



**NJSC “Kazakh National Research Technical University named after
K.I. Satbayev”**

**K. Turysov Institute of Geology and Oil-Gas Business
Department of Chemical and Biochemical Engineering
Department of Chemical Processes and Industrial Ecology**

EDUCATION PROGRAM

"BIOECOLOGICAL ENGINEERING"




**Doctor of Philosophy (PhD) by education program of
"8D05201 – Bioecological engineering"**

3rd edition

in accordance with State Mandatory Standard of Higher Education 2018

Almaty 2021

**The program is drawn up and signed by the parties:
From KazNRTU after K.I. Satbayev**

1. Head of the Department of C&BT  A. Amitova
2. Head of the Department of ChP&IE  Sh. Kubekova
3. Director of IGOM named after K.Turysov  A. Syzdykov



From Employers:

Chief Specialist of LLP “Kazakh Agency of Applied Ecology”, Candidate of Technical Sciences Duisenova Zh.A.

Approved at the meeting of the Academic Council of the Kazakh National Research Technical University named after K.I. Satbayev. Protocol №3 from 25.06.2021.

Qualification:

- Level 8 of the National Qualifications Framework:
- 8D05 - Natural Sciences, Mathematics and Statistics
- 8D052 - Environment (Doctorate)
- 8D051 - Biological and related sciences (Doctorate)

Professional competence:

Possessing the fundamental and biological knowledge of modern engineering biotechnology and environmental engineering; understanding their purpose for solving some global mankind problems (environmental, energy, raw materials, food); the ability to organize and conduct scientific educational, experimental research and management activities in the field of biological engineering; the ability to navigate in biological engineering, and its individual areas. In addition, knowing and being able to use scientific and technological capabilities of bio-ecological engineering in science and production.

Program brief description:

1 Purpose of "Bio ecological Engineering" EP

Training the highly qualified PhD doctors in the field of eco and biotechnology, who have fundamental scientific knowledge, who own scientific creativity methodology, who are able to use methods of obtaining, processing, analyzing and storing scientific information as well as ready for research, pedagogical-design and production work.

2 Types of work

Professional activity types of Natural Sciences Master in the scientific and pedagogical direction '8D051-Biological and related sciences' '8D052-Environment' training:

- Research;
- Pedagogical;
- Design and engineering;
- Production and technological;
- Organizational and managerial.

3 Objects of professional activity

Sphere of professional activity: higher educational and special educational institutions of the state and non-state sector, research institutes and research and production corporations; laboratories for control over the quality and safety of products; energy, mining, mining and metallurgical, oil-gas and chemical industries, mechanical engineering, agro-industrial complex; environmental and customs services and organizations.

The objects of professional activity of graduates are:

- Natural and manufactured ecosystems; design, control, operation, monitoring and expertise of environmental and biological processes in industrial production;
- Devices and equipment for studying the properties of microorganisms used, cell cultures obtained by biosynthesis of substances obtained in laboratory and industrial conditions;
- Regulations for producing biotechnology products, international standards;
- Biomass, structures and green technologies for industrial biotechnological processes;
- Microorganisms, cell cultures of plants and animals, biologically active substances;
- Means of quality control of ecosystems, raw materials and products;
- Environmental and biotechnological regulations for the production of products, international standards.

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EDUCATIONAL PROGRAM PASSPORT

1 Program scope and content

The educational program for training Doctors of Philosophy (PhD) has a scientific and pedagogical focus and involves fundamental educational, methodological and research training and in-depth study of disciplines in the relevant areas of science for the system of higher and postgraduate education and the scientific sphere.

The educational program for coaching doctors in the profile assumes fundamental educational, methodological, research training, and in-depth study of disciplines in the relevant areas of science for national economy and social sphere branches: education, medicine, law, art, economics, business administration and in national security and military affairs fields.

Educational programs for doctoral studies in terms of vocational training are developed based on studying the experience of foreign universities and research centers that implement accredited training programs for PhD doctors or doctors in the field.

The content of the educational program regarding specialized doctoral studies is established by the university independently.

The main criterion for educational process completeness for training the doctors of philosophy (PhD) (doctor by profile) is the mastering of at least 180 academic credits by a doctoral student, including all types of educational and scientific activities.

