Kazakh National Research Technical University named after K.I. Satpayev
K. Turysov Institute of Geology and Oil-Gas Business
Department of Chemical and Biochemical Engineering

EDUCATOIN PROGRAM

"HYDROCARBON ENGINEERING"

8D07107- Chemical Engineering of Hydrocarbon Compounds" Doctor of Philosophy (PhD) in Engineering and Engineering Business

1st Edition
in accordance with the State Educational Standard of Higher Education, 2018

Almaty 2021

The program is compiled and by the parties:

From KazNRTU named after K.Satpayev:

1. The Head of the ChTOS&P Department A.A. Amitova
2. Director of the Ch&BT Institute A.Kh.Syzdykov

From employers:

1 LLP "Independent Center of Expertise Petroleum Products "Organic", Director A.A. Kalmuratova

Approved et the meeting of the Educational and Methodological Council of the Kazakh National Research Technical University named after K.I. satpayev.
Minutes number 3 of 25/06/2021

Qualification:

Level 8 National Qualification Framework:
8D07 – Engineering, manufacturing and construction industries
8D071 - Engineering and Engineering business (PhD)

Professional competence: organization of innovation activities in the fild of synthesis and production of hydrocarbon substances, organization and provide of scientific, educational, experimental research and management activities in the field of petrochemical products.

Brief description of the program:

The goal of the program: the training of highly qualified specialists with fundamental educational, methodological and research training in the field of chemical technology of organic substances, hydrocarbons and their products that are competitive both within the country and on the international labor market.

Types of employment. PhD in engineering and engineering businesscan perform the following professional activities: educational (pedagogical); technological; social and pedagogical; research; organizational and managerial.

The objects of professional activity of doctoral graduates are the most advanced positions in higher and special educational institutions of the state and non-state sectors, research institutes and production corporations of the organic substances and materialsproduction, domestic and foreign enterprises of chemical, petrochemical, gas and coal profile.

EDUCATIONAL PROGRAM PASSPOR

1. Volume and content of the program

The educational program for the doctor of philosophy (PhD) has a scientific and pedagogical orientation and assumes fundamental educational, methodological and research preparation and profound studying of disciplines in the corresponding directions of Sciences for system of the higher and postgraduate education and the scientific sphere.

Doctoral educational programs in terms of professional training are developed on the basis of studying the experience of foreign universities and research centers that implement accredited training programs for doctors of PhD or doctors in the profile.

The content of the educational program profile doctoral established by the University itself.

The main criterion for the completion of the educational process for the preparation of doctors of philosophy (PhD) (doctor of profile) is the development of doctoral at least 180 academic credits, including all types of educational and scientific activities.

The period of study for doctoral degree is determined by the volume of mastered academic credits.

The educational program of doctoral studies for the degree of doctor of philosophy (PhD) or the profile is considered fully in case when the established volume of academic credits are learnt andthe expected results of training are achieved.

Training in doctoral studies is carried out on the basis of master's degree programs in two directions:

1) scientific and pedagogical with term of training of not less than three years;

2) profile with a period of training of at least three years.

The content of the educational program "Chemical processes and production of chemical materials" involves in-depth study of the English language, specialization disciplines that provide a high level of professional training, in-depth training on the topic of dissertation research, interdisciplinary training, the formation of teaching skills in

higher education. The program also as a mandatory component includes teaching practice, the implementation of research work of the doctoral student. For the development of the educational component of the educational program of doctoral studies and/or research doctoral student conducts field trips to foreigneducation and science institutions.

The objectives of the program are: harmonization of technology training of scientific and pedagogical specialists of higher qualification with international standards, as well as advancing the issues of their scientific, methodological, legal, financial and economic, personnel and material&technical support; implementation of the educational process in accordance with the principles of the international practice of training highly qualified scientific and pedagogical personnel, ensuring the implementation of an independent original scientific research, characterized by considerable relevance and practical significance.

2 Requirements for applicants

The doctoral program accepts persons who have a master's degree and work experience of at least 1 (one) year or have completed training in residency.

Admission to the number of doctoral students is carried out by the admission commissions of Universities and scientific organizations on the basis of the entrance exam for groups of educational programs of doctoral studies and a certificate confirming foreign language proficiency in accordance with the common European competence (standards) of foreign language proficiency.

