

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

EDUCATION PROGRAM

"CHEMICAL ENGINEERING OF HYDROCARBON COMPOUNDS"
"7M07109 - Chemical Engineering of hydrocarbon compounds"
Master of Technical Sciences

1st Edition

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

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.M. Syzdykov



From employers:

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

Approved at 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 7 National Qualification Framework:

- 7M071 – Engineering, manufacturing and construction industries
- 7MB07 - Engineering and engineering (master's degree)

Professional competencies: mastering modern methods of scientific research, setting and formulating the tasks of scientific research based on the results of the search for scientific and technical information, processing and analysis of scientific and technical information, development of new technical and technological solutions in the development of petrochemical products taking into account technical, economic and environmental requirements, Organization of work of the team of performers, making managerial decisions in the conditions of different opinions, application of interactive forms and innovative methods of training in modern universities.

BRIEF DESCRIPTION OF THE PROGRAM

1 The goal of the program:

- formation on the basis of the scientific school of the National Research University of general cultural, professional and special competencies that allow graduates to work successfully in the field of petrochemical technology and be competitive in the labor market;
- development of such personal qualities as creativity, responsibility, tolerance, striving for self-development and disclosure of their creative potential among undergraduates;
- the development of research qualities, the ability to plan, formulate, perform and generalize experimental studies according to the chosen program, the formation of a critical understanding of the existing fundamental scientific theories and concepts, and the explanation of the results obtained from the standpoint of modern chemical science and technology.

2 Types of employment. A graduate of the educational program "Chemical engineering of hydrocarbon compounds" in the scientific and pedagogical direction of training 7M071

- Engineering and Engineering is preparing for the following types of professional activity:

- production and technological;
- organizational and managerial;
- scientific research;
- design and engineering;
- pedagogical.

3 The objects of professional activity chemicals and materials; methods and devices for determining and researching the composition and properties of substances and materials; technological processes and industrial systems for producing petrochemical products, as well as systems for managing and regulating them; interactive forms and innovative teaching methods in a modern university.

Subjects of professional activity: research and engineering companies, research and design industry institutes; research laboratories, higher and secondary technical educational institutions; chemical and petrochemical plants and enterprises.

EDUCATIONAL PROGRAM PASSPORT

1. Volume and content of the program

The duration of the master's degree is determined by the amount of academic credits mastered. Upon mastering the established amount of academic credits and achieving the expected learning outcomes for obtaining a master's degree, the Master's degree program is considered fully mastered. The scientific and pedagogical Master's degree program has at least 120 academic credits for the entire period of study, including all types of educational and scientific activities of a graduate student.

Planning of the content of education, the way of organizing and conducting the educational process is carried out by the university and the scientific organization independently on the basis of credit technology of training.

The Master's degree in scientific and pedagogical direction implements educational programs of postgraduate education for the training of scientific and scientific-pedagogical personnel for universities and scientific organizations with in-depth scientific-pedagogical and research training.

The content of the Master's degree program consists of:

- 1) theoretical training, including the study of cycles of basic and core disciplines;
- 2) practical training of undergraduates: various types of practices, scientific or professional internships;
- 3) research work, including the implementation of a master's thesis – for a scientific and pedagogical master's degree
- 4) final certification.

Regulatory documents for the development of an educational program

The regulatory legal framework for the development of this educational program consists of:

- The Law of the Republic of Kazakhstan "On Education" with amendments and additions within the framework of legislative changes to increase the independence and autonomy of universities dated 04.07.18 No. 171-VI.
- The Law of the Republic of Kazakhstan "On Amendments and Additions to Some Legislative Acts of the Republic of Kazakhstan on the expansion of academic and managerial independence of higher educational institutions" dated 04.07.18 No. 171-VI;
- Order of the Minister of Education and Science of the Republic of Kazakhstan dated 30.10.18 No. 595 "On approval of Standard rules for the activities of educational organizations of appropriate types";

- State mandatory standard of postgraduate education (Annex 8 to the Order of the Minister of Education and Science of the Republic of Kazakhstan dated 31.10.18, No. 604;

- Order of the Minister of Education and Science of the Republic of Kazakhstan dated 20.01.15 No. 19 On Approval of the Rules for the Transfer and restoration of Students by Types of Educational Organizations with Amendments and Additions by Order No. 601 dated 31.10.18.;

- Working curriculum of the educational program "Chemical Engineering of hydrocarbon compounds" for 2019-2020, approved by the Rector of the K.I. Satpayev Kazakh National Research Technical University;

- Documents of the QMS system (Quality Management System) on the organization of the educational process at the K.I. Satpayev Kazakh National Research Technical University.

The content of the EP: The EP "Chemical Engineering of hydrocarbon compounds" is implemented by K.I. Satpayev KazNITU in the field of training 7M071 - Engineering and Engineering (Master's degree) and presents a system of documentation regulating the goals, expected results, content and implementation of the educational process in the field of chemical engineering and production of chemical materials.

The EP provides an opportunity to obtain in-depth knowledge, key skills and abilities of the graduate and their further development in the field of petrochemical engineering and production of chemical materials. This EP is built taking into account the possibility of providing a master's student with a choice of an appropriate educational trajectory or a specific specialization based on the main educational program, but containing their own individual competencies reflecting the specifics of a particular specialization within the framework of the unified educational direction 7M071 – Engineering and Engineering (Master).

Objectives of the educational program:

A master's degree in the field of training 7M071 - Engineering and Engineering should be prepared to solve the following professional tasks in accordance with the direction of the EP "Chemical engineering of hydrocarbon compounds" and types of professional activities:

1. Design and engineering activities

- calculate the material and thermal balances of the chemical-technological process;
- to make the hardware and technological scheme of the process;

- calculate the main structural and technological parameters of the main and auxiliary equipment;

- develop or select drawings of equipment, buildings and structures;
- develop simulation models of chemical and technological processes.