The study duration in doctoral studies is determined by the amount of acquired academic credits. Upon mastering the established amount of academic credits and achieving the expected learning outcomes for obtaining a PhD or profile, the doctoral education program is considered fully mastered.

The training of personnel in doctoral studies is carried out based on educational Master's programs in two areas:

- 1) Scientific and pedagogical area with a training period of at least three years;
- 2) Specialized area with a training period of at least three years.

Content of EP

University carries out planning the education content, the method of organizing and conducting the educational process and the research organization independently based on credit education technology.

Doctoral studies in the scientific and pedagogical direction implements educational programs of postgraduate education for training the academic and scientific-pedagogical personnel for universities and scientific organizations with in-depth scientific-pedagogical and research training.

Doctoral study program content consists of:

- 1) Theoretical training, including the study of cycles of basic and major disciplines;
- 2) Practical training for doctoral students, which includes research internships undergoing;

- 3) Research work: performing experimental research, interpreting scientific results, formalizing the scientific data obtained, and writing a dissertation.
- 4) Final certification.

Educational program objectives:

- Provision of conditions for training the academic and scientific-production personnel in bio-ecological engineering
- Providing conditions for conducting scientific research on evolving breakthrough eco-biotechnologies
- Providing the knowledge and skills that supply the graduate with professional relevance, both in educational environment and in research and production
- Training of competitively capable qualified personnel of a new formation, capable of solving modern problems of eco-biotechnology and possessing general cultural, universal and professional competencies.

2 Requirements to applicants

Individuals with a Master's degree and work experience of at least 1 (one) year or who have completed residency training are admitted to doctoral studies.

Selection committees of universities and scientific organizations perform enrollment in the number of doctoral students based on entrance exam results for groups of doctoral programs and a certificate confirming proficiency in a foreign language in accordance with Common European Competences (standards) of foreign language proficiency.

When enrolling in universities, doctoral students independently choose an educational program from educational programs' corresponding group.

The enrollment of persons for the targeted training of philosophy doctors (PhD) under the state educational order is realized on the competitive basis.

The procedure for admission of citizens to doctoral studies is established in accordance with "Standard Rules for admission to training at educational institutions that implement educational programs of postgraduate education." The doctoral students' contingent formation is carried out by placing a state educational order for the training of scientific and pedagogical personnel, as well as paying for education at the expense of citizens' own funds and other sources. The state provides the citizens of Republic of Kazakhstan with the right to receive, on a competitive basis, in accordance with the state educational order, free postgraduate education, in case they are going to receive education of this level for the first time.

At "the entrance", the doctoral student must have all the prerequisites for mastering the relevant professional doctoral curriculum. The higher education institution determines the list of required prerequisites independently.

In the absence of the prerequisites, the doctoral student is allowed to master them on a paid basis. In this case, doctoral studies start after the doctoral student has fully mastered the prerequisites.

3 Requirements for completing studies and obtaining a diploma

Individuals, who have mastered doctoral studies educational program and defended their doctoral dissertation, with Dissertation Councils' positive decision, University with a special status or Committee for Control in the field of education and science. Under RK Education and Science Ministry, based on the examination results, are awarded Doctor of Philosophy (PhD) degree or Doctor by profile, and issued a state diploma with an attachment (transcript).

Individuals, who have received a PhD degree, in order to deepen the scientific knowledge and solve scientific and applied problems on a specialized topic, carry out a postdoctoral program or conduct research under the guidance of a chief scientist chosen by the university.

3.1 Requirements to doctoral graduates' key competencies:

1) to be aware of:

- the main stages of development and the change of paradigms in science evolution;
- the subject, ideological and methodological specifics of natural (social, humanitarian, economic) sciences;
- scientific schools of the relevant branch of knowledge, their theoretical and practical developments;
- the scientific concepts of world and Kazakh science in the relevant field;
- the implementation mechanism of scientific developments in practice;
- the norms of interaction in the scientific community;
- the pedagogical and scientific ethics of the scientist-researcher;

2) to know and understand:

