



**«Geology and Oil-gas Business» Institute named after K. Turyssov  
Department of «Chemical and Biochemical Engineering»**

**EDUCATIONAL PROGRAM  
6B07216 «Technology of polymer production and  
processing»**

Code and classification of the field of education: **6B07** «Engineering  
and manufacturing and construction industries»

Code and classification of training areas: **6B072** «Manufacturing and processing  
industries»

Group of educational programs: **B069** «Production of materials» (glass, paper,  
plastic, wood)

Level according to the NQF: 6

Level according to the IQF: 6

Duration of study: 4 years

Volume of loans: 240

**Almaty 2025**

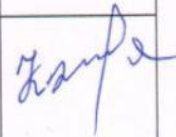
The educational program 6B07216 «Technology of polymer production and processing» was approved at the meeting of the Scientific Council of KazNTU named after K.I.Satpayev

Protocol №10 from «06» 03 2025y

Reviewed and recommended for approval at a meeting of the Educational and Methodological Council of K.I.Satpayev KazNTU

Protocol №3 from «20» 12 2024y

The educational program 6B07216 «Technology of polymer production and processing» was developed by the academic committee in the direction 6B072 «Manufacturing and processing industries»

| Name                                       | Academic degree/<br>academic         | Post                       | Place of work                                                                   |                                                                                       |
|--------------------------------------------|--------------------------------------|----------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Chairman of the Academic Committee:</b> |                                      |                            |                                                                                 |                                                                                       |
| Mangazbaeva<br>Rauash<br>Amantaevna        | Candidate of<br>Chemical<br>Sciences | Associate Professor        | Kazakh National<br>Research Technical<br>University named<br>after K.I.Satpayev |   |
| <b>Teaching staff:</b>                     |                                      |                            |                                                                                 |                                                                                       |
| Kerimkulova<br>Aigul<br>Zhadyraevna        | Candidate of<br>Chemical<br>Sciences | Associate Professor        | Kazakh National<br>Research Technical<br>University named<br>after K.I.Satpayev |  |
| Narmuratova<br>Zhanar<br>Bakhytovna        | Doctor PhD                           | Associate Professor        | Kazakh National<br>Research Technical<br>University named<br>after K.I.Satpayev |  |
| <b>Employers</b>                           |                                      |                            |                                                                                 |                                                                                       |
| Omarova<br>Marzhan<br>Ernarovna            | -                                    | Director of "Dolce"<br>LLP | Petro Gas Chemical<br>Association,                                              |  |
| <b>Students:</b>                           |                                      |                            |                                                                                 |                                                                                       |
| Usanchikova<br>Alena<br>Andreevna          | -                                    | Student                    | Kazakh National<br>Research Technical<br>University named<br>after K.I.Satpayev |  |
| Kassymbekova<br>Yasmina<br>Dodomuratovna   | -                                    | Student                    | Kazakh National<br>Research Technical<br>University named<br>after K.I.Satpayev |  |

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## **List of abbreviations and designations**

**EP** – Educational program  
**CC** – Communicative competence  
**LO** – Learning Outcomes  
**NJSC** - Non-profit joint stock company

### **1. Description of the educational program**

The educational program is a set of documents developed by the academic committee of the Kazakh National Research Technical University named after K.I. Satpayev. The EP takes into account the needs of the regional labor market, the requirements of government agencies and relevant industry requirements.

The production and processing of polymers is based on fossil organic raw materials: oil, natural gas and refinery gas. Using them as raw materials for organic synthesis will allow modern processes of polymer production and processing.

The formation of such a complex of technologically related industries will allow the production of high-tech and knowledge-intensive types of products, which, in turn, will cause accelerated development of other sectors of the real sector of the economy of the Republic of Kazakhstan.

The EP is based on the state educational standard for higher professional education in the relevant field.

The EP defines the program educational goals, the learning outcomes of students, the necessary conditions, content and technologies for the implementation of the educational process, assessment and analysis of the quality of students during training and after graduation.

The EP includes the curriculum, the content of disciplines, learning outcomes and other materials to ensure high-quality education of students.

### **2. The purpose and objectives of the educational program**

**Purpose of the educational program** - Training competitive specialists with theoretical knowledge and professional competencies capable of solving production tasks, developing and implementing innovative, environmentally and socially responsible solutions in the field of polymer, elastomer, and paint and varnish production and processing technologies to contribute to sustainable development, ensure rational use of resources, and reduce environmental impact.

**The task of the EP** is focused on the implementation of the following principles: different directions are offered within the framework of the program. The direction is designed to provide specialization in a specific area of technology for the production and processing of polymers, elastomers and paint materials. Students have the opportunity to adapt their education by choosing one direction and

supplementing it with courses in other directions. You can also choose courses from any direction to create your own unique professional profile.

### **3.Requirements for the evaluation of learning outcomes of the educational program**

The educational program was developed by the academic committee in accordance with the State Mandatory Standards of Higher and Postgraduate Education of the Republic of Kazakhstan dated July 20, 2022 No. 2 and reflects the learning outcomes on the basis of which curricula (working curricula, individual curricula of students) and working curricula in disciplines (syllabuses) are developed. Formed learning outcomes: applies knowledge of natural science, socio-economic and profile disciplines of biotechnology to solve practical and professional tasks of the biotechnology industry.

Formed learning outcomes: applies knowledge of natural science, socio-economic and profiling disciplines of technology to solve practical and professional problems of polymer production and processing technology.

Evaluation of learning outcomes is carried out according to the developed test tasks within the educational program in accordance with the requirements of the state mandatory standard of higher and postgraduate education.

When evaluating learning outcomes, uniform conditions and equal opportunities are created for students to demonstrate their knowledge, skills and abilities. To use modern information technologies for the collection, processing and dissemination of scientific information in the field of polymer production and processing technology.

## **4. Passport of the educational program**

### **4.1. General information**

| <b>№</b> | <b>Field name</b>                                 | <b>Note</b>                                                                                                                                                                                                                                                                                                                                                                    |
|----------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | Code and classification of the field of education | 6B07 «Engineering and manufacturing and construction industries»                                                                                                                                                                                                                                                                                                               |
| 2        | Code and classification of training areas         | 6B072 «Manufacturing and processing industries»                                                                                                                                                                                                                                                                                                                                |
| 3        | Group of educational programs                     | B069 «Production of materials» (glass, paper, plastic, wood)                                                                                                                                                                                                                                                                                                                   |
| 4        | Name of the educational program                   | 6B07216 «Technology of polymer production and processing»                                                                                                                                                                                                                                                                                                                      |
| 5        | Brief description of the educational program      | The educational program of this profile allows you to master competencies in technological and production areas, equipment, materials, methods and means of testing and quality control in the field of polymer production for various purposes, and the program is also focused on the processing of polymer products, design, commissioning, operation of technical devices. |