2. Design and technological activities

- develop chemical and technological processes for obtaining new substances and materials;

- to improve the technological schemes of existing production facilities with justification of the main parameters and indicators of the process;

- to draw up a business plan for a chemical and technological project;

- develop energy- and resource-saving technologies in the field of oil and gas refining and production of chemical materials;

- develop environmental protection measures for petrochemical enterprises.

3. Research activities

- conduct a literary and patent search, compile reports on patent research, informational reviews, conclusions, etc.;

- plan experimental research, choose research methods;

- to develop schemes and design of the experimental installation, to carry out installation and debugging;

- to carry out experimental work using modern instrumental methods of research and analysis of the composition, structure and quality of the resulting products and starting substances;

- process data using mathematical methods of experiment planning, regression and correlation analysis;

- develop and research mathematical models of chemical and technological processes;

- to analyze and summarize the results of the research, to publish the results in the form of scientific articles and abstracts, to issue pre-patents and patents for inventions.

4. Organizational and managerial activities.

- to provide information support for production, labor and management;

- to carry out measures for the organization of production in accordance with regulatory documents;

- develop and compile the necessary documentation;

- organize the activities of the team, make work plans and set production tasks.

- solve logistical issues, monitor the execution of tasks.

5. Pedagogical activity:

- develop and implement active teaching methods that help to form a creative,

innovative approach to understanding professional activity, develop independent thinking and the ability to make optimal decisions in a certain situation;

- develop educational and methodological documentation, methods for monitoring students' knowledge and multimedia materials for the educational process;
- conduct laboratory and practical classes.

2 Requirements for applicants

The previous level of education of applicants (first cycle) is higher professional education (bachelor's degree). The applicant must have a diploma of the established sample and confirm the level of knowledge of the English language with a certificate or diplomas of the established sample.

The procedure for admission of citizens to the magistracy is established in accordance with the "Standard rules for admission to training in educational organizations implementing educational programs of postgraduate education."

The formation of a contingent of undergraduates is carried out by placing a state educational order for the training of scientific and pedagogical personnel, as well as paying for training at the expense of citizens' own funds and other sources. The State provides citizens of the Republic of Kazakhstan with the right to receive free postgraduate education on a competitive basis in accordance with the state educational order, if they receive education of this level for the first time.

At the "entrance", a master's student must have all the prerequisites necessary to master the relevant master's degree program. The list of necessary prerequisites is determined by the higher educational institution independently.

In the absence of the necessary prerequisites, the undergraduate is allowed to master them on a paid basis.

3 Requirements for completing studies and obtaining a diploma

Degree/qualifications awarded: The graduate of the educational program "Chemical Engineering of hydrocarbon compounds" is awarded the academic degree "Master of Technical Sciences".

A graduate who has mastered master's degree programs must have the following general professional competencies:

- * the ability to independently acquire, comprehend, structure and use new knowledge and skills in professional activities, develop their innovative abilities;
- * the ability to formulate research goals independently, establish the sequence of solving professional tasks;

- * the ability to put into practice knowledge of fundamental and applied sections of disciplines that determine the orientation (profile) of the master's degree program;

- * the ability to professionally select and creatively use modern scientific and technical equipment to solve scientific and practical problems;

- * the ability to critically analyze, present, defend, discuss and disseminate the results of their professional activities;

- * proficiency in the preparation and execution of scientific and technical documentation, scientific reports, reviews, reports and articles;

- * willingness to lead a team in the field of their professional activities, tolerantly perceiving social, ethnic, confessional and cultural differences;

- * willingness to communicate orally and in writing in a foreign language to solve the tasks of professional activity.

A graduate who has mastered the master's degree program must have professional competencies corresponding to the types of professional activities that the master's degree program is focused on:

research activities:

- * the ability to form diagnostic solutions to professional problems by integrating the fundamental sections of sciences and specialized knowledge acquired during the development of the master's degree program;

- * the ability to independently conduct scientific experiments and research in the professional field, generalize and analyze experimental information, draw conclusions, formulate conclusions and recommendations;

- * the ability to create and explore models of the studied objects based on the use of in-depth theoretical and practical knowledge in the field of chemical materials production, chemical engineering and engineering;

scientific and production activities:

- * the ability to independently carry out production and scientific-production experimental, laboratory and interpretive work in solving practical problems;

- * the ability to professionally operate modern industrial and laboratory equipment and devices in the field of the master's degree program;

- * the ability to use modern methods of processing and interpreting complex information to solve production problems;

design and technological activities:

- * the ability to independently draw up and submit projects of research and scientific-production works;

- * readiness to design complex research and scientific-production works in solving professional tasks;

organizational and managerial activities:

* readiness to use practical skills in organizing and managing research and scientific-production work in solving professional tasks;

* readiness for the practical use of regulatory documents in the planning and organization of scientific and production work;

scientific and pedagogical activity:

* ability to conduct seminars, laboratory and practical classes;

* the ability to participate in the development of interactive teaching methods, educational and methodological documentation, multimedia materials and methods of monitoring learning;

* the ability to participate in the management of scientific and educational work of students in the field of petrochemical engineering.

When developing a master's degree program, all general cultural and general professional competencies, as well as professional competencies related to those types of professional activities that the master's program is focused on, are included in the set of required results of mastering the master's program.