- modern trends, directions and patterns of domestic science growth in globalization and internationalization context;
- scientific cognition methodology;
- achievements of world and Kazakh science in the relevant field;
- (to understand and accept) the social responsibility of science and education;
- perfectly foreign language for scientific communication and international cooperation;

3) to be able to:

- organize, plan and implement the scientific research process;
- analyze, evaluate and compare various theoretical concepts in the field of research, and draw conclusions;
- analyze and process information from various sources;
- conduct independent scientific research, characterized by academic integrity, based on modern theories and methods of analysis;

- generate their own new scientific ideas, communicate their knowledge and ideas to the scientific community, expanding the boundaries of scientific knowledge;
- choose and effectively use modern research methodology;
- plan and predict their further professional development;

4) *to acquire skills of:*

- critical analysis, assessment and comparison of various scientific theories and ideas;
- analytical and experimental scientific activities;
- planning and forecasting research results;
- oratory and public speaking at international scientific forums, conferences and seminars;
- scientific writing and scientific communication;
- planning, coordination and implementation of scientific research processes;
- systematic understanding of the study field and demonstrate the quality and effectiveness of the selected scientific methods;
- participation in scientific events, fundamental scientific domestic and international projects;
- leadership management and team leadership;
- a responsible and creative attitude to scientific and scientific-pedagogical activities;
- conducting a patent search and experience in the transfer of scientific information using modern information and innovative technologies;
- protection of intellectual property rights to scientific discoveries and developments;
- free communication in a foreign language;

5) *to be competent in:*

- the field of scientific and scientific-pedagogical activity in conditions of rapid renewal and growth of information flows;
- carrying out theoretical and experimental scientific research;
- the formulation and solution of theoretical and applied problems in scientific research;
- conducting a professional and comprehensive analysis of problems in the relevant area;
- issues of interpersonal communication and human resource management;
- matters of university training the specialists;
- the examination of scientific projects and research;
- ensuring constant professional growth.

3.2 Requirements for the research work of a doctoral student enrolled in PhD program:

- 1) compliance with the main problems of the educational program of doctoral studies, on which the doctoral dissertation will be defended;
- 2) is relevant and contains scientific novelty and practical significance;
- 3) is based on modern theoretical, methodological and technological achievements of science and practice;
- 4) is based on modern methods of data processing and interpretation using computer technology;
- 5) is carried out using modern scientific research methods;
- 6) contains research (methodological, practical) sections on the main protected provisions.

3.3 Requirements for organizing internships:

The internship is carried out with the aim of developing practical skills in scientific, scientific, pedagogical and professional activities.

The educational program of doctoral studies includes:

- 1) Teaching and research practice - for students under Ph.D. program.
- 2) Industrial internship - for students under the program of specialized doctoral studies.

During the period of pedagogical practice, doctoral students, if necessary, are involved in conducting classes in undergraduate and graduate programs.

The research practice of a doctoral student is implemented with the aim of studying the latest theoretical, methodological and technological achievements of domestic and foreign science, as well as consolidating practical skills, applying modern research methods, processing and interpreting experimental data in the dissertation research.

The industrial practice of a doctoral student is executed in order to consolidate the theoretical knowledge gained in the training process and improve the professional level.

The content of research and industrial practice is determined due to doctoral dissertation topic.

4 Working curriculum of the «Bioecological Engineering» educational program

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
Kazakh National Research Technical University named after K.I. Satpayeva



MAJOR CURRICULUM for 2021-2022 academic year admission

Educational program 8D05201 - "Bioecological Engineering"

Group of Educational programs D087 - "Environmental protection technology"

