

Ministry of Education and Science of the Republic of Kazakhstan  
NPJSC "Karaganda University named after Academician E.A.Buketov"

"AGREED"

Director

Department of Ecology of the Karaganda region

Committee for Environmental Regulation and Control of the Ministry  
of Ecology, Geology and Natural Resources of the Republic of  
Kazakhstan

 K.Zh. Musaparbekov

«15» 11 2022 y.

"I APPROVE"

Chairman of the Management Board – Rector

 Karaganda University named  
after Academician E.A. Buketov

N.O. Dulatbekov

2022 y.

**EDUCATIONAL PROGRAM**

"7M05201 - Ecology"

**Level: Magistracy**

city of Karaganda

2022 y.

**The educational program "7M05201 - Ecology" was developed on the basis of:**

- Law of the Republic of Kazakhstan dated July 27, 2007 No. 319-III "On Education"
- Law of the Republic of Kazakhstan No. 151-I of July 11, 1997. "About languages in the Republic of Kazakhstan"
- State mandatory standard of postgraduate education of education dated October 31, 2018 No. 604
- The National Qualifications Framework of March 16, 2016 by the Republican Tripartite Commission on Social Partnership and Regulation of Social and Labor Relations.
- Order of the Ministry of Education and Science of the Republic of Kazakhstan "On approval of the Rules for the organization of the educational process on credit technology" dated October 2, 2018 No. 152
- Classifier of training areas with higher and postgraduate education dated October 13, 2018 No. 569.

Educational program «7M05201 – Ecology»

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## 1. Passport of the educational program

1. Code and name of the educational program: «7M05201 – Ecology»
2. Code and classification of the field of education, areas of training: 7M05 - Natural sciences, mathematics and statistics, 7M052 Environment
3. Group of educational programs: 7M087 Environmental protection technology
4. Volume of credits: 120
5. Form of study: full-time
6. Language of instruction: Kazakh, Russian
7. Degree awarded: Doctor of Philosophy PhD in the educational program "7M05102 - Biotechnology"
8. Type of EP: current EP
9. The level of the ISQ: 7
10. The level of the NQF: 7
11. Level according to the IQF: 7
12. Distinctive features of the EP: -
13. Number of the application to the license for the direction of training: KZ83LAA00018495, date of issue 28.07.2020. Appendix 16
14. The name of the accreditation body and the validity period of the EP accreditation: IKAQAE, certificate S-A № 0174/4, date of issue 23.12.2019, validity period 20.12.2024
15. Purpose of the EP: Training of qualified specialists for the development of the economy, industry and culture of the Republic of Kazakhstan, providing conditions for full education, professional competence of environmental specialists in the interests of environmentally safe development, practical and theoretical solutions of environmental problems in the scientific and practical sphere, teaching.
16. Qualification characteristics of the graduate:
  - a) List of graduate positions: researcher of research institutes and scientific and production centers of ecological profile, expert, specialist of the Department of Environmental Protection, environmental protection enterprises, national parks and reserves, ecologist at industrial enterprises, employee of laboratories for quality control and safety of products of the national economy, researcher of laboratories of medical institutions, sanitary and environmental supervision, teacher at universities and colleges;
  - b) The scope and objects of professional activity of the graduate: research institutes, research and production centers and laboratories of ecological profile, industrial enterprises, environmental protection departments, organizations of sanitary and environmental supervision, organizations in the field of certification and standardization, national parks and reserves, agricultural complexes, hydrometeorological organizations, agricultural plants universities and colleges;
  - c) Types of professional activity of the graduate:
    - organizational and technological: management and engineering activities, environmental impact analysis and assessment, research and engineering and technological developments, analysis and control of compliance with management technology, performance of tasks of state and industrial environmental control, scientific and organizational activities;