4 Working curriculum of the educational program "Chemical engineering of hydrocarbon compounds"

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.SATPAYEV



CURRICULUM
of Educational Program on enrollment for 2022-2023 academic year

Educational program 7M07109 - "Chemical engineering of hydrocarbon-hydrogen compounds"
Group of educational programs M097 - "Chemical engineering and processes"

Discipline code	Name of disciplines	Cycle	Duration of study: 2 year			Academic degree: Master of Technical Sciences			Allocation of face-to-face training based on courses and semesters						
			Total amount in credits	Total hours	Classroom amount lec/lab/pr	SIS (including TSIS) in hours	Form of control	1 course							
								1 semester	2 semester	3 semester	4 semester				
CYCLE OF BASIC DISCIPLINES (BD)															
M-1. Module of basic training (university component)															
ENG210	English (professional)	BD UC	5	150	0/0/3	105	E	5							
ILUM214	Management Psychology	BD UC	3	90	1/0/1	60	E		3						
ILUM212	History and philosophy of science	BD UC	3	90	1/0/1	60	E		3						
ILUM213	Higher school pedagogy	BD UC	3	90	1/0/1	60	E	3							
M-2. Modular basic general technical and chemical technology															
CHE779	Mechanisms of organic reactions	BD CCH	5	150	2/0/1	105	E	5							
CHE785	Basic organic analysis														
CHE765	Chemical reagents in the processes of oil preparation and oil production	BD CCH	5	150	2/0/1	105	E	5							
CHE786	Certain aspects of the production of valuable products from hydrocarbons														
CHE768	Chemotology of petroleum products	BD CCH	5	150	2/0/1	105	E			5					
CHE797	Rheology and oil transportation														
CYCLE OF PROFILE DISCIPLINES (PD)															
M-3. Module of specialized engineering and technical training															
CHE766	Industrial reactors for large-capacity chemical production	PD UC	5	150	2/0/1	105	E	5							
CHE767	Technology of heterolytic and homolytic processes	PD UC	5	150	2/0/1	105	E	5							
CHE769	Modern problems of quality control of chemical products	PD UC	5	150	2/0/1	105	E		5						
CHE772	Heavy oil refining technology	PD UC	5	150	2/0/1	105	E			5					
BIO289	New technologies of materials and products	PD UC	5	150	2/0/1	105	E			5					
CHE773	Problems of waste disposal of petrochemical industries	PD UC	5	150	2/0/1	105	E		5						
CHE774	Biotech technology	PD UC	5	150	2/0/1	105	E		5						
CHE775	Industrial catalysis and catalysts in oil refining	PD UC	5	150	2/0/1	105	E			5					
CHE776	Selectivity and stereospecificity of catalysts in organic chemistry	PD UC	5	150	2/0/1	105	E			5					
M-4. Practice-oriented module															
AAP229	Pedagogical practice	BD UC	6												
AAP256	Research practice	PD, CCH	4							6		4			
M-5. Experimental research module															
AAP251	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	2						2						
AAP241	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	3							3					
AAP254	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	5								5				
AAP255	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	14									14			
M-6. Module of final attestation															
ECA205	Preparation and defense of a master's thesis	FA	12									12			
Total based on UNIVERSITY:												30	30	30	30
												60		60	

Cycle code	Cycles of disciplines	Credits			Total
		university component (UC)	component of choice (CCH)		
BD	Cycle of basic disciplines	20	15		35
PD	Cycle of profile disciplines	49	0		49
	Total for theoretical training:	69	15		84
	RWMS	24			24
FA	Final attestation	12			12
	TOTAL:	12	93	15	120

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol № 3 of 22 "04" 2022.

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev. Protocol № 7 of 26 "04" 2022.


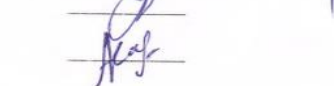


Decision of the Academic Council of the Institute _____, Protocol № 1 of 30 "12" 2021.

Vice-Rector for Academic Affairs

Institute Director of GaOGB

Head of the Department of Chemical and Biochemical Engineering

Specialty Council representative from employers

Zhautikov B.A.

Syzdykov A.H.

Amitova A.A.

Kalmuratova A.A.

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

The requirements for the master's degree level are determined on the basis of the Dublin descriptors of the second level of higher education (Master's degree) and reflect the acquired competencies expressed in the achieved learning outcomes.

Learning outcomes are formulated both at the level of the entire master's degree program, and at the level of individual modules or academic discipline.

Descriptors reflect learning outcomes that characterize the student's abilities:

1) demonstrate developing knowledge and understanding in the field of chemical processes and production of organic and inorganic substances and materials, based on advanced knowledge of chemical science and engineering in the development and (or) application of ideas in the context of research;

2) apply their knowledge, understanding and abilities at a professional level to solve problems in a new environment, in a broader interdisciplinary context;

3) to collect and interpret information for the formation of judgments taking into account social, ethical and scientific considerations;

4) clearly and unambiguously communicate information, ideas, conclusions, problems and solutions to both specialists and non-specialists;

5) to show the learning skills necessary for independent continuation of further education in the field of chemical engineering and engineering.

6. Competencies upon completion of training

6.1 Requirements for the key competencies of graduates of the scientific and pedagogical Master's degree.

The graduate must:

1) *have an idea:*

* about the role of science and education in public life;

* about current trends in the development of scientific knowledge;

* about current methodological and philosophical problems of natural (social, humanitarian, economic) sciences;

* about the professional competence of a high school teacher;

* contradictions and socio-economic consequences of globalization processes;

2) *know:*

* methodology of scientific knowledge;

* principles and structure of the organization of scientific activity;

* psychology of cognitive activity of students in the learning process;

* psychological methods and means of improving the effectiveness and quality of training;

3) be able to:

- * use the acquired knowledge for the original development and application of ideas in the context of scientific research;
- * critically analyze existing concepts, theories and approaches to the analysis of processes and phenomena;
- * integrate knowledge gained in different disciplines to solve research problems in new unfamiliar conditions;
- * by integrating knowledge to make judgments and make decisions based on incomplete or limited information;
- * apply the knowledge of pedagogy and psychology of higher education in their teaching activities;
- * apply interactive teaching methods;
- * carry out information-analytical and information-bibliographic work with the involvement of modern information technologies;
- * think creatively and be creative in solving new problems and situations;
- * be fluent in a foreign language at a professional level, which allows conducting scientific research and teaching special disciplines in universities;
- * summarize the results of research and analytical work in the form of a dissertation, scientific article, report, analytical note, etc.;

4) have skills:

- * research activities, solutions of standard scientific tasks;
- * implementation of educational and pedagogical activities on credit technology of training;
- * methods of teaching professional disciplines;
- * the use of modern information technologies in the educational process;
- * professional communication and intercultural communication;
- * oratory, correct and logical formalization of their thoughts in oral and written form;
- * expanding and deepening the knowledge necessary for daily professional activities and continuing education in doctoral studies.