|    |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6  | The purpose of the EP                            | Training of competitive specialists with theoretical knowledge and professional competencies capable of solving production problems, conducting design and research activities in the field of technology for the production and processing of polymers, elastomers and paints.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 7  | Type of EP                                       | New                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 8  | Level according to the NQF                       | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 9  | Level according to the IQF                       | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 10 | Distinctive features of the EP                   | no                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 11 | List of competencies of the educational program: | <p>KK1.Communication</p> <ul style="list-style-type: none"> <li>- Fluent monolingual oral, written and communication skills</li> <li>- The ability to use communicative communication in various situations</li> </ul> <p>KK 2. Basic literacy in natural science disciplines - basic understanding of the scientific picture of the world with an understanding of the essence of the basic laws of science</p> <p>KK3.General engineering competencies</p> <ul style="list-style-type: none"> <li>- basic general engineering skills and knowledge, the ability to solve general engineering tasks and problems</li> </ul> <p>KK4.Professional competencies</p> <ul style="list-style-type: none"> <li>- a wide range of theoretical and practical knowledge in the professional field;</li> <li>- the ability to carry out the technological process in accordance with the regulations and use technical means to measure the main parameters of the technological process, the composition and properties of raw materials and finished products;</li> </ul> <p>KK5. Engineering and computer competencies</p> <ul style="list-style-type: none"> <li>- basic skills of using computer programs and software systems to solve general engineering tasks</li> </ul> <p>KK6.Engineering and working competencies</p> <ul style="list-style-type: none"> <li>- skills and abilities of using technical means and experimental devices to solve general engineering tasks</li> </ul> <p>KK7. Socio-economic competencies</p> <ul style="list-style-type: none"> <li>- Critical understanding and cognitive ability to reason on contemporary social and economic issues</li> </ul> <p>KK8. Specially-professional competencies for the perception of information, setting goals and choosing ways to achieve it;</p> <ul style="list-style-type: none"> <li>- the ability to independently organize the work of performers, find and make management decisions in the field of labor organization and implementation of environmental measures;</li> <li>- knowledge of the principles of management, control and correction of activities in the context of teamwork, improving managerial and executive professionalism.</li> </ul> |
| 12 | Learning outcomes of the educational program:    | <p>PO1. Carry out technological processes for the production and processing of polymers of various levels of complexity, operation of equipment and ensuring their safe functioning, analysing the production performance of the enterprise and the condition of oil products processing facilities with the issuance of recommendations to improve these data ;</p> <p>PO2. Understanding the impact of engineering decisions in global, economic, environmental, and social contexts, demonstrating a</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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|----|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                           | <p>responsible attitude towards sustainable development, adhering to ethical standards, analyzing trends of societal development, and navigating appropriately in diverse social situations.;</p> <p>PO3. Formation of the ability to independently and in practice apply new knowledge and skills with the help of information technologies, including in new areas of knowledge not directly related to the field of activity, process information using modern programs and databases to calculate technological parameters of tools used in the use of modern information technologies, obtaining polymers and monitoring the natural environment ;</p> <p>PO4.Solve various typical practical tasks requiring independent analysis of working situations: control of the main technological process in the area of their professional activity of various levels of complexity ;</p> <p>PO5.Formulate basic laws of natural science disciplines and methods of mathematical analysis and modelling when solving problems in the field of polymer production and processing technology and industry, ability to find solutions to general technical problems;</p> <p>PO6. Apply knowledge of modern trends in the development of the industry in production and technological, design, research and organizational and management activities</p> <p>PO7. Select and justify a rational technological scheme for the production of polymers, elastomers, paints and varnishes, taking into account economic and environmental factors.</p> |
| 13 | Form of training          | Full-time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 14 | Duration of training      | 4 years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 15 | Volume of loans           | 240                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 16 | Languages of instruction  | Kazakh, Russian, English                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 17 | Academic degree awarded   | Bachelor of Engineering and Technology in Engineering and Engineering                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 18 | Developer(s) and authors: | Mangazbayeva R.A.,Kerimkulova A.Zh,Narmuratova Z.B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

#### 4.2. The relationship between the achievability of the formed learning outcomes according to the educational program and academic disciplines

| №                                      | Name of the discipline                     | Brief description of the discipline                                                                                                                                                                                                                                                                                                                                                                                                                         | Num<br>ber of<br>credits | Generated learning outcomes (codes) |         |         |         |         |         |         |
|----------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------------------|---------|---------|---------|---------|---------|---------|
|                                        |                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                          | PO<br>1                             | PO<br>2 | PO<br>3 | PO<br>4 | PO<br>5 | PO<br>6 | PO<br>7 |
| Cycle of general education disciplines |                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                          |                                     |         |         |         |         |         |         |
| Required component                     |                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                          |                                     |         |         |         |         |         |         |
| 1                                      | Foreign language                           | English is a discipline of the general education cycle. After determining the level (according to the results of diagnostic testing or IELTS results), students are divided into groups and disciplines. The name of the discipline corresponds to the level of English proficiency.<br>During the transition from level to level, the prerequisites and post-prerequisites of discipline are observed.                                                     | 10                       | v                                   |         |         |         |         |         |         |
| 2                                      | Kazakh (Russian) language                  | The socio-political, socio-cultural spheres of communication and functional styles of the modern Kazakh (Russian) language are considered. The course highlights the specifics of scientific style in order to develop and activate professional and communicative skills and abilities of students, allows students to practically master the basics of scientific style and develops the ability to perform structural and semantic analysis of the text. | 10                       | v                                   |         |         |         |         |         |         |
| 3                                      | Physical culture                           | The purpose of the discipline is to master the forms and methods of forming a healthy lifestyle within the framework of the professional education system. Familiarization with the natural-scientific basics of physical education, knowledge of modern health-improving technologies, basic methods of independent physical education and sports. As part of the course, the student will master the rules of judging in all sports.                      | 2                        |                                     |         |         |         |         |         |         |
| 4                                      | Information and communication technologies | Required component. The task of studying the discipline is to acquire theoretical knowledge about information processes, about new information technologies, local and global computer networks, methods of information protection; to acquire skills                                                                                                                                                                                                       | 5                        |                                     |         |         |         | v       |         |         |



|   |                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |   |   |  |  |  |  |   |
|---|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|--|--|--|--|---|
|   |                                                                    | in using text editors and tabular processors; to create databases and various categories of application programs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |   |   |  |  |  |  |   |
| 5 | Modern history of Kazakhstan                                       | The course studies historical events, phenomena, facts, processes that took place on the territory of Kazakhstan from ancient times to the present day. The sections of the discipline include: the steppe empire of the Turks; early feudal states on the territory of Kazakhstan; Kazakhstan during the Mongol conquest (XIII century), medieval states in the XIV-XV centuries. The epoch of the Kazakh Khanate XV-XVIII centuries. Kazakhstan as part of the Russian Empire, Kazakhstan during the Great Patriotic War, during the formation of independence and at the present stage.                                        | 5 |   | v |  |  |  |  | v |
| 6 | Philosophy                                                         | Philosophy forms and develops critical and creative thinking, worldview and culture, provides knowledge about the most general and fundamental problems of existence and gives them a methodology for solving various theoretical and practical issues. Philosophy expands the horizon of vision of the modern world, forms citizenship and patriotism, promotes self-esteem, awareness of the value of human existence. It teaches how to think and act correctly, develops practical and cognitive skills, helps to search and find ways and means of living in harmony with oneself, society, and the world around us.         | 5 |   |   |  |  |  |  | v |
| 7 | Module of socio-political knowledge (sociology, political science) | The study of the course contributes to the formation of students' theoretical knowledge about society as an integral system, provides the political aspect of training a highly qualified specialist on the basis of modern world and domestic political thought. The discipline is designed to improve the quality of both general humanitarian and professional training of students. Knowledge in the field of sociology and political science is necessary to understand political processes, to form a political culture, to develop a personal position and a clearer understanding of the measure of one's responsibility. | 3 | v |   |  |  |  |  |   |
| 8 | Module of socio-political knowledge (cultural studies, psychology) | The module of socio-political knowledge (cultural studies, psychology) is designed to familiarize students with the cultural achievements of mankind, to understand and assimilate the basic forms and universal patterns of formation                                                                                                                                                                                                                                                                                                                                                                                            | 3 |   | v |  |  |  |  |   |