In admission case to universities doctoral students independently choose the educational program of the corresponding group educational programs.

Enrollment of persons for targeted training of doctors of philosophy (PhD) on the state educational order is carried out on a competitive basis.

The procedure for admission of citizens to doctoral studies is established in accordance with the"Standard rules for admission to training in educational organizations that implement educational programs of postgraduate education."

The formation of the contingent of doctoral students is carried out through the placement of the state educational order for the training of scientific and pedagogical personnel, as well as payment for training at the expense of citizens' own funds and other sources. The state shall ensure to citizens of the Republic of Kazakhstan the right to

receive free postgraduate education on a competitive basis in accordance with the state educational order, if they receive this level of education for the first time.

At the"entrance" the doctoral student must have all the prerequisites necessary for the development of the relevant professional doctoral program. The list of necessary prerequisites is determined by the higher education institution independently.

In the absence of the necessary prerequisites, the doctoral student is allowed to master them on a fee basis. In this case, training in doctoral studies begins after the full development of the doctoral prerequisites.

3 Rrequirements for completion of studies and diploma

Persons who have carried out the educational program of doctoral studies and defended their doctoral dissertation with a positive decision of the dissertation councils of the University, which has a special status or the Committee for control in the field of education and science of the Ministry of education and science of the Republic of Kazakhstan on the results of the examination, are awarded the degree of doctor of philosophy (PhD) or doctor in profile and issued a state diploma with the application (transcript).

Persons who have received a PhD degree, to deepen scientific knowledge, solve scientific and applied problems on a specialized topic performs a postdoctoral program or conduct research under the guidance of a leading scientist of the selected University.

3.1 Requirements for key competencies of doctoral graduates:

1) have a performance:

- on the main stages of development and paradigm shift in the evolution of science;

- on the subject, ideological and methodological specifics of natural (social, humanitarian, economic) Sciences;

- about scientific schools of the corresponding branch of knowledge, their

theoretical and practical developments;

- on scientific concepts of world and Kazakhstan science in the relevant field;

- on the mechanism of implementation of scientific developments in practice;

- norms of interaction in the scientific community;

- pedagogical and scientific ethics of the researcher;

2) know and understand:

- current trends, trends and patterns of development of domestic science in the context of globalization and internationalization;

- methodology of scientific knowledge;

- achievements of world and Kazakhstan science in the relevant field;

- (to realize and accept) social responsibility of science and education;

- perfect foreign language for scientific communication and international cooperation;

3) be able:

- organize, plan and implement the research process;

- analyze, evaluate and compare different theoretical concepts in the field of research and draw conclusions;

- analyze and process information from various sources;

- to conduct independent scientific research, characterized by academic integrity, on the basis of modern theories and methods of analysis;

- generate your own new scientific ideas, communicate your knowledge and ideas to the scientific community, expanding the boundaries of scientific knowledge;

- choose and effectively use modern research methodology;

- plan and forecast your further professional development;

4) have the skills:

- critical analysis, evaluation and comparison of different scientific theories and ideas;

- analytical and experimental scientific activities;

–planning and forecasting the results of the study;

- public speaking and public speaking at international scientific forums, conferences and seminars;

- scientific writing and scientific communication;

- planning, coordination and implementation of research processes;

- systematic understanding of the field of study and demonstrate the quality and effectiveness of the chosen scientific methods;

- participation in scientific events, fundamental scientific domestic and international projects;

- leadership management and team management;

- responsible and creative attitude to scientific, scientific and pedagogical activity;

- carrying out 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) be competent:

- in the field of scientific and scientific-pedagogical activity in the conditions of rapid updating and growth of information flows;
- in conducting theoretical and experimental research;
- in the formulation and solution of theoretical and applied problems in scientific research;
- professional and comprehensive analysis of problems in the relevant field;
- in matters of interpersonal communication and human resource management;
- in matters of University training;
- in the examination of scientific projects and research;
- in ensuring continuous professional growth.

3.2 **Requirements for RWD student program doctor of philosophy (PhD):**

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

3.3 **Requirements for the organization of practices:**

The practice is carried out in order to develop practical skills of scientific, scientific, pedagogical and professional activities.