- management: control of production and management activities, development and application of modern and effective methods, rules and processes of innovative and environmental management planning, analysis of the effectiveness of management decisions in the field of sustainable development and standard tasks of the management system in the field of ecology;
  - project: implementation of organizational design aimed at developing and substantiating organizational management structures, submission of a feasibility study aimed at developing documentation on environmental impact assessment, industrial environmental control, protection and rational use of natural resources, introduction of new types of products, environmental supervision for compliance with professional standards and regulatory documents;
  - research: independent research work, development and participation in research projects, grants, scientific and organizational activities in environmental areas, scientific cooperation;
  - educational: professional work with students and specialists, deepening professional knowledge with the help of modern information and educational technologies;
- d) Functions of the graduate's professional activity:
- participates in the development of state programs in the field of ecology;
  - draws up long-term plans and exercises control over environmental protection;
  - develops measures to comply with environmental regulations and standards of enterprises, prevent the possibility of accidents and catastrophes in accordance with current state, international and industry standards;
  - provides environmental expertise of feasibility studies, scientific and technical projects, new technologies and equipment;
  - carries out work on the organization of investigation of the causes and consequences of emissions of harmful substances into the environment, prepares documentation on their prevention, calculates risks to the state of the environment during the implementation of environmental protection measures;
  - develops and implements the results of scientific research in the field of ecology and environmental monitoring data into production;
  - manages the development of measures to improve environmental protection based on the generalization of best practices of domestic and foreign enterprises, waste disposal documentation and other environmental information;
  - develops environmental training programs at the enterprise, an effective environmental information system, introduces employees to the requirements of environmental legislation.

## Formulation of learning outcomes based on competencies

Type of competencies	Learning result code	Learning result (according to Bloom's taxonomy)
1. Behavioral skills and personal qualities: (Soft skills)	LR 3	Plans and solves the tasks of his own professional and personal development, takes responsibility for the decision made, shows personal enthusiasm, knows how to work in a team.
	LR 7	Reads, analyzes, referees literature in a foreign language and studies foreign sources, uses knowledge of a foreign language in professional and interpersonal communication
2. Digital competencies: (Digital skills):	LR 1	Carries out research activities in the relevant professional field using modern research methods and information and communication technologies
	LR 11	Uses various information environments to study issues and prospects for the development of ecology, global trends and practices of STEAM technologies, analyzes the state of the environment, calculates environmental risks using digital technologies and the digital ecosystem
	LR 2	He has methodological techniques and skills of teaching environmental disciplines in higher school, secondary and vocational schools
	LR 4	Demonstrates the ability to analyze scientific literature in order to choose the direction of research, independently makes a research plan, has the theory and skills of practical work in the chosen field of ecology, is able to work with modern equipment, analyzes the results, makes the necessary conclusions and formulates proposals
	LR 5	Demonstrates an understanding of the main problems and current trends in the development of environmental science, has general scientific methods of research and is able to apply them in professional activities
	LR 6	Owens methods and methods of management of innovative activity, generalizes the advanced achievements and actual tendencies of development in the field of ecology, owns approaches of practical application of tools of commercialization in the conditions of the market relations
	LR 8	Assesses the consequences of anthropogenic impacts on the biosphere and modern biosphere processes, linking their effectiveness with evolutionary historical processes, applies modern environmental technologies in professional activities
	LR 9	Demonstrates knowledge of the main stages and laws of development of ecology, understanding the objective need for new directions, has ideas about the system of fundamental environmental concepts, methodological aspects, forms and methods of scientific knowledge, their role in General education training of environmentalists
	LR 10	Assesses the state of the natural environment and the level of anthropogenic load to ensure the environmental safety of biotic components and humans, promptly and competently makes decisions to reduce the anthropogenic load on natural objects
	LR 12	Adheres to the principles of a comprehensive assessment of the use of natural resources, develops resource-saving measures, assesses the effects of anthropogenic factors on the environment, human genetic safety, applies regulatory documents, environmental approaches to determine the toxicity of harmful substances