|                                                                           |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |   |   |   |  |  |  |   |  |
|---------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|--|--|--|---|--|
|                                                                           |                                                | and development of culture. During the course of cultural studies, general problems of the theory of culture, leading cultural concepts, universal patterns and mechanisms of formation and development of culture, the main historical stages of the formation and development of Kazakh culture are considered.<br>The regularities of the emergence, development and functioning of mental processes, states, properties of a person engaged in a particular activity, the regularities of the development and functioning of the psyche as a special form of vital activity are also studied.                                                                            |   |   |   |  |  |  |   |  |
| <b>Cycle of general education subjects</b><br><b>Selectable component</b> |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |   |   |   |  |  |  |   |  |
| 9                                                                         | Law basics                                     | The purpose of the study: To attain knowledge in legal sphere in order to use them effectively in engineering activity; To make students know about efficient management of a work collective basing on legal mechanisms. Short content: the course allows students to get knowledge about specified directions of law, to organize information about subject and object of legal relations, about the main institutes and functions of legal directions. Expected results: After the course studying students should know, how to use legal norms in particular situations, how to make necessary documents and how to use special legal measures to restore broken rights. | 5 |   | v |  |  |  |   |  |
| 10                                                                        | Basics of Financial Literacy                   | Purpose: formation of financial literacy of students on the basis of building a direct link between the acquired knowledge and their practical application. Contents: using in practice all kinds of tools in the field of financial management, saving and increasing savings, competent budget planning, obtaining practical skills in calculating, paying taxes and correctly filling out tax reports, analyzing financial information, orienting in financial products to choose adequate investment strategies.                                                                                                                                                         | 5 | v |   |  |  |  | v |  |
| 11                                                                        | Fundamentals of economics and entrepreneurship | Purpose: To develop basic knowledge of economic processes and skills in entrepreneurial activities. Content: The course aims to develop skills in analyzing economic concepts such as supply and demand, and market equilibrium. It includes the                                                                                                                                                                                                                                                                                                                                                                                                                             | 5 |   | v |  |  |  | v |  |

|                                                            |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |   |   |  |   |   |   |   |  |
|------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|--|---|---|---|---|--|
|                                                            |                                   | basics of creating and managing a business, developing business plans, risk assessment, and strategic decision-making.                                                                                                                                                                                                                                                                                                                                                                                                                       |   |   |  |   |   |   |   |  |
| <b>Cycle of basic disciplines<br/>University component</b> |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |   |   |  |   |   |   |   |  |
| 12                                                         | Mathematics I                     | Purpose: to introduce students to the fundamental concepts of linear algebra, analytical geometry and mathematical analysis. To form the ability to solve typical and applied problems of the discipline. Contents_ Elements of linear algebra, vector algebra and analytical geometry. Introduction to the analysis. Differential calculus of a function of one variable. The study of functions using derivatives. Functions of several variables. Partial derivatives. The extremum of a function of two variables.                       | 5 | v |  |   |   | v | v |  |
| 13                                                         | Physics                           | Purpose: To form ideas about the modern physical picture of the world and scientific worldview, the ability to use knowledge of fundamental laws, theories of classical and modern physics. Contents_ physical fundamentals of mechanics, fundamentals of molecular physics and thermodynamics, electricity and magnetism, vibrations and waves, optics and fundamentals of quantum physics.                                                                                                                                                 | 5 |   |  |   |   | v |   |  |
| 14                                                         | Mathematics II                    | Purpose: To teach students integration methods. To teach you how to choose the right method for finding the primitive. To teach how to apply a certain integral to solve practical problems. Contents_ integral calculus of the function of one and two variables, series theory. Indefinite integrals, methods of their calculation. Certain integrals and applications of certain integrals. Improper integrals. Theory of numerical and functional series, Taylor and Maclaurin series, application of series to approximate calculations | 5 |   |  |   | v | v | v |  |
| 15                                                         | Engineering and computer graphics | Purpose: To develop students' knowledge of drawing construction and skills in developing graphical and textual design documentation in accordance with standards. Content: Students will study ESKD standards, graphic primitives, geometric constructions, methods and properties of orthogonal projection, Monge's projection, axonometric projections, metric tasks, types and features of connections, creating part                                                                                                                     | 5 | v |  | v |   |   | v |  |

|    |                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   |  |   |   |   |   |  |
|----|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|--|---|---|---|---|--|
|    |                                                                       | sketches and assembly drawings, detailing, and creating complex 3D solid objects in AutoCAD.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |   |  |   |   |   |   |  |
| 16 | Instrumental methods of analysis in polymer technology and processing | The purpose of studying the discipline: The formation of students' skills in the application of instrumental methods of polymer analysis, including those used in industry. Mastering the methods of technical analysis of polymer materials and products made from them. Methods of polymer research. Experimental standard methods: light, tunneling microscopy, AFM, SEM, TAM; IR, UV, fluorescence, RAMAN, NMR, EPR spectroscopy, calorimetry, DSC, TGA rheology, TMA, DMA                                                                                                                                                                                                                                                                                                | 5 | v |  | v |   | v |   |  |
| 17 | Introduction to specialty                                             | The purpose of the discipline is to acquaint students who have started studying at the university with the basic and basic provisions of the specialty and training program; the development of interest in the chosen profession, the formation of students' competence and understanding of the chosen field of study, initial professional knowledge about the physico-chemical fundamentals of organic matter technology; the formation of technological and environmental thinking among students. The basic initial concepts of chemical technology are considered: kinetic patterns of chemical transformations, types of reactors and equations of molar balances, technological indicators of processes, preparation of technological schemes of chemical processes. | 4 | v |  |   |   |   | v |  |
| 18 | Chemistry                                                             | Purpose: formation of knowledge on fundamental issues of general chemistry and skills of their application in professional activity. Summary Laws, theoretical propositions and conclusions that underlie chemical disciplines; properties and relationships of chemical elements based on the periodic law of D.I.Mendeleev and on modern ideas about the structure of matter; fundamentals of chemical thermodynamics and kinetics; processes in solutions; structure of complex compounds.                                                                                                                                                                                                                                                                                 | 5 |   |  |   |   | v | v |  |
| 19 | Organic Chemistry I                                                   | The purpose of the discipline is to master the complex of knowledge and scientific ideas about the fundamental theoretical and experimental foundations of organic chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 | v |  |   | v |   | v |  |

|    |                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |   |  |  |   |  |   |   |
|----|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|--|--|---|--|---|---|
|    |                                                      | of aliphatic compounds; in obtaining students' knowledge of the basic concepts of theoretical organic chemistry, mastering the skills to characterize the structure, physico-chemical properties of organic substances, as well as modern methods of synthesis of organic substances. The course forms the basis of chemical reactions and methods of synthesis of organic compounds for the most important branches of the chemical and biochemical industry                                                                                                                                                                     |   |   |  |  |   |  |   |   |
| 20 | Organic Chemistry II                                 | The aim of the course is to study the general patterns of organic reactions of cyclic compounds, such as cycloalkanes, aromatic hydrocarbons, and heterocyclic compounds. Each class of compounds is considered in terms of their chemical structure, isomerism and nomenclature, method of preparation, physical and chemical properties, and scope of their application. In the process of mastering this discipline, the student forms and demonstrates competencies that allow applying the acquired basic scientific and theoretical knowledge to solve scientific and practical problems.                                   | 5 | v |  |  | v |  | v |   |
| 21 | Physical and colloidal chemistry                     | The purpose of the course: the formation of students' scientific thinking, in particular, the correct understanding of the limits of applicability of various physical and chemical concepts, laws, theories. The course deals with chemical thermodynamics, the first law of thermodynamics, thermal effects, Hess' Law, Kirchhoff's equations, the second law of thermodynamics. Entropy. chemical balance. The doctrine of solutions. Phase equilibria. Electrochemistry. electrolyte solutions. Galvanic elements. Chemical kinetics and catalysis. surface phenomena. dispersed systems. Methods for obtaining and cleaning. | 5 | v |  |  | v |  |   |   |
| 22 | Fundamentals of chemistry and technology of monomers | The course is designed to study the method of obtaining and basic technological schemes for the synthesis of specific monomers, for the production of polyolefins as lower olefins (ethylene, propylene, isobutylene), halogen-containing monomers, styrene, acrylic monomers, esters and esters used for the further synthesis of various polymers and polymer materials based on them. An example of large-capacity                                                                                                                                                                                                             | 5 |   |  |  |   |  | v | v |