The doctoral education program includes:

1) teaching and research practice - for students under the program of doctor of philosophy;
2) practical training – for students on the profile of doctoral program.

In the period of pedagogical practice, doctoral students, if necessary, are involved in conducting classes in bachelor's and master's degrees.

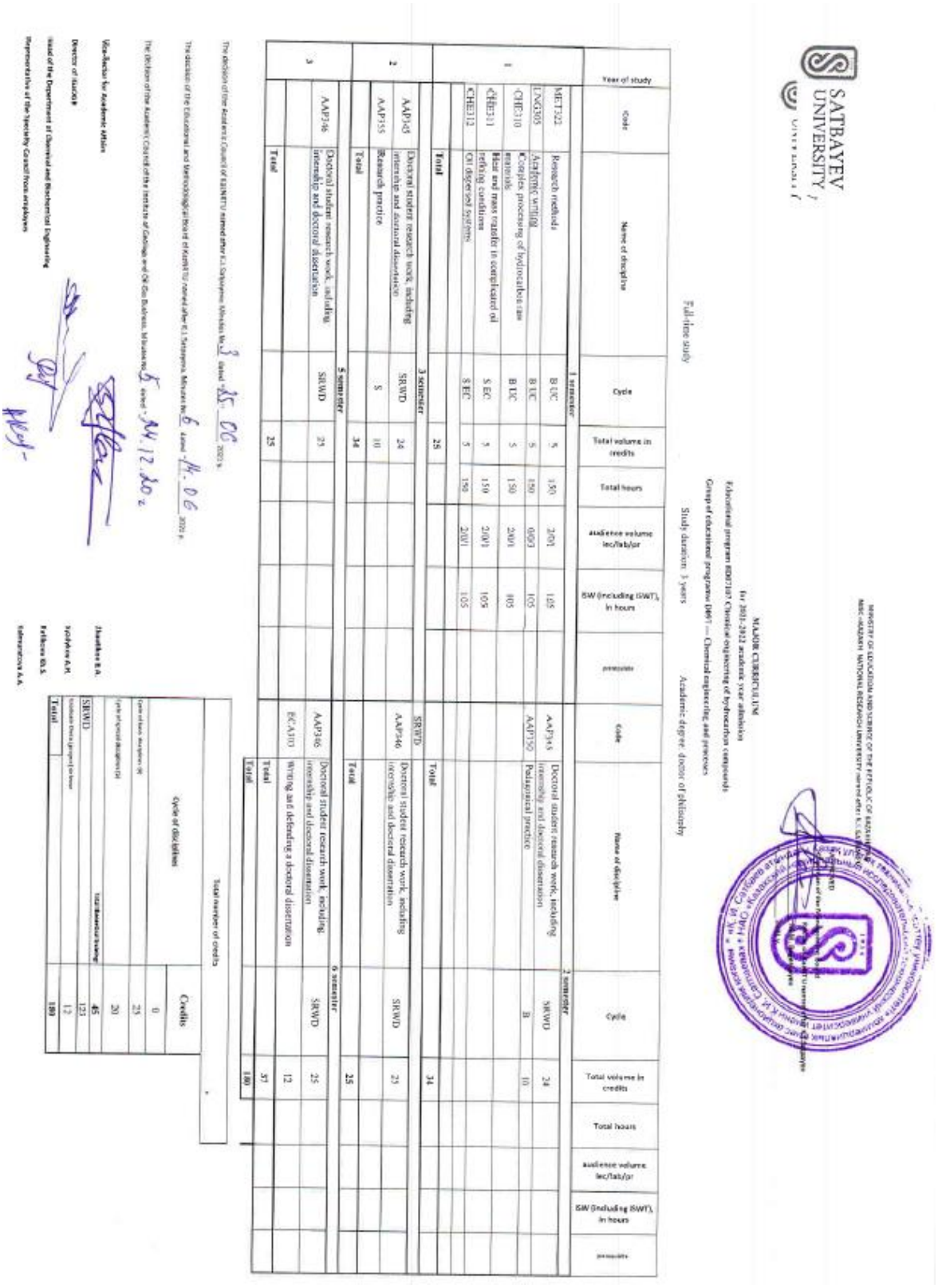
Research practice of the doctoral student is carried out in order to study the latest theoretical, methodological and technological achievements of domestic and foreign science, as well as the consolidation of practical skills, the use of modern methods of scientific research, processing and interpretation of experimental data in the dissertation research.