### Determination of modules of disciplines in accordance with the results of training

Learning result code	Name of the module	Name of disciplines	Volume (ECTS)
LR 1, LR 2, LR 3, LR 4, LR 5	Philosophical and historical aspects of social and humanitarian knowledge	History and philosophy of science	4
		Pedagogy of higher education	4
		Management psychology	4
		Pedagogical practice	4
LR 1, LR 3, LR 4, LR 7, LR 11, LR 12	Professional languages	Foreign language (professional)	4
		Scientific-research communications	5
		English for STEM Program	
LR 1, LR 4, LR 5, LR 6, LR 8, LR 9, LR 10	Issues of modern science and technology	Commercialization of the results of scientific and technical services	5
		Innovation in ecology	
		Research methods in ecology ( in English)	5
		Ecological aspects of genetic engineering ( in English)	
LR 1, LR 4, LR 5, LR 6, LR 8, LR 9, LR 10	Природопользование	Rational use of natural resources	5
		Modern problems of ecology	5
		Technology of using sustainable energy ( in English)	5
LR 1, LR 4, LR 5, LR 6, LR 8, LR 9, LR 10, LR 11, LR 12	Прикладные направления экологии	Environmental risk	5
		Bioecological basis of pathological processes	
		Ecology of agrobiocenoses	5
		Environmental safety of industrial enterprises	
		Communal ecology of the city	5
		Environmental epidemiology	
		Ecological physiology	5
		Ecological toxicology	
LR 1, LR 4, LR 6, LR 9, LR 11	Научно-исследовательская работа	Research practice	14
		Scientific research work of a master student, including an internship and a master's thesis (NIRM)	24
	Итоговая аттестация	Writing and defending a doctoral dissertation	12



### Matrix of achievability of learning outcomes

NN n/n	Name of disciplines	Brief description of the discipline (30-40 words)	Number of credits	Generated learning outcomes (codes)													
				LR 1	LR 2	LR 3	LR 4	LR 5	LR 6	LR 7	LR 8	LR 9	LR 10	LR 11	LR 12	LR 13	
<b>Cycle of basic disciplines University component</b>																	
D1	History and philosophy of science	History and philosophy of science as a study of the General laws of scientific knowledge in its historical development and changing socio-cultural context. Philosophy of science and methodology of science. Science as a cognitive activity and tradition, as a social institution and as a special sphere of culture. Science in the culture of modern civilization. Features of scientific knowledge. Functions of science in society. Historical development of institutional forms of scientific activity.	4	+	+			+					+	+	+	+	+
D2	Pedagogy of higher education	Pedagogy of higher education is designed to put on a scientific basis both the solution of the problem of higher education for specific specialties, and the development of management of the process of mastering this content by undergraduates in their future professional activities. Higher school pedagogy allows us to scientifically substantiate the requirements for the modern educational process and identify its regularities.	4	+				+					+	+	+	+	+
D3	Psychology of management	Basic concepts, theoretical positions and actual problems of psychology of management. Theoretical features of management psychology. Personal features of the head. Features of communication of the head and subordinates in the organization. Basic aspects of management psychology. Psychological aspects of business communication, motivational aspects of management	4	+	+	+		+					+	+	+	+	+
D4	Pedagogical practice	Formation of knowledge about the legal and regulatory framework for the functioning of the higher education system; the order of implementation of the main provisions and documents regulating the activities of the University to improve educational, methodological and scientific work. Analysis of active teaching methods and the use of modern educational technologies in teaching, monitoring and evaluating the effectiveness of educational activities, organization of students	4	+		+		+					+	+	+	+	+



D5	Foreign language (professional)	educational activities The academic discipline implements the basic part of the general scientific curriculum of the main educational program of the postgraduate schooling and is an integral part of the process of training highly qualified specialists who actively speak a foreign language as a means of intercultural and professional interests. To study the discipline master-students must have a good language command provided by the undergraduate level of education.	5	+		+	+	+							+			+	+
D6	Scientific-research communications	The study of the mechanisms for promoting scientific ideas within the scientific community and beyond, the issues of disseminating scientific knowledge about the surrounding reality through various forms and institutions of communication. Formation of knowledge about topical problems of experimental, design and research activities. Analysis of the patterns of development of the natural environment, society, technologies	5		+	+	+	+										+	+
	English for STEM	Formation of an idea about academic and professional interaction, global trends and practices of STEAM technologies. Improving skills in professional 3D modeling programs. Improving the competencies of possession of the necessary skills of professional communication in a foreign language and writing, the use of professional English in the practical activities of biotechnologists					+	+	+										
Cycle of basic disciplines Component of choice																			
D7	Commercialization of scientific and technological activities	The study of the main approaches and the process of commercialization of the results of scientific and intellectual activity, investment, implementation of developments in production and their further support. Knowledge of the practice of scientific and technological innovation and the results of technology commercialization, the conditions for the development of science and technological innovation policy, the ability to develop an action plan to achieve the results of commercialization of science	5	+	+			+	+	+	+	+	+	+	+			+	+
	Innovation in ecology	Formation of knowledge about innovation in the field of applied ecology, environmental safety and management in the field of environmental protection, criteria of innovation, innovative scientific and technical developments of domestic and foreign scientists, the development of innovative environmental capacity, innovation in the			+					+	+			+	+				