|    |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |   |  |   |   |   |   |  |
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|    |                                                          | production of expanded polystyrene is given. The issues of synthesis and production of polycondensation monomers for the production of esters, polyamides, phenol-, carbamide- and melamine-formaldehyde polymers, polyurethanes, polycarbonates are disclosed.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |   |  |   |   |   |   |  |
| 23 | Theoretical foundations of organic substances technology | The purpose of the discipline is for students to study modern trends in the creation of theoretical foundations of technology for processing oil, gas, coal, hydrocarbon raw materials, monomers for the synthesis of polymers and synthetic rubbers, synthetic detergents. The theoretical foundations of preparation and physical methods of separation of oil, gas, coal and products of their processing, various processes (thermdestructive, thermooxidative, catalytic) transformations of combustible minerals and products of their processing are considered, the theoretical foundations of polymer production, which are one of the main directions of application of organic substances, are touched upon. | 5 | v |  |   | v | v |   |  |
| 24 | CAD Chemical engineering I                               | The purpose of studying the discipline is to develop the ability to create effective and optimal technologies for various chemical processes using the modeling computer program CemKad. The issues considered in the course are the study of the laws of hydromechanical and heat exchange processes occurring in various systems, and the development of various calculation methods. The method of calculating chemical technology devices using a modeling program. The course-forms the student's ability to perform engineering and technological calculations using a computer modeling program, encourages the creation of various projects.                                                                    | 5 |   |  | v | v |   |   |  |
| 25 | Technology for the production of polymers                | The study of the course begins with the introduction of the concept of polymers and polymeric materials. Technological methods of carrying out polymerization processes of polymer synthesis are revealed. Students get acquainted with the principles of creating polymer composite materials. Then they study the production of specific polymerization monomers - unsaturated aliphatic hydrocarbons, their halogen derivatives and aromatic monomers. The characteristic of polyacrylate                                                                                                                                                                                                                            | 5 | v |  |   | v |   | v |  |

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|    |                                                        | production is given. Plastic masses based on polymers obtained by polycondensation reaction are considered. Polymers based on phenol and aldehydes. Production of polyesters. Properties and application of polyesters. Polyethylene terephthalate. Polycarbonates.                                                                                                                                                                                                                                                                                                                                                                                                                            |   |   |  |   |   |   |   |   |
| 26 | Basic processes and apparatus of chemical technology I | Study the regularities and mathematical description of the hydromechanical and heat exchange processes occurring in systems with several phases and several components and to develop methods for calculating equipment, choosing a rational design and determining the size of the apparatus. Classification of the main processes and devices of chemical technology. The method of calculating the devices. Equations of equilibrium of an ideal fluid. Equations of motion of ideal fluids. Separation of heterogeneous systems. The main regularities of the flow of hydromechanical and heat exchange processes, designs and principles of operation of devices used in these processes. | 5 |   |  | v | v |   | v |   |
| 27 | Technology of polymer processing                       | The purpose of the course is to teach students the basic methods of polymer processing and the influence of physical and mechanical properties of polymers on the choice of processing method. The most important industrial methods of processing of thermoplastics and thermosetting plastics, such as extrusion, calendaring, injection moulding, pressing, vacuum forming, stamping, etc. will be considered. In addition, the equipment used in these methods, parameters regulated during processing, types of defects in products, causes of their occurrence and methods of their elimination will be discussed.                                                                       | 5 | v |  |   | v |   | v |   |
| 28 | Chemistry and physics of polymers                      | The purpose of the discipline is to study by students the main directions of modern development of chemistry and physics of polymers, their use and various sectors of the economy. General concepts and terminology in the field of polymers. Regularities of the chain and step mechanism of polymer synthesis. Chemical modification of polymers. Molecular and supramolecular structure of polymers. Deformation properties of polymers. Thermomechanical method of polymer research.                                                                                                                                                                                                      | 5 |   |  |   |   | v | v | v |

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|                                                            |                                                               | Features of polymer dissolution. In the process of mastering this discipline, students develop knowledge on the classification and terminology of polymers.                                                                                                                                                                                                                                                                                                                                                                            |   |   |  |   |   |   |  |   |  |
| 29                                                         | Basic processes and apparatus of chemical technology II       | The purpose of the discipline is to study the regularities and mathematical description of mass transfer processes occurring in systems with several phases and several components and the formation of knowledge and skills in the field of processes and devices of chemical technology and practical calculations of processes and devices. Mass transfer processes, calculation and selection of devices and structures; comparative analysis of the operation of devices, finding optimal conditions for technological processes. | 4 | v |  | v |   |   |  | v |  |
| 30                                                         | CAD Chemical Engineering II                                   | The purpose of the discipline is to study the modeling of chemical and technological processes using the AspenHysys modeling software package. The course studies the basic concepts of the modeling method, methods of constructing a technological scheme, characteristics of the technological scheme and flows, calculation of parameters of all flows and equipment. The course forms the ability to develop an optimal chemical process technology with a high-quality output of the target product                              | 5 | v |  |   |   |   |  | v |  |
| 31                                                         | Educational practice                                          | Passing an instruction on familiarization with the requirements of labor protection, safety, fire safety, and the rules of the internal labor regulations of the enterprise. Conducting a general tour of the enterprise, studying the structure. The stage of collecting, processing and analyzing technical or technological information on the technology being implemented.                                                                                                                                                        | 2 |   |  |   | v | v |  |   |  |
| <b>Cycle of basic disciplines<br/>Selectable component</b> |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |   |   |  |   |   |   |  |   |  |
| 32                                                         | Analytical chemistry and physico-chemical methods of analysis | The purpose of the course is to master the methods of analysis of organic substances and their application to solve problems in professional activity. The course discusses the principles and methods of determining the chemical composition of substances and their structure, including using physico-chemical research methods. Application of analytical methods                                                                                                                                                                 | 5 |   |  |   | v |   |  | v |  |



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|    |                                                                        | for product quality control in various industries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |   |   |   |   |   |   |   |  |
| 33 | Legal regulation of intellectual property                              | Purpose: the goal is to form a holistic understanding of the system of legal regulation of intellectual property, including basic principles, mechanisms for protecting intellectual property rights and features of their implementation. Content: The discipline covers the basics of IP law, including copyright, patents, trademarks, and industrial designs. Students learn how to protect and manage intellectual property rights, and consider legal disputes and methods for resolving them.                                                                                                        | 5 |   | v |   |   |   |   |  |
| 34 | General chemical technology                                            | The purpose of the course: to study the general patterns of chemical and technological processes (CTP) of the most important chemical industries. The course examines the patterns of chemical transformations in industrial production conditions; basic chemical equipment. Calculation of technical and economic indicators of the process, material and energy balances. Industrial catalysis. Basic mathematical models of chemical reactors. Methods of development of effective chemical-technological processes and systems, methods of energy and resource conservation, environmental protection. | 5 |   |   |   |   | v | v |  |
| 35 | General principles of chemical and technological processes             | The course is designed to get acquainted with the general laws of chemical technology, the most typical chemical-technological processes, reactors and chemical-technological systems. As a result, the course forms competencies that allow carrying out the technological process in accordance with the regulations and using technical means to control its main parameters of the technological process, the properties of raw materials and products                                                                                                                                                  | 5 | v |   |   | v |   |   |  |
| 36 | Fundamentals of sustainable development and ESG projects in Kazakhstan | Purpose: the goal is for students to master the theoretical foundations and practical skills in the field of sustainable development and ESG, as well as to develop an understanding of the role of these aspects in the modern economic and social development of Kazakhstan. Contents: introduces the principles of sustainable development and the implementation of ESG practices in Kazakhstan, includes the study of national and international standards, analysis of successful ESG                                                                                                                 | 5 |   | v | v |   |   |   |  |