5) be competent:

- in the field of research methodology;
- in the field of scientific and scientific-pedagogical activity in higher educational institutions;
- in matters of modern educational technologies;

* in the implementation of scientific projects and research in the professional field;
* in ways to ensure constant updating of knowledge, expansion of professional skills and abilities.

B - Basic knowledge, skills and abilities

B1 - the ability to use philosophical concepts of natural science to form a scientific worldview;

B2 - the ability to apply knowledge of the methodology of chemical sciences and chemical engineering to solve specific professional tasks and assess technological risks;

B3 - the ability to use psychological methods and means to improve the effectiveness and quality of training.

P - Professional competencies:

P1 – the ability to independently analyze the available information, set goals and objectives and perform experimental research using modern instrumental methods and computing tools, be responsible for the quality of research and the scientific reliability of the results obtained;

P2 - the ability to generate new ideas and methodological solutions;

P3 - the ability to professionally design, present and report the results of research and production and technological work according to approved forms;

P4 - willingness to creatively apply modern computer technologies in the collection, storage, processing, analysis and transmission of information to solve professional problems in the field of chemical engineering and production of chemical materials;

P5 - the ability to plan and carry out measures to assess the state and protection of the environment, to organize measures for rational use of natural resources;

P6 - proficiency in the formation and presentation of educational material in various forms, conducting laboratory and practical classes, readiness to teach in educational institutions and leadership of students' research work.

O - Universal, social and ethical competencies

O1 - knowledge of modern social and political problems;

O2 - the ability to perceive cross-cultural differences, the ability to observe and maintain ethical norms and rules;

O3 - communication skills in a foreign language, ability to work in an international context;

C - Special and managerial competencies:

C1 - the ability to lead a work team and ensure industrial safety measures;

C2 - ability to plan and organize professional events;

C3 - willingness to act in non-standard situations, to bear social and ethical responsibility for the decisions made.

6.2 Requirements for the research work of a master's student in the scientific and pedagogical magistracy.

The research work of a master's student should:

- 1) correspond to the profile of the master's degree program, according to which the master's thesis is being performed and defended;
- 2) be relevant and contain scientific novelty and practical significance;
- 3) be based on modern theoretical, methodological and technological achievements of science and practice;
- 4) be carried out using modern methods of scientific research;
- 5) contain research (methodological, practical) sections on the main protected provisions;
- 6) be based on the best international experience in the field of chemical science and engineering.

6.3 Requirements for the organization of practices:

The educational program of the scientific and pedagogical Master's degree includes two types of practices that are conducted in parallel with theoretical training or in a separate period:

- 1) pedagogical in the cycle of BD - at the university;
- 2) research in the PD cycle - at the place of the dissertation.

Pedagogical practice is conducted in order to form practical skills of teaching and learning methods. At the same time, undergraduates are involved in conducting undergraduate classes at the discretion of the university.

The research practice of the undergraduate is conducted in order to familiarize himself with the latest theoretical, methodological and technological achievements of domestic and foreign science, modern methods of scientific research, processing and interpretation of experimental data.

7 Appendix to the diploma according to the ECTS standard

The application is developed according to the standards of the European Commission, the Council of Europe and UNESCO/SEPES. This document serves only for academic recognition and is not an official confirmation of the document of education. It is not valid without a higher education diploma. The purpose of filling out the European Application is to provide sufficient data about the diploma holder, the qualification he received, the level of this qualification, the content of the training program, the results, the functional purpose of the qualification, as well as information about the national

education system. The application model, according to which the estimates will be translated, uses the European Credit Transfer or Credit 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 traveling abroad, additional legalization of the diploma of education will be required for professional recognition. The European diploma supplement is filled out in English according to an individual request and is issued free of charge.

ENGLISH LANGUAGE (PROFESSIONAL)

Professional English for Project Managers

COD– LNG210

CREDIT – 5

PREREQUISITE –Academic English, Business English, IELTS 5.0-5.5

THE PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course is to form a foreign-language professionally oriented competence among undergraduates. Course objectives:

to develop the ability to realize communicative intention in various situations of professionally oriented oral and written communication based on four types of speech activity:

Listening, Speaking, Reading and Writing. To teach to use a foreign language as a means of accumulating information for professional and academic communication. Prepare undergraduates for passing certified tests

BRIEF DESCRIPTION OF THE COURSE

The course is designed for master students of technical specialties for improvement and development of foreign language communication skills in the professional and academic spheres. The course introduces students the general principles of professional and academic intercultural oral and written communication using modern pedagogical technologies (round table, debates, discussions, analysis of professionally oriented cases, projecting).