		field of ecology, to analyze information and predict the feasibility of innovative ideas for profit																	
D8	Research methods in ecology ( in English)	Formation of undergraduates understanding of the integrated assessment of environmental quality, the development of modern scientific approaches and research methods in ecology, methods of processing, analysis and synthesis of field and laboratory environmental information, organization and conduct of laboratory and field research, forecasting the state and changes in natural environments and biota	5	+				+	+	+					+				5
	Ecological aspects of genetic engineering ( in English)	The study of the methodology of genetic and cellular engineering, the disclosure of the General laws of the mechanisms of molecular genetic processes, instilling certain skills to work with DNA and RNA molecules, the development of basic techniques of gene cloning, the design of recombinant molecules, methods and possibilities of gene therapy, the use of research methods for solving practical problems in medicine, agriculture, biotechnology		+				+	+	+					+				+
Cycle of profile disciplines University component																			
D9	Rational use of natural resources	Study of the peculiarities of distribution of raw materials of Kazakhstan, their reserves and prospects of development. Analysis of modern effective technologies for the use of natural resources. Generalization of the advanced achievements and actual tendencies of development in the field of rational use of natural resources	5						+	+				+	+	+			5
D10	Modern problems of ecology	Obtaining students views on the topical problems of ecology and ways of their solution. Knowledge about the optimization of the natural environment, the conditions of environmentally sustainable development of society. Development of forecasts of changes in the biosphere and the environment in different scenarios of economic and social development of mankind, the ability to analyze and conduct environmental and economic assessment of the impact of harmful emissions on the environment	5	+				+	+					+		+			5
D11	Technology of using sustainable energy ( in English)	Formation of students " knowledge and skills in the field of prospects for the use of alternative energy sources in domestic and foreign practice, mastering knowledge about the characteristics and features of renewable energy sources, modern methods of their use, problems and prospects for the development of alternative energy, developing the ability to objectively assess the advantages and disadvantages of such systems and their elements.	5	+				+							+	+			5
Cycle of profile disciplines																			

Component of choice															
D12	Environmental risk	Knowledge of the main factors of environmental risk and ways out of the environmental crisis, methodological approaches aimed at solving the problems of ensuring safe and sustainable human interaction with the natural environment, analysis of the causes and mechanisms of impact, the practical application of risk assessment methodology as a basis for forecasting hazardous natural processes	5	+				+	+			+	+		5
	Biocological basis of pathological processes	The study of the influence of the main biological and ecological factors on the emergence and development of pathological processes in the organism, to give an idea about the current issues, methodological advances and promising areas of biology and medicine in the study and prevention of pathologies, to identify the influence of the main biological and ecological factors on the emergence and development of pathological processes in the body, to identify current issues, methodological advances and future						+	+			+	+		
D13	Ecology of agrobiocenoses	The study of the features and promising directions of the functioning of agroecosystems in the conditions of modern technogenesis. Analysis of problems of ecologization of land use, economization and agroecological monitoring. Development of developments and methods of production of environmentally friendly agricultural products. Calculation of pollutants in the soil and agriculture in accordance with the MPC	5					+						+	5
	Environmental safety of industrial enterprises	The study of the types and sources of man-made impacts, legal, organizational bases of labor protection, a system of measures for the safe operation of hazardous production facilities. Conducting a justification on the requirements and provisions of industrial safety and industrial hygiene at technological enterprises. Mastering safe methods of work in production										+	+	+	+
D14	Communal ecology of the city	Knowledge of environmental aspects of specific problems of municipal services of the city, analysis of existing standards, technical and technological characteristics of the urban environment, obtaining practical skills in the use of modern protection technologies in the assessment of air, water, soil of the city, sanitary cleaning of household waste	5	+				+	+			+	+	+	
	Environmental epidemiology	Study of the influence of adverse environmental factors on the health indicators of the population. Practical application of methods for determining environmentally caused changes in human health. Assessment of medical										+	+	+	