Practical training of doctoral students is carried out in order to consolidate the theoretical knowledge gained in the learning process, and improve the professional level.

The content of research and production practices is determined by the theme of the doctoral dissertation.

4 **Curriculum of the educational program"Hydrocarbon engineering"**

4.1 Study duration: 3 years



5 Descriptors of level and scope of knowledge, skills and competences

Descriptors of the third level within the Comprehensive framework of qualifications of the European higher education area (EHEA) reflect the learning outcomes that characterize the ability of the student:

1) demonstrate a systematic understanding of the field of study, skills and research methods used in the field of chemistry of organic compounds;

2) demonstrate the ability to think, design, implement and adapt an essential research process with a scientific approach;

3) contribute with their own original research to the expansion of the boundaries of the scientific field, which deserves publication at the national or international level;

4) critically analyze, evaluate and synthesize new and complex ideas;

5) communicate their knowledge and achievements to colleagues, the scientific community and the General public;

6) to promote, in the academic and professional context, the technological, social or cultural development of a knowledge-based society.

6 Supplement to the diploma according to the standard ECTS

The application is developed according to the standards of the European Commission, the Council of Europe and UNESCO/CEPES. This document serves only for academic recognition and is not an official confirmation of the document on education. Without a diploma of higher education is not valid. The purpose of completing the European Annex is to provide sufficient data on the holder of the diploma, the qualification he / she obtained, the level of this qualification, the content of the training program, the results, the functional purpose of the qualification, as well as information on the national education system. The application model that will translate the estimates uses the European credit transfer or credit transfer system (ECTS).

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

RESEARCH METHODS
CODE – CHE322
CREDIT – 5
PREREQUISITE –

THE PURPOSE AND OBJECTIVES OF THE COURSE

The main purpose of the course- the training course allows you to gain knowledge on the basic theoretical provisions, technologies, operations, practical methods and techniques of conducting scientific research based on modern achievements of domestic and foreign scientists and to master the skills of choosing the topic of scientific research, scientific search, analysis, experimentation, data processing, obtaining sound effective solutions using information technology.

BRIEF DESCRIPTION OF THE COURSE

the concept of science and scientific research, methods and methodology of scientific research, methods of collecting and processing scientific data, principles of organization of scientific research, methodological features of modern science (differentiation, integration, systematic approach, abstraction, concretization, synergetic paradigm, evolutionism, logic, instrumental analysis, etc.), ways of development of science and research, the role of technical sciences, computer science and engineering research in modern science, the structure of technical sciences, the application of general scientific, philosophical and special methods (including marketing and investment) of scientific research in theory and in practice.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

--formation of a number of skills and abilities necessary for independent creative activity in science and writing scientific work.
- acquisition of skills in searching and processing legal scientific literature, taking notes and referencing material, making annotations and abstracts, making references and a list of sources used; mastering the language of scientific work and familiarization with the conceptual apparatus of scientific research.

ACADEMIC WRINING

CODE - LNG305

CREDIT-5

PREREQUISITES - Professional English

THE 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 AND SKILLS UPON COMPLETION OF 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.

OIL DISPERSED SYSTEMS

CODE – **CHE312**

CREDITS - 5

PREREQUISITE– Physics, Physical Chemistry.

PURPOSE AND OJECTIVES OF THE COURSE

The main purpose of the course is to form students'

- knowledge about the dispersed state of a substance, about the peculiarities of molecular-kinetic, optical, surface, electrochemical properties of oil dispersed systems;

- concepts of the general laws of the physical chemistry of oil dispersed systems and surface phenomena,

- the concept of surface forces and adsorption;

- knowledge of the stability of oil disperse systems;

- the ability to use the general laws of physical chemistry of oil disperse systems and surface phenomena in the integrated production and technological activities;

- the ability to perform calculations of the parameters of oil dispersed systems based on physical chemistry methods;

- creative thinking, the ability to apply fundamental knowledge of the dispersed state of a substance to solve production problems, with subsequent processing and analysis of research results;

- skills of independent carrying out theoretical and experimental research of properties of oil dispersed systems.