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|    |                                         | projects and strategies for their implementation in enterprises and organizations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |   |   |  |   |   |   |  |
| 37 | Fundamentals of Artificial Intelligence | Purpose: to familiarize students with the basic concepts, methods and technologies in the field of artificial intelligence: machine learning, computer vision, natural language processing, etc. Contents: general definition of artificial intelligence, intelligent agents, information retrieval and state space exploration, logical agents, architecture of artificial intelligence systems, expert systems, observational learning, statistical learning methods, probabilistic processing of linguistic information, semantic models, natural language processing systems.                                              | 5 |   | v |  |   |   |   |  |
| 38 | Ecology and life safety                 | The discipline studies the main approaches to solving environmental problems; sources and types of environmental pollution by transport enterprises; methods of reducing harmful effects on the environment. Natural and man-made emergencies, their causes, methods of prevention and protection. Carrying out rescue and other urgent work, rules of behavior of people in emergency situations.                                                                                                                                                                                                                             | 5 | v | v |  |   |   | v |  |
| 39 | ESG principles in inclusive culture     | Purpose of the course: It focuses on studying ESG (Environmental, Social, Governance) principles and their interaction with the creation of an inclusive culture within an organization. Content: Students will gain knowledge on how implementing ESG principles contributes to corporate social responsibility, sustainable development, and equal opportunities for all employees, including those who may face various forms of discrimination. The course will help students understand the importance of an inclusive culture in achieving long-term business goals and ensuring sustainable organizational development. | 5 |   | v |  |   |   |   |  |
| 40 | Fundamentals of scientific research     | Purpose: to form students' research skills, to develop interest in scientific activity. Content: based on the course study, students will consider: - formation of practical skills in planning and performing scientific research; - development of skills of independent search, analysis and use of scientific information using software and hardware; - mastering the concepts of                                                                                                                                                                                                                                         | 5 |   |   |  | v | v |   |  |

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|    |                                                                 | sustainable development and ESG principles, with an emphasis on their application in the oil and gas sector of Kazakhstan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |   |   |   |  |   |   |  |
| 41 | Fundamentals of anti-corruption culture                         | The course introduces students to the improvement of socio-economic relations of the Kazakh society, the psychological characteristics of corrupt behavior. Special attention is paid to the formation of an anti-corruption culture, legal responsibility for acts of corruption in various fields. The purpose of studying the discipline "Fundamentals of anti-corruption culture and law" is to increase public and individual legal awareness and legal culture of students, as well as the formation of a knowledge system and a civic position on combating corruption as an antisocial phenomenon. Expected results: to realize the values of moral consciousness and follow moral norms in daily practice; to work on improving the level of moral and legal culture; to use spiritual and moral mechanisms to prevent corruption. | 5 |   | v | v |  | v |   |  |
| 42 | Automation of control systems                                   | Purpose: - to form the ability to develop, research and operate modern automated process control systems. As a result of training: understand the theory and practice of automated process control systems, learn the principles of building a technical base, mathematical and information support for automated process control systems, be able to apply the basic principles of preparing technological processes and industries for automation.                                                                                                                                                                                                                                                                                                                                                                                        | 6 | v |   | v |  |   | v |  |
| 43 | Automation of control systems in chemical engineering processes | Automation of control systems in chemical and technological processes. The purpose of studying the discipline is to acquire the knowledge necessary for effective use in the development of modern automatic control systems. Possession of sections of containers necessary for solving research and applied tasks. The course "ASUHTP" provides a presentation of the sections of the basics of TAR, measuring elements, functional circuits. The study of this discipline will allow the student to acquire the skills to choose the types of switching devices and regulators depending on the law of regulation, to develop a functional and mathematical model of the control system, to analyze the operation of the system based on qualitative                                                                                     | 6 | v |   | v |  | v |   |  |

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|                                                              |                                                    | indicators of regulation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |   |  |  |   |  |  |   |
| <b>Cycle of profile disciplines<br/>University component</b> |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |   |   |  |  |   |  |  |   |
| 44                                                           | Elastomers technology                              | The purpose of studying the discipline is to study the processing of elastomers and the creation of elastomeric materials and products. Information will be considered on the structure and properties of rubbers used as the polymer base of elastomeric materials, on the ingredients, as a rule, included in the elastomeric material, on the main technological processes for obtaining elastomeric materials and products - mixing, calendering, molding, vulcanization, injection molding and others, as well as on the technical and special properties of elastomeric materials widely used in various branches of technology, and environmental problems of the elastomer processing industry.                                                                                              | 4 | v |  |  | v |  |  | v |
| 45                                                           | Technology of organic and petrochemical production | The course examines the use of modern processes for obtaining organic products based on hydrocarbon raw materials: their specifics and technological features of the hardware design of the most important processes of the branch of basic organic and petrochemical synthesis and promising areas for their improvement, the assimilation of the principles of the organization of waste-free and low-waste production, as well as the directions of their improvement for the purpose of resource and energy conservation, increasing industrial and environmental efficiency. security. Basic knowledge and skills in the field of technological processes for obtaining organic and petrochemical synthesis products, as well as methods for optimizing production processes will be presented. | 4 | v |  |  | v |  |  | v |
| 46                                                           | Fundamentals of enterprise design                  | The purpose of the discipline is to study the structures, the principle of operation of basic and special equipment for chemical production, familiarization with its main components and details. At the end of the course, the student must know the basic principles of design and development of a feasibility study of production; parameters and modes of operation of                                                                                                                                                                                                                                                                                                                                                                                                                         | 5 | v |  |  | v |  |  | v |

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|                                                              |                                                            | standard equipment; typical processes of chemical technology, corresponding devices and methods of their calculation; requirements for the technical condition of equipment; methods of technological calculations of individual components and parts of chemical equipment.                                                                                                                                                                                                                                                           |   |   |   |  |   |  |  |   |
| 47                                                           | Equipment of polymer production and processing enterprises | The purpose of studying the discipline is: students receive professional training in the design of polymer production and processing enterprises, study of standard equipment used for the production of polymers and their processing into products, substantiation of methods of production of plastic products, consumer goods.                                                                                                                                                                                                     | 6 | v |   |  | v |  |  | v |
| 48                                                           | Recycling and recycling of polymer materials               | The purpose of the discipline is to form competencies that allow for a complex of economic, organizational, engineering and technical measures carried out in order to reduce the volume of formation and storage of waste in the polymer industry, as well as to obtain additional economic benefits from the recycling of polymers. The methods of polymer recycling to minimize anthropogenic impact on the environment, methods of their disposal, methods of analysis and control of waste and recycling products are considered. | 4 |   | v |  |   |  |  |   |
| 49                                                           | Production practice I                                      | The production practice I is of an introductory nature. During the internship, students will get acquainted with the work of the production enterprise, they will observe the production process.                                                                                                                                                                                                                                                                                                                                      | 2 |   |   |  | v |  |  | v |
| 50                                                           | Production practice II                                     | Goals and objectives of the practice:<br>1. To ensure the formation of professional knowledge, skills and abilities in the information and communication field.<br>2. To acquaint students with the methods of work and the specifics of the activities of specialists in the production process.<br>3. To demonstrate the relationship between theoretical courses taught in the learning process and practical activities.<br>4. Consolidate students' knowledge                                                                     | 3 |   |   |  | v |  |  | v |
| <b>Cycle of profile disciplines<br/>Selectable component</b> |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |   |   |   |  |   |  |  |   |

