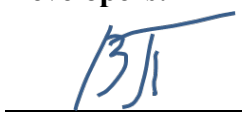

signature **Pinaev V.E.** name and surname

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signature **Savenkova E.V.** name and surname

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05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Philosophical problems of nature sciences
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Features of philosophical problems	The crisis of metaphysics. Philosophical problems of technology. Philosophical problems of modern science Philosophical problems of physics and cosmology
Skepticism in modern philosophy	The problem of rationality The induction problem
Linguistic turn in philosophy	The problem of truth. The problem of consciousness. Communicative program by J. Habermas

Developers:

signature **Redina M.M.** name and surname

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signature **Savenkova E.V.** name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Simulation and prevention of accidents
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Natural risks: types, sources	Natural disasters and their consequences
Technogenic risks: sources, types	Technogenic disasters and their consequences
Methodology of risk evaluation	Methodology of risk evaluation: regulations, estimation approaches
Risk management approaches	Main principles of risk management for the regulation of natural and technogenic risks:
Praxis of risk management	Practical examples of risk management approaches in branches of economy

Developers:

signature **Redina M.M.** name and surname

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signature **Savenkova E.V.** name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Standards of environmental management and occupational safety
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Management Basics	Product and technology life cycle. The strategic goals of the firm. Company mission Building a SWOT analysis matrix Analysis of the system of environmental management standards
Introduction to the subject. Professional risks and methods of their management	Study of the structure and content of the OHSAS 18001 standard. Development of an enterprise policy. Assessing the significance of aspects
Regulatory and methodological base of labor protection at enterprises and organizations.	Development of an audit plan. Drawing up checklists.
Creation of professional safety management systems	Evaluation of the effectiveness of the management system based on the requirements of ISO 14031

Developers:

signature **Khaustov A.P.** name and surname

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signature **Savenkova E.V.** name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Surface water quality: modeling and management
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
Sources of water pollution.	Water Resources. The Hydrologic Cycle.Classification of Sources of water pollution. Continuous and instantaneous sources. Sources of Chemical Water Pollution. Exposure to Chemical Water Pollution
Types of water pollutants	Indicators of water pollution: Sediments, Biological Oxygen Demand (laboratory method for determination of Biochemical Oxygen Demand), Nutrients (Eutrophication), Salts, Heavy metals, Pesticides, VOCs, Chlorinated dibenzo dioxins. Physical pollutants, chemical pollutants, biological pollutants
Surface Water Standards	Clean Water Act. Safe Drinking Water Act
Surface Water Monitoring	Main purposes of a WQM programme. Hydrological monitoring. Key elements of a water-quality monitoring programme. Methods of measuring and Analyzing
Surface Water Quality Modeling	Introduction of mathematical modelling of surface water. The aim of mathematical modelling. Classification of mathematical models. Modelling procedure. Specifics of the WASP program. Description of the EUTRO model. Modelling of eutrophication. Modeling Water Quality in Rivers

Developers:

Kurbatova A.I.

signature name and surname

HEAD
OF EDUCATIONAL DEPARTMENT

Savenkova E.V.

signature name and surname

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COURSE DESCRIPTION

05.04.06 Ecology and nature management
Economics of natural resources management

field of studies / speciality code and title

Course Title	Wastes: Landfills, Processing and Recycling
Course Workload	3 ECTS (108 ac.h.)
Course contents	
Course Module Title	**Brief Description of the Module Content**
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
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
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
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
Transportation of hazardous waste.	The main hazards during transportation. Prevention and management of emergencies involving dangerous goods. Technical and organizational measures

Developers:

signatur **Kharlamova M.D.**

name and surname

HEAD
OF EDUCATIONAL DEPARTMENT

Savenkova E.V.

signature name and surname