		and environmental safety and quality of environmental components. Substantiation of the role of the immunological structure of the population as an important factor in the development of the epidemic process															
D15	Ecological physiology	Formation of undergraduates ideas about the physiological basis of the human body as a whole system, taking into account the interaction with the environment; knowledge of the mechanisms of regulation, management and integration of physiological systems of the body, providing homeostasis in different environmental conditions; analysis of environmental principles of the formation of different levels of adaptation	5	+			+	+				+		+			+
	Environmental toxicology	Formation of an idea of industrial intoxication of biota, behavior of chemicals in the environment, mechanisms of action and influence of environmental factors on the toxic effect. Determination of classes of toxic substances, polytropicity of the action of poisons. Analysis of regulatory documents, hygienic approaches, scientific and legislative tasks in the field of ecotoxicology											+			+	+
D16	Research practice	The purpose of the research practice is to study the latest theoretical, methodological and technological achievements of domestic and foreign science, as well as to consolidate practical skills in applying modern methods of scientific research, processing and interpretation of experimental data in dissertation research	14	+			+		+			+			+		

### Coordination of the planned learning outcomes with the methods of teaching and evaluation within the module

Learning outcomes	Planned learning outcomes for the module	Teaching methods	Assessment methods
LR 1	Carries out research activities in the relevant professional field using modern research methods and information and communication technologies	round table	preparation of the presentation
LR 2	He has methodological techniques and skills of teaching environmental disciplines in higher school, secondary and vocational schools	interactive lecture	testing
LR 3	Plans and solves the tasks of his own professional and personal development, takes responsibility for the decision made, shows personal enthusiasm, knows how to work in a team.	business game	preparation of the presentation
LR 4	Demonstrates the ability to analyze scientific literature in order to choose the direction of research, independently makes a research plan, has the theory and skills of practical work in the chosen field of ecology, is able to work with modern equipment, analyzes the results, makes the necessary conclusions and formulates proposals	case study method	project preparation
LR 5	Demonstrates an understanding of the main problems and current trends in the development of environmental science, has general scientific methods of research and is able to apply them in professional activities	method of projects	preparation of the presentation
LR 6	Owens methods and methods of management of innovative activity, generalizes the advanced achievements and actual tendencies of development in the field of ecology, owns approaches of practical application of tools of commercialization in the conditions of the market relations	interactive lecture	testing
LR 7	Reads, analyzes, referees literature in a foreign language and studies foreign sources, uses knowledge of a foreign language in professional and interpersonal communication	method of analysis of specific situations	project preparation
LR 8	Assesses the consequences of anthropogenic impacts on the biosphere and modern biosphere processes, linking their effectiveness with evolutionary historical processes, applies modern environmental technologies in professional activities	discussion	project preparation
LR 9	Demonstrates knowledge of the main stages and laws of development of ecology, understanding the objective need for new directions, has ideas about the system of fundamental environmental concepts, methodological aspects, forms and methods of scientific knowledge, their role in General education training of environmentalists	research method	participation in the colloquium
LR 10	Assesses the state of the natural environment and the level of anthropogenic load to ensure the environmental safety of biotic components and humans, promptly and competently makes decisions to reduce the anthropogenic load on natural objects	research method	conducting a colloquium
LR 11	Uses various information environments to study issues and prospects for the development of ecology, global trends and practices of STEAM technologies, analyzes the state of the environment, calculates environmental risks using digital technologies and the digital ecosystem	project method	preparation of the presentation
LR 12	Adheres to the principles of a comprehensive assessment of the use of natural resources, develops resource-saving measures, assesses the effects of anthropogenic factors on the environment, human genetic safety, applies regulatory documents, environmental approaches to determine the toxicity of harmful substances	research method	preparation of a program for the safe operation of production facilities