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| 51 | Polycondensation materials                                             | The purpose of the discipline is for students to study the basic provisions of polymer synthesis by polycondensation. Methods for the production of synthetic polymers. Structure and classification of polycondensation polymers. The main types of polycondensation reactions, their conditions and mechanism. Monomers for polycondensation resins. Functionality of monomers. Cyclization as a competing reaction. Kinetics and MMR in polycondensation. Patterns of reversible and irreversible polycondensation. Methods of polycondensation. PC regularities in the melt, in solution, technological features. Emulsion polycondensation. Interphase polycondensation and its varieties. | 5 | v |  |  | v |   | v |   |
| 52 | Production of hydrocarbon raw materials for the petrochemical industry | The purpose of studying the discipline: The formation of students' system knowledge on the theoretical foundations and technology of production of hydrocarbon raw materials for the petrochemical industry. In the course of studying the discipline, the student must: -know the chemistry and mechanism of thermal and catalytic transformations of oil and gas components; - to know the physico-chemical properties of hydrocarbons and other oil components and their influence on the properties of petroleum products, - to know the principles of constructing technological schemes and designing technological processes of the petrochemical industry.                              | 5 |   |  |  |   |   |   |   |
| 53 | Reactivity of monomers in polymerization reactions                     | The course is designed to study the method of obtaining and basic technological schemes for the synthesis of a number of monomers for the production of synthetic rubbers. Examples of large-scale production of diene monomers and styrene are given. The issues of synthesis and production of polycondensation monomers for the production of esters, polyamides, phenol-, carbamide- and melamine-formaldehyde polymers, polyurethanes, polycarbonates are disclosed.                                                                                                                                                                                                                       | 6 |   |  |  |   |   |   | v |
| 54 | Biopolymers and Biomaterials                                           | The aim of the course is to study materials from proteins, DNA and carbohydrates to natural and synthetic materials designed to interact with biological systems for medical purposes. The course also studies the synthesis, assembly and functions of various biomolecules, information on how these molecules                                                                                                                                                                                                                                                                                                                                                                                | 5 | v |  |  | v | v |   |   |

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|    |                                                          | interact with other natural and synthetic materials, biocompatibility, polymer-based implants, biosensors, drug delivery, magnetic materials and medical devices.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |   |  |  |  |  |  |   |
| 55 | Gaschemistry                                             | The purpose of the discipline is to form the competence of the student in the field of natural and associated gas processing technology. In the course of studying the discipline, the student must: - know the importance of natural gases in the economy and energy, the composition of hydrocarbon gases, their physical and chemical properties, the current state and prospects for the development of the gas processing industry in Kazakhstan and the world; -be able to assess the technical and economic efficiency of the technology and possess the skills to determine the technical characteristics of devices and equipment; | 5 | v |  |  |  |  |  | v |
| 56 | Chemical reactors                                        | Fundamentals of the theory of chemical reactors. Classification of chemical reactors according to various criteria. Qualitative and quantitative criteria for evaluating the effectiveness of a chemical process in a reactor. Reactor of ideal (full) mixing and reactor of ideal (complete) displacement. Characteristic and design equations. Mathematical model of an ideal mixing reactor of periodic and continuous action. Mathematical model of a continuous-flow plug-flow reactor. Types of chemical reactor designs widely used in the technology of main production.                                                            | 5 | v |  |  |  |  |  |   |
| 57 | Chemistry and technology of paints and coatings          | The purpose of teaching the discipline is to form students' basic theoretical knowledge and practical skills in chemistry and technology of film-forming polymers and coatings. The features of safety, labor protection and environmental protection in the production of synthetic and processing of natural film-forming substances are considered. The acquired knowledge allows students to perceive the impact of engineering solutions in a global, economic, natural and social context;                                                                                                                                            | 5 | v |  |  |  |  |  | v |
| 58 | Economic aspects of the technology of organic substances | The purpose of the discipline is to form a set of students' knowledge about the methods of conducting production processes, scientific thinking about understanding the logical connection between the chemical structure and reactivity of                                                                                                                                                                                                                                                                                                                                                                                                 | 5 |   |  |  |  |  |  | v |

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|    |                                                     | organic compounds, the processes of their processing, leading to a radical change in their properties. Creation of the basics of theoretical training for students to solve practical problems in the field of basic organic and petrochemical production.                                                                                                                                                                                                                                                                                              |   |   |  |  |   |  |   |   |
| 59 | Technical analysis of polymers and polymer products | The purpose of the discipline: Formation of students' deep knowledge in the field of analysis of polymers and polymer products. Mastering the methods of technical analysis of polymer materials and products made of them. Acquisition of skills in the organization and management of technological process, conducting technological and calculation of chemical analyses; ability to work with regulatory and technical documents.                                                                                                                  | 5 | v |  |  | v |  |   | v |
| 60 | Monomer technology for synthetic rubber             | The course is designed to study the method of obtaining and basic technological schemes for the synthesis of a number of monomers for the production of synthetic rubbers. Examples of large-scale production of diene monomers and styrene are given. The issues of synthesis and production of polycondensation monomers for the production of esters, polyamides, phenol-, carbamide- and melamine-formaldehyde polymers, polyurethanes, polycarbonates are disclosed.                                                                               | 6 | v |  |  | v |  |   | v |
| 61 | Physical and mechanical testing of plastics         | The purpose of studying the discipline is to instill in students the skills of conducting physical and mechanical tests of plastics. Summary: Examines the physical and mechanical properties of plastics, standardization and certification of plastic testing methods, standard test methods, the relationship of loading conditions of polymers and products made of them with their mechanical behavior and mechanical properties. Methods of testing polymer materials. Mechanical tests. Strength, deformation and tensile modulus of elasticity. | 5 | v |  |  | v |  | v |   |
| 62 | Physico-chemical methods of analysis                | The course is designed to understand the principles of research and experimental work on modern analytical tools and practical use of the results and the data obtained. The purpose of the course is to teach students how to use FHMA to study the properties and composition of new organic materials and substances. Theoretical principles of methods, methods of computer processing of experimental results are described.                                                                                                                       | 5 | v |  |  | v |  |   | v |



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|    |                                               | Mass spectrometric methods. Electronic paramagnetic resonance (EPR) method. Nuclear magnetic resonance (NMR) method. Radiometric methods.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |   |  |  |  |   |   |   |
| 63 | Nanocomposites and nanomaterials              | The goal is to form the ability to understand the main classes of nanomaterials and nanotechnologies used in the production and processing of polymers. As a result of training: to understand the main classes of nanopolymers and their properties; to understand the basic technologies for obtaining modern nanopolymer materials; to understand the tasks and technologies for obtaining nanopolymers and nanocomposites; to be able to use search engine methods, research methods in the field of technology for the production and processing of nanopolymers and nanocomposites.                                                                                                                                                                                | 5 |   |  |  |  | v | v | v |
| 64 | Fundamentals of obtaining composite materials | The purpose of the study is to give an in-depth understanding of the principles of creating polymer composite materials (PCM) with an improved complex of physico-chemical properties. Formation of students' ability to understand the physico-chemical essence of the processes of obtaining PCM and use the basic theoretical patterns in complex production and technological activities. Classification of composite materials according to materials science, structural, technological and operational principles. Mastering this course allows you to expand your understanding of the principles of creating composite materials based on thermo- and reactoplasts, the theoretical foundations for choosing plastics to create products for a specific purpose | 5 | v |  |  |  |   |   | v |

## 5. Curriculum of the educational program



«APPROVED»  
Decision of the Academic Council  
NPJSC «KazNRTU»  
named after K.Satbayev»  
dated 06.03.2025 Minutes № 10

### WORKING CURRICULUM

Academic year 2025-2026 (Autumn, Spring)  
Group of educational programs B069 - "Production of materials (glass, paper, plastic, tree)"  
Educational program 6B07216 - "Technology of the production and processing of polymers"  
The awarded academic degree Bachelor of engineering and technology  
Form and duration of study full time - 4 years