Full-time study

Study duration: 3 years

Academic degree: PhD

Year of study	Code	Name of discipline	Cycle	Total volume in credits	Total hours	audience volume lec/lab/pr	ISW (including ISWT), in hours	prerequisite	Code	Name of discipline	Cycle	Total volume in credits	Total hours	audience volume lec/lab/pr	ISW (including ISWT), in hours	prerequisite		
																	1 semester	
1	MET322	Research methods	BD UC	5	150	2/0/1	105		AAP345	Doctoral student research work, including internship and doctoral dissertation	DSRW	24						
	LNG305	Academic writing	BD UC	5	150	2/0/1	105		AAP350	Pedagogical practice	BD	10						
	CHE745	Modern trends in nanotechnology in environmental protection	BD CC	5	150	2/0/1	105											
	CHE751	Global environmental problems of our time and ways to solve them	SD CC/UC	5	150	2/0/1	105											
	CHE309	Melioration, reclamation and restoration of land	SB CC	5	150	2/0/1	105											
	Total				25					Total		34						
2	3 semester								4 semester									
	AAP345	Doctoral student research work, including internship and doctoral dissertation	DSRW	24					AAP346	Doctoral student research work, including internship and doctoral dissertation	DSRW	25						
	AAP355	Research practice	SD	10														
Total				34					Total		25							
3	5 semester								6 semester									
	AAP346	Doctoral student research work, including internship and doctoral dissertation	DSRW	25					AAP346	Doctoral student research work, including internship and doctoral dissertation	DSRW	25						
									ECA303	Writing and defending a doctoral dissertation	FA	12						
Total				25					Total		37							
Total												180						

Decision of the Academic Council of KazNRTU named after K.I. Satbayev. Minutes № 3 Dated 25.06 2021 y.

Decision of the Academic Council of the Institute of Geology and Oil-Gas Business. Minutes № 5 Dated 04.12 2021 y.

Vice-rector for academic affairs

Director of the Institute of Geology and Oil-Gas Business

Head of Department "Chemical Processes and Industrial Ecology"

Sh. Kubekova

Total number of credits	
Cycle of disciplines	Credits
Cycle of general disciplines	0
Cycle of basic disciplines (BD UC, BD CC)	25
Cycle of special disciplines (SD UC, SD CC)	20
Total theoretical training:	45
DSRW	123
Writing and defending a doctoral dissertation	12
TOTAL:	180

5 Descriptors of the level and scope of knowledge, abilities, skills and competencies

The third level descriptors within Comprehensive Qualifications Framework of European Higher Education Area (EC-EHEA) reflect learning outcomes that characterize the student's abilities:

- 1) to demonstrate a systematic understanding of the field of study, mastering the skills and research methods used in this area of bio-ecological engineering;
- 2) to demonstrate the ability to think, design, implement and adapt an essential research process with a scientific approach;
- 3) to contribute with their own original research to expand the boundaries of the scientific field, which deserves publication at the national or international level;
- 4) to critically analyze, evaluate and synthesize new and complex ideas;
- 5) to communicate their knowledge and achievements to colleagues, the scientific community and the general public;
- 6) to promote, in an academic and professional context, the technological, social or cultural development of a knowledge-based society.

6 Diploma supplement by ECTS standard

The supplement was developed according to European Commission Standards, Council of Europe and UNESCO / CEPES. This document is for academic recognition only and is not an official proof of education. Not valid without a university degree. The purpose of completing the European Annex is to provide sufficient information about the holder of the diploma, the qualification obtained, the level of this qualification, the content of the study program, the results, the functional purpose of the qualification, as well as information about the national education system. The supplement model that will be used to translate grades uses European Credit Transfer or Transfer System (ECTS).

The European Diploma Supplement provides an opportunity to continue education at foreign universities, as well as to confirm national higher education for foreign employers. When going abroad for professional recognition, additional legalization of the educational diploma will be required. European Diploma Supplement is completed in English upon individual request and is issued free of charge.

7 Short descriptions of the courses

Research methods

CODE – MET322

CREDITS – 5 (2/0/1/2)

PREREQUISITE – Master's degree courses

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course: “is to acquire knowledge about the laws, principles, concepts, terminology, content, specific features of the organization and management of scientific research using modern methods of scientometrics.