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

Upon completion of the course, undergraduates will know:

- language means of professionally oriented and academic foreign language communication;
- a system of rules for constructing meaningful statements in a foreign language; be able to use a foreign language as a means of oral and written communication for professional and academic purposes; communicate and request information, express their own opinion / judgment, using argumentation, and evaluative language means;
- logically and consistently build an oral / written statement (in connection with what they heard / read), expressing personal attitude to the subject of speech;
- use a foreign language as a means of professional and academic interaction

HISTORY AND PHILOSOPHY OF SCIENCE

COD – HUM210

CREDIT – 4

PREREQUISITE – HUM124

THE PURPOSE AND OBJECTIVES OF THE COURSE

– to reveal the connection between philosophy and science, to highlight the philosophical problems of science and scientific cognition, the main stages of the history of science, the leading concepts of philosophy of science, modern problems of the development of scientific and technical reality

BRIEF DESCRIPTION OF THE COURSE – subject of philosophy of science, dynamics of science, specifics of science, science and pre-science, antiquity and the formation of theoretical science, the main stages of the historical development of science, features of classical science, non-classical and post-non-classical science, philosophy of mathematics, physics, engineering and technology, specifics of engineering sciences, ethics of science, social and moral responsibility of a scientist and engineer

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE– to know and understand the philosophical issues of science, the main historical stages of the development of science, the leading concepts of the philosophy of science, to be able to critically evaluate and analyze scientific and philosophical problems, to understand the specifics of engineering science, to possess the skills of analytical thinking and philosophical reflection, to be able to justify and defend their position, to master the techniques of discussion and dialogue, to possess the skills of communicativeness and creativity in their professional activities

PEDAGOGY OF HIGHER EDUCATION

COD – HUM209

CREDIT – 4

PREREQUISITE: LNG102

THE PURPOSE AND OBJECTIVES OF THE COURSE. The course is aimed at studying the psychological and pedagogical essence of the educational process of higher education; forming ideas about the main trends in the development of higher education at the present stage, considering the methodological foundations of the learning process in higher education, as well as psychological mechanisms affecting the success of learning, interaction, management of subjects of the educational process. Development of psychological and pedagogical thinking of undergraduates.

BRIEF DESCRIPTION OF THE COURSE

In the course of studying the course, undergraduates get acquainted with the didactics of higher education, forms and methods of organizing education in higher school, psychological factors of successful learning, features of psychological impact, mechanisms of educational influence, pedagogical technologies, characteristics of pedagogical communication, mechanisms for managing the learning process. They analyze organizational conflicts and ways to resolve them, psychological destructions and deformations of the teacher's personality.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

at the end of the course, a master's student should know the features of the modern system of higher professional education, the organization of pedagogical research, the characteristics of the subjects of the educational process, the didactic foundations of the organization of the learning process in higher school, pedagogical technologies, the patterns of pedagogical communication, the features of educational influences on students, as well as the problems of pedagogical activity.

PSYCHOLOGY OF MANAGEMENT

CODE - HUM208

CREDIT - 3

PREREQUISITE –

THE PURPOSE AND OBJECTIVES OF THE COURSE

The main purpose of the course is aimed at studying the characteristics of the behavior of individuals and groups of people within organizations; determining psychological and social factors influencing the behavior of employees. Also, much attention will be paid to the issues of internal and external motivation of people. The main goal of the course is to apply this knowledge to improve the efficiency of the organization.

BRIEF DESCRIPTION OF THE COURSE

The course is designed to provide balanced coverage of all the key elements that make up the discipline. It will briefly examine the origin and development of the theory and practice of organizational behavior, and then will examine the main roles, skills and functions of management with an emphasis on management effectiveness, illustrated by real-life examples and case studies.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

At the end of the course, students will know: the basics of individual and group behavior; basic theories of motivation; basic theories of leadership; concepts of communication, conflict management and stress in the organization; will be able to identify various roles of managers in organizations; look at organizations from the point of view of managers; understand how effective management contributes to an effective organization.

TECHNOLOGY OF HETEROLYTIC AND HOMOLYTIC PROCESSES

COD – CHE 767

CREDIT – 5

PREREQUISITE: organic chemistry, physical chemistry

THE PURPOSE AND OBJECTIVES OF THE COURSE

"Technology of heterolytic and homolytic processes of oil refining" - to give scientific foundations and master the basic technological principles of catalytic processes of oil refining.

Course objectives:

- creation of the basics of theoretical training for undergraduates to solve practical problems;
- laying the scientific foundations of chemistry, kinetics and technology of hydrocarbon processing processes;
- instilling practical skills for the development of energy- and material-saving environmentally friendly technological productions;

- acquisition of skills in technological and structural calculation of equipment for oil refining and petrochemical industries;

BRIEF DESCRIPTION OF THE COURSE

The discipline "Technology of heterolytic and homolytic processes of oil refining" is intended for undergraduates to study the theoretical foundations for solving practical problems, laying the scientific foundations of chemistry, kinetics and technology of hydrocarbon processing processes, instilling practical skills for the development of energy- and material-saving environmentally friendly technological productions, acquisition of skills in technological and structural calculation of equipment of oil refining and petrochemical industries, formation of scientific thinking among students, in particular, understanding of the logical connection between the structure and reactivity of organic compounds, about the compounds themselves and methods of their production, instilling practical skills in the synthesis and identification of compounds, application of the knowledge gained in economics, everyday life and in solving environmental protection problems.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

The study of this discipline will allow the undergraduate to solve practical problems, to form scientific thinking, in particular, to correctly understand the limits of applicability of knowledge about the chemical nature, composition and basic physical properties of organic compounds, and methods of their processing, to understand the relationship between the chemical nature, composition and physico-chemical properties of various classes of compounds, to apply the knowledge gained in economics, everyday life and solving environmental problems.

CHEMMOTOLOGY OF PETROLEUM PRODUCTS

COD– CHE 768

CREDIT – 5

PREREQUISITES: organic chemistry, oil and gas refining technologies.

THE PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the discipline: to study the scientific and applied foundations of the effective use of fuels, lubricants and technical fluids in various types of equipment.

BRIEF DESCRIPTION OF THE COURSE

Methods of qualification assessment of fuels, oils and special liquids. Requirements for the quality of fuels and lubricants. System and methods for assessing the quality of fuels and lubricants. Metrology, standardization and certification of fuels and lubricants. The study of scientific and applied fundamentals of the effective use of fuels, lubricants and technical fluids in various types of equipment. Formation of general ideas and understanding of the theoretical foundations of the composition of oil, production of fuels, oils, greases, technical fluids used in road transport, methodology for determining the quality indicators of fuel and lubricants.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

Instilling practical skills to solve various tasks related to the development of methods for the qualification assessment of the properties of fuels and lubricants; acquiring skills for the modernization and improvement of technical requirements for commercial petroleum products; the ability to formulate technical proposals.