## Graduate Model EP «7M05201 – Ecology»

### Graduate Attributes:

- Deep professional knowledge in their field of study
- Interest in mastering trends in education and science
- Ability to collaborate in the professional community
- Independence in the search for opportunities for professional and personal development
- Communication skills
- Tolerance and good manners
- Academic integrity
- Willingness to participate in solving state tasks and strategies of Kazakhstan

Types of competencies	Description of competencies
1. Behavioral skills and personal qualities (Softskills)	<p>Ability to critical thinking, analysis, independent organization of their professional activities.</p> <p>The ability to quickly solve tasks, act in non-standard situations, take responsibility for yourself.</p> <p>The ability to independently develop, define and solve the tasks of their professional and personal development, engage in self-education.</p> <p>Knowledge of work ethics, discipline, sense of responsibility, ability to work in a team.</p>
2. Digital competencies (Digital skills):	<p>The ability to develop and use information and communication technologies in professional activities, to have awareness of the basic technologies of digital learning.</p> <p>Ability to analyze modern methodologies and principles of environmental project management, substantiate scientific approaches using digital technologies.</p> <p>The ability to master the generally accepted language of international communication in a digital environment.</p>
3. Professional competencies (Hardskills)	<p>The ability to develop, implement and apply innovative technologies for the protection and restoration of ecosystems using the latest results of scientific research.</p> <p>The ability to comply with the principles of a comprehensive assessment of the use of natural resources, to develop measures related to resource conservation and assessment of the environmental effectiveness of environmental protection measures.</p> <p>The ability to assess the effects of natural and anthropogenic factors on the environment, to develop programs for the safe operation of hazardous production facilities, to reduce the harmful effects on the environment and humans, to manage technological processes.</p> <p>The ability to develop plans and carry out sanitary and environmental supervision of the state of the urban environment, conduct examinations, surveys of public utilities in order to prevent harmful effects on public health.</p> <p>The ability to justify the choice and application of methods for solving professional tasks in the field of environmental protection in order to minimize the consequences of anthropogenic activities and reduce harm to human health.</p> <p>The ability to comply with the principles of environmental assessment based on environmental monitoring data, to calculate environmental risks in accordance with regulatory requirements, to make environmental justifications for projects at the stages of construction and operation.</p> <p>The ability to analyze the mechanisms of toxicity of chemical compounds, assess toxic damage at the level of</p>



organisms, populations and ecosystems.

The ability to defend its position on modern environmental issues and compliance with environmental safety in a reasoned manner.

The ability to justify, implement and implement technological processes of production, apply modern methods of processing, analysis and synthesis of environmental information in production.

The ability to justify and develop plans for the use of alternative technology to solve environmental problems.

The ability to determine scientific approaches and methods for studying the mechanisms of immunoregulation of biotechnological production, the principles of the organization of quality control of biological products and methods of immunodiagnosics for the management of biotechnological processes.

**Developers:**

Members of the working group:

Head of the Department of Physiology, Candidate of Biological Sciences, Professor

C.b.s, Professor

Master's student 2 years of study

Employer: Director of the "Department of Ecology

for the Karaganda region of the Committee for Environmental

Regulation and Control of the Ministry of Ecology,

Geology and Natural Resources of the Republic of Kazakhstan"

G.M. Tykezhanova

A.M. Aitkulov

N. T. Sadibek

K.Zh. Musaparbekov

The educational program was reviewed by the Faculty Council from 15. 03 2011 protocol № 8

The educational program was reviewed at the meeting of the Academic Council from 18. 04 2011 protocol № 5

The educational program was reviewed and approved at the meeting of the University Board from 26. 05 2011 protocol № 12

**Board Member-Vice-Rector for Academic Affairs**

**Director of the Academic Work Department**

**Dean of the Faculty of Biology and Geography**

T.Z. Zhysipbek

G.S. Akybaeva

S.A. Talzhanov