Objectives of the course:

- acquaintance with the basic theoretical provisions, laws, principles, terms, concepts, processes, methods, technologies, tools, operations for the implementation of scientific activities;
- study of methods of planning and organizing scientific research;
- acquaintance with the general methodology of scientific design, creativity, the general scheme of the organization of scientific research, the practice of using the methods of scientific knowledge in the field of the relevant industry;
- mastering the skills of choosing a scientific research topic and selecting the necessary bibliographic publications and information materials on the research topic;
- practice of working with scientific databases (ORCID, SCOPUS, Google Scholar, Web of Science, Elsevier, ClarivateAnalytics, Science Direct, Wiley InterScience, Cambridge Journals Online, RSCI, ProQuest Dissertations & Theses, databases of metallurgical and Canadian societies TMS and Met Soc, patent Derwent Innovations Index databases, etc.), the study of scientometrics and scientometric indicators; practice of selecting a journal for publication (understanding the quartiles Q1, Q2, Q3, Q4 WoS, percentiles by CiteScore in the Scopus database),
- study of the basic methods of scientific research;
- study of procedures for setting and solving scientific problems of information processes and informatization of enterprises and organizations;
- acquaintance with the possibilities of conducting scientific research in the international community in the field of fundamental and applied metallurgy;
- study of standards and norms for the registration of scientific research results, preparation of scientific projects, reports, publications for seminars and conferences;
- acquaintance with the procedures for approbation of the results of scientific research, preparation of publications based on the results of scientific research;
- studying the methods of presenting scientific materials and forming a manuscript of a scientific work, preparing a PhD thesis.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

professional: the ability to critically analyze and evaluate modern scientific achievements, generate new ideas in solving research and practical problems, including in interdisciplinary fields;

- implementation of complex research, including interdisciplinary, based on a holistic systemic scientific worldview;

- readiness to participate in the work of Kazakhstani and international research teams to solve scientific and scientific and educational problems;

- the ability to follow ethical standards in professional activities;

managerial: the ability to plan and solve problems of their own professional and personal development; possession of the methodology of theoretical and experimental research in the field of professional activity.

communicative: ability to work in a team; show of initiative; consistency of judgments; the ability to effectively cooperate with other people, to build subject-subject relations in the process of professional activity; possession of the culture of scientific research, including the use of modern information and communication technologies.

Academic Writing

CODE – LNG305

CREDITS – 5 (2/0/1/2)

PREREQUISITE – Professional English

PURPOSE AND OBJECTIVES OF THE COURSE

Developing academic writing skills for writing research papers.

SHORT DESCRIPTION OF THE COURSE

The course aims to develop academic writing skills of doctoral students in engineering and natural sciences.

The course focuses on fundamentals and general principles of academic writing for;

- writing effective sentences and paragraphs;
- the use of tenses in scientific works, as well as styles and punctuation;
- writing an abstract, introduction, results, discussion, conclusion, literature and resources used;

- citing in the text;

- preventing plagiarism, and making a presentation at the conference.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Upon successful completion of the online course doctoral students will be able to:

- recognize the features of effective academic writing;
- improve the accuracy and readability of their own writing;
- correct their own scientific work;
- use the skills of reading scientific papers and the material read to write a research paper;

- analyse scientific articles published in international publications in their specialty, as well as to write scientific articles according to the requirements of the content of each part of the scientific article.

Modern trends in nanotechnology in environmental protection

CODE – CHE745

CREDITS – 5 (2/0/1/2)

PREREQUISITE – Master's degree courses

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of teaching the discipline "Modern trends in nanotechnology in environmental protection" is to train doctoral students in the use of nanodevices in research and control systems for products and waste of various chemical industries, on the creation of new "clean" technologies with a minimum yield of hazardous production waste, as well as on recycling garbage in landfills and cleaning contaminated water bodies.

Objectives: Scientifically grounded combination of environmental, economic and social interests of a person, society and the state in order to ensure sustainable development and a favorable environment, as well as protection, reproduction and rational use of natural resources as necessary conditions for ensuring a favorable environment and environmental safety.

BRIEF DESCRIPTION OF THE COURSE

The discipline is focused on improving the economic, social and environmental components in the training of technical specialists and is based on the knowledge gained in the study of socio-economic, natural science and general education disciplines.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

know

- scientific principles of environmental protection;
- on socio-economic tasks and environmental problems in order to transfer the Republic of Kazakhstan to sustainable development in the conditions of market relations and meet the needs of current and future generations of people
- norms of international law and environmental legislation of the Republic of Kazakhstan.

be able to

- scientifically substantiate, analyze and apply integrated approaches to environmental protection;
- to stimulate users of natural resources to prevent, reduce and eliminate environmental pollution.

have skills

- the ecosystem approach in the regulation of the ecological approach;
- on working with environmental information on a global and regional scale.