MECHANISMS OF ORGANIC REACTIONS

COD – CHE 779

CREDIT-5

THE PURPOSE AND OBJECTIVES OF THE COURSE

As part of the course, a master's student will master the practical use of knowledge on high-molecular compounds, according to their nomenclature, methods of obtaining.

BRIEF DESCRIPTION OF THE COURSE

The basic knowledge and skills in the field of chemistry of high-molecular compounds, modern ideas about their structure, properties, as well as the most important areas and aspects of the practical application of polymers, methods of their analysis and identification will be presented.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

The ability to perceive and analyze information about chemical processes; modern methods of working with organic substances; A master's student should be able to: determine the reaction mechanism by external controlled parameters; determine the reaction mechanism by the reaction equation; be able to determine the reaction mechanism by the natu

re of reagents to navigate the flow of information concerning the dynamics of chemical processes; interpret experimental data and make judgments about the reaction mechanism;- classification of organic reactions and reagents; basic mechanisms of organic reactions.

TECHNOLOGY OF BIOFUELS

COD – CHE 774

CREDIT-5

THE PURPOSE AND OBJECTIVES OF THE COURSE

As part of the course, a master's student will master the practical use of modern biofuel production processes, their types, acquisition of skills in technological and structural calculation of equipment of this type of production, formation of scientific thinking among students, application of acquired knowledge in economics, everyday life and in solving environmental protection problems.

BRIEF DESCRIPTION OF THE COURSE

Basic knowledge and skills in the field of technological processes for the production of petrochemical synthesis products, as well as methods for optimizing production processes will be presented. The final stage of the course is the exam. After completing the course, the student must demonstrate the ability to analyze, synthesize and design petrochemical synthesis technologies, as well as calculate the corresponding costs. A master's student should be able to: calculate technical and technical-economic indicators of technological processes; analyze and provide a reasonable assessment of the efficiency of biofuels industry processes; analyze trends in the use of raw materials for the production of biofuels products.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

Theoretical foundations for solving practical problems; the limits of applicability of knowledge about the chemical nature, composition and basic physical properties of organic compounds and methods of their processing; to identify the relationship between the chemical nature, composition and physico-chemical properties of various classes of compounds; to apply the knowledge gained in economics, everyday life and solving environmental problems.

MODERN PROBLEMS OF QUALITY CONTROL OF ORGANIC PRODUCTS

COD - CHE 769

CREDIT-5

THE PURPOSE AND OBJECTIVES OF THE COURSE

Ensuring compliance with all required standards and not exceeding permissible values.

BRIEF DESCRIPTION OF THE COURSE

A set of knowledge about the basic intellectual potentials of individual citizens and society, methods of product quality assessment and control. Management and quality control -provides indicators of product quality, methods of formulation of regulatory documents, quality assessment and quality control.

The product quality assurance system is based on actions and measures distributed at all stages of the product life cycle, and develops planned and systematic support of measures that create conditions for the implementation of quality objectives and goals at all stages of the product life cycle so that the product quality meets the specified requirements.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

Acquired knowledge and skills at the end of the course – at the end of the course, the master's student will learn to solve problems independently using modern methods and techniques of working with organic substances, the completeness of compliance with the quality of chemical products according to specified regulatory characteristics and apply modern methods of organizing a product quality assurance system, features of the modern system of higher professional education.

MODERN PROBLEMS OF ORGANIC MATTER PROCESSING

COD – CHE 771

CREDIT - 5

THE PURPOSE AND OBJECTIVES OF THE COURSE

After using organic products, the relevant waste remains, which should be properly disposed of and processed. If this is not done, then besides the fact that human habitation will be uncomfortable, environmental pollution will also occur, which is fraught with the development of various diseases, infections, and so on. Considering that organic substances are, in fact, natural resources, their utilization can occur both in real conditions of the

natural environment, and with the use of techniques using the principles of transformation of organic matter in the natural cycle.

BRIEF DESCRIPTION OF THE COURSE

The process of processing organic waste consists of several stages, including waste collection, sorting for recycling and the actual processing process itself according to the chosen methodology. The main purpose of processing this type of waste is to obtain secondary raw materials, combustible substances or products that can be used in various spheres of human activity

The most commonly used methods of processing organic waste include bioenergy plants. With their help, from different types of waste, it is possible to obtain gas, which can subsequently be burned in special fuel installations. In addition to this method, there are a considerable number of other techniques that allow you to effectively recycle or dispose of organic waste without harming the environment. There are many different ways to recycle organic waste and get the most out of it.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

Theoretical foundations for solving practical problems; the limits of applicability of knowledge about the chemical nature, composition and basic physical properties of organic compounds and methods of their processing; to identify the relationship between the chemical nature, composition and physico-chemical properties of various classes of compounds; to apply the knowledge gained in economics, everyday life and solving environmental problems.

The study of this discipline will allow the undergraduate to solve practical tasks, to form scientific thinking, in particular, to correctly understand the limits of applicability of knowledge about the chemical nature, composition and basic physical properties of organic compounds.

CHEMICAL REAGENTS IN THE PROCESSES OF OIL PREPARATION AND OIL PRODUCTION

COD – CHE 765

CREDIT – 5

PREREQUISITE - Technology of organic and petrochemical production, Basic processes and devices of chemical technology, Technology of processing of hydrocarbon raw materials

THE PURPOSE AND OBJECTIVES OF THE COURSE

The discipline "Chemical reagents in the processes of oil preparation and oil production" aims to familiarize undergraduates with the practical and theoretical foundations for the use of reagents in the oilfield and oil refining industry.