| Discipline code                                                              | Name of disciplines                                                | Block | Cycle    | Total ECTS credits | Total hours | lek/lab/pr Contact hours | in hours SIS (including TSIS) | Form of control | Allocation of face-to-face training based on courses and semesters |       |          |       |          |       |          |       | Prerequisite |  |
|------------------------------------------------------------------------------|--------------------------------------------------------------------|-------|----------|--------------------|-------------|--------------------------|-------------------------------|-----------------|--------------------------------------------------------------------|-------|----------|-------|----------|-------|----------|-------|--------------|--|
|                                                                              |                                                                    |       |          |                    |             |                          |                               |                 | 1 course                                                           |       | 2 course |       | 3 course |       | 4 course |       |              |  |
|                                                                              |                                                                    |       |          |                    |             |                          |                               |                 | 1 sem                                                              | 2 sem | 3 sem    | 4 sem | 5 sem    | 6 sem | 7 sem    | 8 sem |              |  |
| CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)                                 |                                                                    |       |          |                    |             |                          |                               |                 |                                                                    |       |          |       |          |       |          |       |              |  |
| M-1. Module of language training                                             |                                                                    |       |          |                    |             |                          |                               |                 |                                                                    |       |          |       |          |       |          |       |              |  |
| LNG108                                                                       | Foreign language                                                   |       | GED, RC  | 5                  | 150         | 0/0/45                   | 105                           | E               | 5                                                                  |       |          |       |          |       |          |       |              |  |
| LNG104                                                                       | Kazakh (russian) language                                          |       | GED, RC  | 5                  | 150         | 0/0/45                   | 105                           | E               | 5                                                                  |       |          |       |          |       |          |       |              |  |
| LNG108                                                                       | Foreign language                                                   |       | GED, RC  | 5                  | 150         | 0/0/45                   | 105                           | E               |                                                                    | 5     |          |       |          |       |          |       |              |  |
| LNG104                                                                       | Kazakh (russian) language                                          |       | GED, RC  | 5                  | 150         | 0/0/45                   | 105                           | E               |                                                                    | 5     |          |       |          |       |          |       |              |  |
| M-2. Module of physical training                                             |                                                                    |       |          |                    |             |                          |                               |                 |                                                                    |       |          |       |          |       |          |       |              |  |
| KFK101                                                                       | Physical culture I                                                 |       | GED, RC  | 2                  | 60          | 0/0/30                   | 30                            | E               | 2                                                                  |       |          |       |          |       |          |       |              |  |
| KFK102                                                                       | Physical culture II                                                |       | GED, RC  | 2                  | 60          | 0/0/30                   | 30                            | E               |                                                                    | 2     |          |       |          |       |          |       |              |  |
| KFK103                                                                       | Physical culture III                                               |       | GED, RC  | 2                  | 60          | 0/0/30                   | 30                            | E               |                                                                    |       | 2        |       |          |       |          |       |              |  |
| KFK104                                                                       | Physical culture IV                                                |       | GED, RC  | 2                  | 60          | 0/0/30                   | 30                            | E               |                                                                    |       |          | 2     |          |       |          |       |              |  |
| M-3. Module of information technology                                        |                                                                    |       |          |                    |             |                          |                               |                 |                                                                    |       |          |       |          |       |          |       |              |  |
| CSE677                                                                       | Information and communication technology                           |       | GED, RC  | 5                  | 150         | 30/15/0                  | 105                           | E               |                                                                    |       | 5        |       |          |       |          |       |              |  |
| M-4. Socio-cultural development module                                       |                                                                    |       |          |                    |             |                          |                               |                 |                                                                    |       |          |       |          |       |          |       |              |  |
| HUM137                                                                       | History of Kazakhstan                                              |       | GED, RC  | 5                  | 150         | 15/0/30                  | 105                           | GE              |                                                                    | 5     |          |       |          |       |          |       |              |  |
| HUM134                                                                       | Module of socio-political knowledge (cultural studies, psychology) |       | GED, RC  | 5                  | 150         | 30/0/15                  | 105                           | E               |                                                                    |       | 5        |       |          |       |          |       |              |  |
| HUM132                                                                       | Philosophy                                                         |       | GED, RC  | 5                  | 150         | 15/0/30                  | 105                           | E               |                                                                    |       |          | 5     |          |       |          |       |              |  |
| HUM120                                                                       | Module of socio-political knowledge (sociology, political science) |       | GED, RC  | 3                  | 90          | 15/0/15                  | 60                            | E               |                                                                    |       |          | 3     |          |       |          |       |              |  |
| M-5. Module on the basis of anti-corruption culture, ecology and life safety |                                                                    |       |          |                    |             |                          |                               |                 |                                                                    |       |          |       |          |       |          |       |              |  |
| MNG489                                                                       | Fundamentals of economics and entrepreneurship                     | 1     | GED, CCH | 5                  | 150         | 30/0/15                  | 105                           | E               |                                                                    |       |          | 5     |          |       |          |       |              |  |
| MNG564                                                                       | Basics of Financial Literacy                                       | 1     | GED, CCH | 5                  | 150         | 30/0/15                  | 105                           | E               |                                                                    |       |          | 5     |          |       |          |       |              |  |
| HUM159                                                                       | Law basics                                                         | 1     | GED, CCH | 5                  | 150         | 30/0/15                  | 105                           | E               |                                                                    |       |          | 5     |          |       |          |       |              |  |
| CYCLE OF BASIC DISCIPLINES (BD)                                              |                                                                    |       |          |                    |             |                          |                               |                 |                                                                    |       |          |       |          |       |          |       |              |  |
| M-6. Module of physical and mathematical training                            |                                                                    |       |          |                    |             |                          |                               |                 |                                                                    |       |          |       |          |       |          |       |              |  |
| MAT101                                                                       | Mathematics I                                                      |       | BD, UC   | 5                  | 150         | 15/0/30                  | 105                           | E               | 5                                                                  |       |          |       |          |       |          |       |              |  |
| PHY468                                                                       | Physics                                                            |       | BD, UC   | 5                  | 150         | 15/15/15                 | 105                           | E               | 5                                                                  |       |          |       |          |       |          |       |              |  |
| MAT102                                                                       | Mathematics II                                                     |       | BD, UC   | 5                  | 150         | 15/0/30                  | 105                           | E               |                                                                    | 5     |          |       |          |       |          |       | MAT101       |  |
| M-7. Module of basic training                                                |                                                                    |       |          |                    |             |                          |                               |                 |                                                                    |       |          |       |          |       |          |       |              |  |
| CHE692                                                                       | Introduction to speciality                                         |       | BD, UC   | 4                  | 120         | 30/0/15                  | 75                            | E               | 4                                                                  |       |          |       |          |       |          |       |              |  |