The main *tasks* of the studying this discipline include the following items:

- the study of the main sections of the colloidal chemistry of oil disperse systems — the thermodynamics of surface phenomena, the molecular kinetic and optical properties of oil disperse systems, the stability of oil disperse systems, surface phenomena involving oil, adsorption on solid surfaces, the regulation of the stability of oil disperse systems using surfactants , capillary pressure in porous bodies;

- providing students with creative thinking, combining the fundamental knowledge of the basic laws and methods of conducting physical and chemical research, with the subsequent processing and analysis of the results.

- finding the relationship between chemical and physical processes.

BRIEF DESCRIPTION OF THE COURSE

In the course of discipline the following aspects will be considered: dispersed (colloidal) state of matter; methods for the preparation and purification of oil disperse systems; molecular kinetic, surface and optical properties of oil dispersed systems; basics of thermodynamic description of surface phenomena; adsorption at various phase boundaries; the phenomenon of wetting and spreading of fluid (oil); electric double layer and electro-surface phenomena in oil dispersed systems; stability and structural-mechanical properties of oil dispersed systems; properties of oil emulsion; surfactants and micellar systems; colloid-chemical bases of environmental protection.

COMPLEX PROCESSING OF HYDROCARBON RAW MATERIALS

КОД – CHE310

КРЕДИТ – 5

Prerequisite – Physical chemistry, General chemical technology, Technology of processing of hydrocarbon raw materials, Basic processes and devices of chemical technology.

PURPOSE AND TASKS OF THE COURSE

The main objective of the course - study of the general trend of the oil industry in the processing of hydrocarbon raw materials.

Course objectives: to form the foundations of technological thinking, to reveal the relationship between the development of chemical science and chemical technology, to prepare graduates for active creative work.

BRIEF DESCRIPTION OF THE COURSE

The course "Complex processing of hydrocarbon raw materials" presents the following sections: the contribution of technologies based on traditional processes to the global processing of heavy petroleum raw materials, new technologies in the form of pilot plants, primary processing of heavy oils, thermal and extraction processes, hydrocatalytic processes, a type of hydrocatalytic processing of natural bitumen, physico-chemical and technological aspects of processing heavy hydrocarbon raw materials, features of the composition of heavy and bituminous oils. Natural bitumen, their rheological properties..

KNOWLEDGE, ABILITIES, SKILLS TO COMPLETE COURSE

To develop new approaches to the processing of hydrocarbon raw materials; to calculate the technological parameters of the processes of processing raw materials; to determine the parameters of the best organization of the process with adjustments to the specifics of raw materials; methods for determining the optimal and rational technological modes of operation of equipment for processing hydrocarbon raw materials.

HEAT AND MASS TRANSFER IN COMPLICATED OIL REFINING CONDITIONS

CODE – **CHE311**

CREDIT – 5

PREREQUISITE – Organic Chemistry, Physical Chemistry

THE PURPOSE AND OBJECTIVES OF THE COURSE

to learn the features of the operation of heat and mass transfer devices in complicated conditions of oil refining, the influence of various technological and design factors on the efficiency and productivity of the devices.

BRIEF DESCRIPTION OF THE COURSE

As part of the course, the regularities and mathematical description of heat and mass transfer processes occurring in systems with several phases and several components in complicated oil refining conditions associated with an increase in the volume of processing of high-sulfur oil and the processing of crude oil with increased density values are considered. Skills and practical skills will be formed for calculating processes and devices, heat and mass transfer processes, performing constructive calculations of the device, using reference literature for a reasonable choice of equipment.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

- solve professional production tasks, including the choice of technological parameters of the process, materials and energy costs;

- analyze the influence of technological parameters on heat and mass transfer, calculate and optimize the process.

to know the essence of the technology of heat and mass transfer process and methods of calculation and design of devices;

-the main directions of improving the work and improving the designs of heat and mass transfer process apparatuses, to evaluate the technical and economic efficiency of the technological process;

-methods for determining the optimal operating modes of equipment, methods for calculating technological standards and parameters of the heat and mass transfer process.

DEFENSE OF DOCTORAL DISSERTATION

CODE – ECA303

CREDIT -12

The purpose of the doctoral dissertation is to assess the scientific-theoretical and research-analytical level of the doctoral student, formed professional and managerial competencies, readiness for independent implementation of professional tasks and compliance of its preparation with the requirements of the professional standard and the educational program of doctoral studies.