Formation of students' professional competencies necessary for professional activity in the field of applied scientific research on problems of oilfield chemistry, initiation of creation, development and experimental verification of innovative technologies in the development and implementation of various chemical reagents in oil and gas production; improvement and development of new methods of experimental research of physical and chemical processes in oil and gas production, testing of chemical reagents for oil and gas production; acquisition of a new qualification "engineer-technologist"

BRIEF DESCRIPTION OF THE COURSE

The course "Chemical reagents in the processes of oil preparation and oil production" is dedicated to the actual tasks of oilfield chemistry related to the extraction, transportation and primary preparation of oil. The main problems arising during the extraction and transportation of crude oil, as well as during its primary preparation, which can be solved by the use of chemical reagents, are summarized and explained from a scientific point of view. The ways and methods of solving these problems are described, practical recommendations on the selection of the necessary reagents of oilfield chemistry are given.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

A master 's student after mastering the program of this discipline must:

- to apply in practice the principles of rational use of chemical reagents in the processes of oil preparation and oil production;
- to carry out and adjust technological processes during the construction, repair and operation of wells for various purposes and the profile of the trunk on land and at sea, transportation and storage of hydrocarbon raw materials;
- to operate and maintain technological equipment used in the construction, repair, reconstruction and restoration of oil and gas wells, oil and gas production, collection and preparation of well products, transportation and storage of hydrocarbon raw materials;
- assess risks and determine measures to ensure the safety of technological processes in oil and gas production;
- participate in the research of technological processes, improvement of technological equipment and reconstruction of production;

- to draw up technological and technical documentation for the operation of oil and gas field equipment.

INDUSTRIAL CATALYSIS AND CATALYSTS IN OIL REFINING

COD – CHE 775

CREDIT – 5

PREREQUISITES - Hydrocarbon processing technology

THE PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of studying the course "Industrial catalysis and catalysts in oil refining" is to form undergraduates' competencies related to understanding the theoretical foundations of catalysis, the use of which is based on many large-scale oil- and gas processing industries, the study of the essence and role of catalysis in the technology of obtaining industrially important products based on petroleum raw materials, in-depth mastering by undergraduates of basic approaches and the development of key skills for conducting catalytic industrial processes, in-depth study of the nature of the action of catalysts, as well as the formation of abilities to acquire new knowledge in the field of industrial catalysis and catalyst technology.

BRIEF DESCRIPTION OF THE COURSE

The discipline "Industrial catalysis and catalysts in oil refining" is intended for general professional training of specialists in petrochemistry, mastering the scientific foundations of the concept, theory, principles and applications of catalysis, developing the competence of a master in the field of industrial catalysis, forming scientific thinking among undergraduates, in particular, analyzing and generalizing the principles of catalytic technologies of petrochemistry. Mastering this course develops and strengthens practical skills of system analysis of the laws of chemical and technological processes, in solving problems of environmental protection and protection.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

As a result of studying the course "Industrial catalysis and catalysts in oil refining", the undergraduate will know: the chemical nature of catalysis, the nature of the action of catalysts, the principles and factors of catalytic processes; the possibility of directing chemical reactions towards obtaining a certain product by selecting a catalyst; issues of theory and practice of preparation of catalysts; scientific foundations of the development of highly selective catalysts and the latest technologies; issues of catalytic reactions and their use in industrial processes; classification of catalysts and catalytic processes; the

essence of catalytic action; requirements for modern catalysts. As a result of studying the course, a master's student will be able to identify, formulate and solve problems in the field of petrochemical and organic synthesis.

HEAVY OIL REFINING TECHNOLOGY

COD – CHE 772

CREDIT – 5

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

THE PURPOSE AND OBJECTIVES OF THE COURSE

To study the general trend of the oil industry in the processing of hydrocarbon raw materials, 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 "Heavy oil refining Technology" 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 AND SKILLS UPON COMPLETION OF THE COURSE

To develop new approaches to the processing of heavy oils; to calculate the technological parameters of heavy oil refining processes; to determine the parameters of the best organization of the process, adjusted for the specifics of raw materials; methods for determining optimal and rational technological modes of operation of equipment for processing heavy hydrocarbon raw materials.

INDUSTRIAL REACTORS FOR LARGE-CAPACITY PETROCHEMICAL INDUSTRIES

COD – CHE 766

CREDIT– 5

PREREQUISITE Physical chemistry, General chemical technology, Basic processes and devices of chemical technology.

THE PURPOSE AND OBJECTIVES OF THE COURSE

The study of the basic laws of chemical processes occurring in reactors, and the theoretical foundations of the calculation of chemical reactors, as well as the design of industrial chemical reactors. Course objectives: to form the foundations of technological thinking, to reveal the relationship between the development of chemical science and chemical engineering, to prepare graduates for active creative work on the creation of modern chemical reactors

BRIEF DESCRIPTION OF THE COURSE

The course "Industrial reactors for large-capacity chemical processes" presents the following sections: fundamentals of the theory of the process in a chemical reactor, mathematical modeling of reactors, designs of modern chemical reactors, new trends in the development of the theory of processes and apparatuses; interactions of chemical transformations and transfer phenomena at all scale levels, methods of choosing a reactor and calculating the process in it, optimization of chemical processes and reactors; structural elements of chemical reactors; schemes and designs of industrial chemical reactors.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

Calculate the main characteristics of the chemical process; select the reactor type and calculate the technological parameters for a given process; determine the parameters of the best process organization in a chemical reactor; methods for determining optimal and rational technological modes of equipment operation; methods for calculating and analyzing processes in chemical reactors; determining process technological parameters; methods for selecting chemical reactors.

PROBLEMS OF WASTE DISPOSAL OF PETROCHEMICAL INDUSTRIES

COD – CHE 773

CREDIT – 5

PREREQUISITE - processes and devices of chemical technology, chemical technology of organic substances.