Global environmental problems of our time and ways to solve them

CODE – CHE751

CREDITS – 5 (2/0/1/2)

PREREQUISITE – Master's degree courses

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the course: Formation of knowledge on global environmental problems of our time and ways of achieving sustainable development for mankind, to provide knowledge about the biosphere capacity of the economic development of civilization, the principles and methods of achieving sustainable development for mankind

Objective of the course:

- to understand the reasons for the emergence and development of environmental problems of our time;
- to master a system-integrated approach in solving environmental problems of our time;
- to acquire practical skills in the development and implementation of long-term environmental programs for the sustainable development of civilization.

BRIEF DESCRIPTION OF THE COURSE

The subject of study is the biosphere, a single system with numerous synergistic effects with unique properties that explain its function and role in supporting life on Earth. The biosphere is open to other spheres and exchanges matter, energy and information with other spheres. However, the huge and steadily increasing impact of human activities on the biosphere has reached a level where human activities have a significant impact on global cycles and flows, in the form of climate change, pollution, catastrophic depletion of biodiversity on Earth and other global problems of our time. Solutions to these problems are spelled out for sustainable development.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

KNOW:

- Assessment of the state of the environment during global changes;
- the main stages of the development of civilization and environmental crises characteristic of each of them;
- principles of respect for nature and sustainable development of civilization;
- methodology for conducting field and laboratory environmental studies.

BE ABLE TO:

- analyze ecological processes and phenomena;
- to form an ecological worldview based on the use of the provisions of the concept of sustainable development.

OWN SKILLS:

- assessment of the state of the environment and human activities;
- analysis of the main stages of the development of civilization from the point of view of global ecology;



- Acquisition of practical skills to adapt and achieve sustainable development in the context of global changes.

Melioration, reclamation and restoration of land

CODE – CHE309

CREDITS – 5 (2/0/1/2)

PREREQUISITE – Master's degree courses

PURPOSE AND OBJECTIVES OF THE COURSE

Formation of a system of scientific knowledge in the organization of work on reclamation, reclamation and restoration of various categories of anthropogenically disturbed and contaminated lands.

BRIEF DESCRIPTION OF THE COURSE

Anthropogenic activity and its influence on the properties of natural objects. Classification of disturbed lands. Disturbed agro-geological systems. Natural and technogenic complexes. Landscape approach to restoration of disturbed lands. Recovery mode. Stages of land reclamation. Preparatory stage for recovery. The technical stage of restoration. Biological recovery period. Reclamation of quarries and dumps. Reclamation of mountain dumps and hydraulic discharges. Reclamation of disturbed lands from unauthorized landfills. Reclamation of waste disposal sites. Restoration of disturbed agroecosystems. Restoration of disturbed agroecosystems. Reclamation of lands formed as a result of desertification. Biological reclamation of saline lands using halophytes. Assessment and restoration of soil fertility through the soil protection system. Remediation of pesticide contaminated land. Reclamation of contaminated land. Chemical pollution of geosystems and the principle of remediation of contaminated lands. Remediation of sites contaminated with heavy metals. Remediation of land contaminated with radionuclides. Remediation of land contaminated with oil products. Land protection systems. Efficiency of land restoration.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Know: what are the causes of disturbed lands and what types of damage and the degree of destruction; be able to apply accurate and effective methods and techniques for soil restoration.

Be able to: determine the type and extent of disturbed lands; apply techniques and methods of soil restoration.

Be competent: in the field of environmental protection and nature management; in the field of preserving the stability of the biosphere and biodiversity and determining the degree of reclamation of disturbed lands.

Doctoral thesis defense

CODE – ECA203

CREDITS– 12

Doctoral dissertation purpose is to assess the scientific-theoretical and research-analytical level of the doctoral student, the created professional and managerial competencies, the readiness to perform independently professional tasks and the compliance of their preparation with the requirements of professional standard and educational program of doctoral studies.

SHORT DESCRIPTION

Doctoral dissertation is a scientific work of a doctoral student, it is an independent research, in which theoretical provisions are developed, the totality of which can be qualified as a new scientific achievement, or a scientific problem was solved, or scientifically grounded technical, economic or technological solutions were stated, the implementation of which makes a significant contribution to the country's economy growth.