BRIEF DESCRIPTION

Doctoral dissertation is a scientific work of a doctoral student, which is an independent study, in which theoretical provisions are developed, the totality of which can be qualified as a new scientific achievement, or a scientific problem is solved, or scientifically substantiated technical, economic or technological solutions are presented, the introduction of which makes a significant contribution to the development of the country's economy.

Doctoral dissertation-the result of research / experimental research work of the doctoral student, conducted during the entire period of doctoral studies.

The defense of the doctoral dissertation is the final stage of the master's degree. Doctoral dissertation should meet the following requirements:

- The theme of the dissertation should be related to the priority directions of development of science and/or state programs or programs of fundamental or applied research.

- The content of the dissertation, goals and objectives, scientific results should strictly correspond to the topic of the dissertation.

- The thesis is carried out in compliance with the principles of independence, internal unity, scientific novelty, reliability and practical value.

Content


СӘТБАЕВ
УНИВЕРСИТЕТІ
1934
SATBAYEV
UNIVERSITY

СӘТБАЕВ УНИВЕРСИТЕТІ SATBAYEV UNIVERSITY

МҰНАЙ ӨНІМДЕРІН СЫНАЙТЫН ТӘУЕЛСІЗ ОРТАЛЫҒЫ
НЕЗАВИСИМЫЙ ЦЕНТР ЭКСПЕРТИЗЫ НЕФТЕПРОДУКТОВ

ЖШС «МӨСТО «ORGANIC»
Қазақстан Республикасы
050028, Алматы қ-сы,
Первомайский бұр., 38
Тел.: 8 727 246 65 42, 380 51 58
E-mail: organic.oiltest@mail.ru

ТОО «НЦЭН «ORGANIC»
Республика Казахстан
050028, г. Алматы,
пер. Первомайский, 38
Тел.: 8 727 246 65 42, 380 51 58
E-mail: organic.oiltest@mail.ru

Рецензия
на образовательную программу PhD докторантуры «Химическая инженерия углеводородных соединений»

Образовательная программа «Химическая инженерия углеводородных соединений» PhD докторантуры предполагает фундаментальную образовательную, методологическую и исследовательскую подготовку высококвалифицированных специалистов, обладающих глубокими научными знаниями и профессиональными педагогическими навыками, для нефте-газохимической отрали экономики, сферы науки и образования.

Образовательная программа (ОП) «Химическая инженерия углеводородных соединений» квалификации «8D071 - Инженерия и инженерное дело» Национальной рамки квалификации, разработана на основе Государственного общеобязательного стандарта высшего образования Республики Казахстан. Содержание и структура ОП по направлению подготовки «8D071 – Инженерия и инженерное дело» отвечает основным требованиям стандарта и содержит следующую информацию: цели и задачи ОП, характеристику профессиональной деятельности выпускника, академические требования к поступающим, требования для завершения обучения, рабочий учебный план, дескрипторы уровня и объёма знаний, умений, навыков.

Структура Учебного плана ОП «Химическая инженерия углеводородных соединений» логична и последовательна. Дисциплины учебного плана раскрывают сущность актуальных на сегодняшний день проблем. В программе предусмотрено углублённое изучение дисциплин по органической химии и химии углеводородных материалов, современным методам их исследования, а так же ряд специальных дисциплины, которые способствуют формированию управленческих навыков выпускников, таких как, разработка и организация безотходного производства, комплексной подход при решении научных проблем в области производства и переработки органических веществ и материалов с минимизацией вредного воздействия на окружающую среду, *способность ориентироваться в больших объёмах информации, действовать в условиях неопределённости.* Эти качества позволяют выпускникам программы PhD докторантуры быть конкурентоспособными в современных условиях развития экономики страны.

Считаю, что образовательная программа «Химическая инженерия углеводородных соединений» PhD докторантуры отвечает потребностями рынка

труда, задачам индустриально-инновационного развития страны и может быть рекомендована к внедрению в учебный процесс.

Директор
ТОО «Независимый центр
экспертизы нефтепродуктов
«ORGANIC» **А. Калмуратова**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