THE PURPOSE AND OBJECTIVES OF THE COURSE

"Recycling and recycling of waste from industry enterprises" is the formation of competencies for undergraduates that allow them to carry out a complex of economic, organizational, engineering and technical measures carried out in order to reduce the volume of waste generation and storage in the oil industry, as well as to obtain additional economic effect from obtaining useful products.

BRIEF DESCRIPTION OF THE COURSE

The growth of oil production, the increase in the volume of its processing and transportation is accompanied by an increase in the discharge of oil pollution and other toxic waste. The main sources of environmental pollution by petroleum products are both mining enterprises, oil refining plants and companies engaged in the transportation of petroleum products. Losses occur during pumping, transportation of oil and petroleum products at oil terminals and oil depots. The inevitable loss of petroleum products occurs on the routes of railway transport, river and sea oil tankers, as well as at gas stations or stations, and at car repair enterprises. During wastewater treatment, in the system of circulating water supply, drilling, oil treatment, during the repair of equipment, during the cleaning of tanks, waste oil products and oil sludge are formed. Environmental characteristics of oil pollution, general characteristics, composition and properties, the impact of oil sludge on the environment, methods of disposal of oil sludge and their classification, the use of oil sludge and products of their disposal as secondary material resources are the basis of the discipline "Waste disposal and recycling of industry enterprises".

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

The main objective of the discipline "Recycling and recycling of waste of industry enterprises" is to master the methodology of research of industrial waste of the oil and gas industry, substantiation of their environmental hazards and development of disposal methods to minimize anthropogenic impact on the environment.

Why a master's student should know: waste characteristics, methods of their disposal, methods of analysis and control of waste and recycling products. A master's student should be able to: identify objects of the oil and petrochemical industry that pose an environmental hazard, apply the methodology for the disposal of industrial waste from the oil and gas industry, determine the environmental hazard of disposal products.

SELECTIVITY AND STEREOSPECIFICITY OF CATALYSTS IN ORGANIC CHEMISTRY

COD – CHE 776

CREDIT – 5

PREREQUISITE – theoretical foundations of organic matter technology, technology of organic and petrochemical industries

THE PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of studying the discipline "Selectivity and stereospecificity of catalysts in petrochemistry" is to study the essence and role of catalysis in the technology of obtaining industrially important products based on petroleum raw materials, in-depth mastering by undergraduates of basic approaches and the development of key skills for conducting catalytic industrial processes, in-depth study of the nature of the action of catalysts, the ability to direct a chemical reaction towards obtaining a certain product from a large number of possible by selecting catalysts

BRIEF DESCRIPTION OF THE COURSE

Classification of catalysis and catalytic processes. Concepts of homogeneous and heterogeneous catalysis. The role of catalysis in the development of petrochemical production. Homogeneous-catalytic and heterogeneous-catalytic reactions. Acid-base and electrophilic catalysis. Principles of catalytic action of metal complexes. Stereospecificity of metal-complex catalysts. Two-phase catalysis. Immobilized homogeneous catalysts. Physical and chemical adsorption. Heterogeneous acid catalysts. Catalysis by metals and metal oxides.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE

- formation of the practice of preparation of catalysts among undergraduates,
- scientific basis for the development of highly selective catalysts and the latest technologies.
- basic concepts of catalysis and catalysts, classification of catalysis and catalytic processes,
- concepts of homogeneous and heterogeneous catalysis, the main characteristics of catalysts,
- to determine the chemical nature of catalysis, to evaluate the nature of the action of catalysts,
- apply the principles and factors of catalytic processes to regulate the direction of chemical reactions towards obtaining a certain product by selecting a catalyst;

- identify, formulate and solve problems in the field of petrochemical and organic synthesis.

DEFENSE OF THE MASTER'S THESIS

COD – ECA205

KREDIT –12

PURPOSE AND OBJECTIVES

The purpose of the master's thesis is: to demonstrate the level of scientific / research qualifications of a graduate student, the ability to independently conduct a scientific search, to test the ability to solve specific scientific and practical problems, knowledge of the most general methods and techniques for solving them.

SHORT DESCRIPTION

A master's thesis is a final qualifying scientific work, which is a generalization of the results of an independent research by a graduate student of one of the actual problems of a specific specialty of the relevant branch of science, having an internal unity and reflecting the progress and results of the development of the chosen topic.

The Master's thesis is the result of the research/experimental research work of the undergraduate conducted during the entire period of the undergraduate's studies.

The defense of a master's thesis is the final stage of master's degree preparation. The master's thesis must meet the following requirements–

- the work must conduct research or solve current problems in the field of chemical technology of inorganic substances;
- the work should be based on the identification of important scientific problems and their solution;
- decisions must be scientifically sound and reliable, have internal unity;
- the dissertation work should be written alone

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МУНАЙ ӨНІМДЕРІН СЫНАЙТЫН ТӘУЕЛСІЗ ОРТАЛЫҒЫ
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Рецензия
на образовательную программу магистратуры
«Химическая инженерия углеводородных соединений»

Образовательная программа (ОП) «Химическая инженерия углеводородных соединений» квалификации «8М071 - Инженерия и инженерное дело» Национальной рамки квалификации, разработана на основе Государственного общеобязательного стандарта высшего образования Республики Казахстан.

Содержание и структура ОП по направлению подготовки «8М071 – 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.

В программе предусмотрено углублённое изучение дисциплин по нефтехимии, химии газов и угля, современным методам их исследования.

Образовательная программа «Химическая инженерия углеводородных соединений» магистратуры предполагает подготовку специалистов владеющих современными методами научных исследований, способных ставить и формулировать задачи научных исследований на основе результатов поиска, обработки и анализа научно-технической информации, разработки новых технических и технологических решений при создании продукции нефтехимической отрасли с учётом технико-экономических и экологических требований, способных организовывать работу коллектива исполнителей, принимать управленческие решения в условиях различных мнений, применять интерактивные формы и инновационных методов обучения в современном вузе.

Считаю, что образовательная программа «Химическая инженерия углеводородных соединений» магистратуры 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