A doctoral dissertation is the result of the research / experimental research work of a doctoral student, carried out during the entire period of a doctoral student's study.

Doctoral dissertation defense is the final stage of a master's training. A master's thesis must meet the following requirements:

- Dissertation topic should be related to priority areas of science evolution and / or government programs or programs of fundamental or applied research.
- Dissertation content, the goals and objectives, scientific results obtained must strictly correspond to the dissertation topic.
- Dissertation is carried out in compliance with the principles of independence, internal unity, scientific novelty, reliability and practical value.

**Рецензия
на образовательную программу «Биоэкологическая инженерия»
для докторантуры
Института химических и биологических технологий
КазННТУ имени К.И. Сатпаева**

Представленная образовательная программа (ОП) докторантуры "Биоэкологическая инженерия", подготовленная Институтом химических и биологических технологий (ИХиБТ) включает систему документов, разработанных высшим учебным заведением с учетом приоритетных направлений наук и технологий в области биологических и смежных наук, отраженных в требованиях ГОСО послевузовского образования по направлению подготовки на научно-исследовательскую, проектную, инновационно-предпринимательскую виды профессиональной деятельности в международном контексте.

Рецензируемая ОП основана на компетентностном подходе, содержит теоретическое обучение, включающее изучение базовых и профилирующих дисциплин; практическую подготовку докторантов, которая состоит из различных видов профессиональных практик; научных стажировок; научно-исследовательской работы; выполнение докторской диссертации и всех видов аттестаций.

Дисциплины, представленные в ОП соответствуют основному направлению, в целом программа нацелена на подготовку специалиста высокого уровня (доктора PhD), обладающего глубокими фундаментальными знаниями и уникальными способностями по разработке биоэкотехнологий.

В паспорте ОП представлены концепция и цели программы, отражающие ее направленность, особенности подготовки специалистов; приведены характеристики профессиональной деятельности выпускников; сформулированы результаты обучения; приведены универсальные и профессиональные компетенции выпускников.

На основании вышеизложенного считаю, что образовательная программа "Биоэкологическая инженерия" может быть реализована на базе Института химических и биологических технологий КазННТУ имени К.И. Сатпаева.

Главный специалист ТОО «КАПЭ»
Ученый секретарь НТС,
Кандидат технических наук
по специальности 25.00.36-Геозкология

Ж.Дюсенова

Подпись и печать
Юри ТОО "КАПЭ" Дрозбаев Д.С.



РЕЦЕНЗИЯ
на образовательную программу «Биоэкологическая инженерия»
для докторантуры
Института химических и биологических технологий
КазННТУ имени К.И. Сатпаева

Представленная образовательная программа (ОП) "Биоэкологическая инженерия» докторантуры Института химических и биологических технологий (ИХиБТ) включает систему документов, разработанных высшим учебным заведением с учетом приоритетных направлений наук и технологий в области биологических и смежных наук, отраженных в требованиях ГОСО высшего образования по указанному направлению подготовки.

Рецензируемая ОП содержит комплекс основных характеристик образования (объем, содержание, планируемый результат), организационные условия, квалификацию, компетенции, краткое описание программы, нормативные документы, характеристику профессиональной и научно-педагогической деятельности, которыми должен обладать докторант в результате освоения образовательной программы «Биоэкологическая инженерия». В рецензируемой ОП определены:

- планируемые результаты освоения образовательной программы;
- компетенции обучающихся, установленные образовательным стандартом;
- планируемые результаты обучения по каждой дисциплине;
- знания, умения и навыки, характеризующие этапы формирования компетенций и обеспечение достижений, планируемых в результате освоения образовательной программы.

В общей характеристике ОП указаны: квалификация, присваиваемая выпускникам; виды профессиональной деятельности, к которой готовятся выпускники; направленность образовательной программы, необходимой для реализации образовательного процесса.

На основании вышеизложенного считаю, что образовательная программа "Биоэкологическая инженерия» может быть реализована на базе Института химических и биологических технологий КазННТУ имени К.И. Сатпаева.

Директор НАО «Национальный аграрный
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