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|        |                                                                        |   |         |   |     |          |     |   |   |   |   |   |   |   |  |  |  |
|--------|------------------------------------------------------------------------|---|---------|---|-----|----------|-----|---|---|---|---|---|---|---|--|--|--|
| GEN429 | Engineering and computer graphics                                      |   | BD, UC  | 5 | 150 | 15/0/30  | 105 | E | 5 |   |   |   |   |   |  |  |  |
| CHE495 | Chemistry                                                              |   | BD, UC  | 5 | 150 | 15/30/0  | 105 | E |   | 5 |   |   |   |   |  |  |  |
| AAP173 | Practical training                                                     |   | BD, UC  | 2 |     |          |     | R |   | 2 |   |   |   |   |  |  |  |
| CHE665 | Organic Chemistry I                                                    |   | BD, UC  | 6 | 180 | 30/15/15 | 120 | E |   |   | 6 |   |   |   |  |  |  |
| CHE869 | Physical and colloidal chemistry                                       |   | BD, UC  | 5 | 150 | 15/15/15 | 105 | E |   |   | 5 |   |   |   |  |  |  |
| HB1126 | Analytical chemistry and physico-chemical methods of analysis          | 1 | BD, CCH | 5 | 150 | 15/15/15 | 105 | E |   |   | 5 |   |   |   |  |  |  |
| MNG562 | Legal regulation of intellectual property                              | 1 | BD, CCH | 5 | 150 | 30/0/15  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| CHE639 | Organic chemistry II                                                   |   | BD, UC  | 5 | 150 | 15/15/15 | 105 | E |   |   | 5 |   |   |   |  |  |  |
| CHE649 | Fundamentals of Chemistry and Monomer Technology                       |   | BD, UC  | 5 | 150 | 30/0/15  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| CHE570 | General chemical technology                                            | 1 | BD, CCH | 5 | 150 | 30/15/0  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| CHE682 | General principles of chemical and technological processes             | 1 | BD, CCH | 5 | 150 | 30/0/15  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| MNG563 | Fundamentals of sustainable development and ESG projects in Kazakhstan | 1 | BD, CCH | 5 | 150 | 30/0/15  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| CSE880 | Fundamentals of Artificial Intelligence                                | 1 | BD, CCH | 5 | 150 | 30/0/15  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| IDD427 | Ecology and life safety                                                | 1 | BD, CCH | 5 | 150 | 30/0/15  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| CHE950 | ESG principles in inclusive culture                                    | 1 | BD, CCH | 5 | 150 | 30/0/15  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| HUM158 | The basics of anti-corruption culture                                  | 1 | BD, CCH | 5 | 150 | 30/0/15  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| PET525 | Fundamentals of scientific research                                    | 1 | BD, CCH | 5 | 150 | 30/0/15  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| CHE637 | Theoretical foundations of organic substances technology               |   | BD, UC  | 5 | 150 | 30/0/15  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| CHE652 | Chemistry and Physics of Polymers                                      |   | BD, UC  | 5 | 150 | 30/15/0  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| CHE816 | Basic processes and apparatus of chemical technology I                 |   | BD, UC  | 5 | 150 | 30/0/15  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| CHE695 | CAD Chemical engineering I                                             |   | BD, UC  | 5 | 150 | 0/15/30  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| CHE818 | Technology for the production of polymers                              |   | BD, UC  | 5 | 150 | 30/0/15  | 105 | E |   |   | 5 |   |   |   |  |  |  |
| HB1131 | Instrumental methods of analysis in polymer technology and processing  |   | BD, UC  | 5 | 150 | 15/15/15 | 105 | E |   |   | 5 |   |   |   |  |  |  |
| CHE699 | CAD Chemical Engineering II                                            |   | BD, UC  | 5 | 150 | 0/15/30  | 105 | E |   |   |   | 5 |   |   |  |  |  |
| CHE817 | Basic processes and apparatus of chemical technology II                |   | BD, UC  | 4 | 120 | 30/0/15  | 75  | E |   |   |   | 4 |   |   |  |  |  |
| HB1138 | Technology of polymer processing                                       |   | BD, UC  | 5 | 150 | 30/0/15  | 105 | E |   |   |   | 5 |   |   |  |  |  |
| AUT434 | Automation of control systems in chemical engineering processes        | 1 | BD, CCH | 6 | 180 | 30/15/15 | 120 | E |   |   |   |   | 6 |   |  |  |  |
| AUT435 | Automation of control systems                                          | 1 | BD, CCH | 6 | 180 | 30/15/15 | 120 | E |   |   |   |   |   | 6 |  |  |  |

**CYCLE OF PROFILE DISCIPLINES (PD)**

**M-7. Module of basic training**

|        |                       |  |        |   |  |  |  |   |  |  |   |  |  |  |  |  |  |
|--------|-----------------------|--|--------|---|--|--|--|---|--|--|---|--|--|--|--|--|--|
| AAP102 | Production practice I |  | PD, UC | 2 |  |  |  | R |  |  | 2 |  |  |  |  |  |  |
|--------|-----------------------|--|--------|---|--|--|--|---|--|--|---|--|--|--|--|--|--|

**M-8. Module of professional activity**

|        |                                                               |   |         |   |     |         |     |   |  |  |  |  |   |   |   |  |  |
|--------|---------------------------------------------------------------|---|---------|---|-----|---------|-----|---|--|--|--|--|---|---|---|--|--|
| HB1132 | Elastomers technology                                         |   | PD, UC  | 4 | 120 | 30/0/15 | 75  | E |  |  |  |  | 4 |   |   |  |  |
| CHE560 | Fundamentals of enterprise design                             |   | PD, UC  | 5 | 150 | 30/0/15 | 105 | E |  |  |  |  | 5 |   |   |  |  |
| CHE680 | Technology of organic and petrochemical production            |   | PD, UC  | 4 | 120 | 30/0/15 | 90  | E |  |  |  |  | 4 |   |   |  |  |
| AAP183 | Production practice II                                        |   | PD, UC  | 3 |     |         |     | R |  |  |  |  | 3 |   |   |  |  |
| HB1133 | Equipment for polymer production and processing enterprises   |   | PD, UC  | 6 | 180 | 30/0/30 | 120 | E |  |  |  |  |   | 6 |   |  |  |
| HB1139 | Economic aspects of the technology of organic substances      | 1 | PD, CCH | 5 | 150 | 30/0/15 | 105 | E |  |  |  |  |   | 5 |   |  |  |
| CHE874 | Chemistry and technology of paints and varnishes and coatings | 1 | PD, CCH | 5 | 150 | 30/0/15 | 105 | E |  |  |  |  |   | 5 |   |  |  |
| CHE875 | Technical analysis of polymers and polymer products           | 2 | PD, CCH | 5 | 150 | 30/0/15 | 105 | E |  |  |  |  |   | 5 |   |  |  |
| CHE876 | Physical and mechanical testing of plastics                   | 2 | PD, CCH | 5 | 150 | 30/0/15 | 105 | E |  |  |  |  |   | 5 |   |  |  |
| HB1128 | Monomer technology for synthetic rubber                       | 3 | PD, CCH | 6 | 180 | 30/0/30 | 120 | E |  |  |  |  |   |   | 6 |  |  |
| HB1129 | Reactivity of monomers in polymerization reactions            | 3 | PD, CCH | 6 | 180 | 30/0/30 | 120 | E |  |  |  |  |   |   | 6 |  |  |
| HB1130 | Chemical reactors                                             | 4 | PD, CCH | 5 | 150 | 30/0/15 | 105 | E |  |  |  |  |   |   | 5 |  |  |

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|------------------------------------------|------------------------------------------------------------------------|---|------------|---|-----|---------|-----|---|--|----|----|----|----|----|----|----|----|
| CHE893                                   | Physico-chemical methods of analysis                                   | 4 | PD,<br>CCH | 5 | 150 | 30/15/0 | 105 | E |  |    |    |    |    |    |    | 5  |    |
| HBI134                                   | Recycling and recycling of polymer materials                           |   | PD, UC     | 4 | 120 | 30/0/15 | 75  | E |  |    |    |    |    |    |    | 4  |    |
| HBI135                                   | Polycondensation materials                                             | 1 | PD,<br>CCH | 5 | 150 | 30/0/15 | 105 | E |  |    |    |    |    |    |    | 5  |    |
| HBI136                                   | Biopolymers and Biomaterials                                           | 1 | PD,<br>CCH | 5 | 150 | 30/0/15 | 105 | E |  |    |    |    |    |    |    | 5  |    |
| CHE823                                   | Fundamentals of obtaining composite materials                          | 2 | PD,<br>CCH | 5 | 150 | 30/0/15 | 105 | E |  |    |    |    |    |    |    | 5  |    |
| CHE825                                   | Nanocomposites and Nanomaterials                                       | 2 | PD,<br>CCH | 5 | 150 | 30/0/15 | 105 | E |  |    |    |    |    |    |    | 5  |    |
| CHE146                                   | Gaschemistry                                                           | 3 | PD,<br>CCH | 5 | 150 | 30/0/15 | 105 | E |  |    |    |    |    |    |    | 5  |    |
| CHE462                                   | Production of hydrocarbon raw materials for the petrochemical industry | 3 | PD,<br>CCH | 5 | 150 | 30/0/15 | 105 | E |  |    |    |    |    |    |    | 5  |    |
| <b>M-9. Final certification module</b>   |                                                                        |   |            |   |     |         |     |   |  |    |    |    |    |    |    |    |    |
| ECA103                                   | Final examination                                                      |   | FA         | 8 |     |         |     |   |  |    |    |    |    |    |    | 8  |    |
| <b>Additional type of training (ATT)</b> |                                                                        |   |            |   |     |         |     |   |  |    |    |    |    |    |    |    |    |
| AAP500                                   | Military training                                                      |   |            |   |     |         |     |   |  |    |    |    |    |    |    |    |    |
| <b>Total based on UNIVERSITY:</b>        |                                                                        |   |            |   |     |         |     |   |  | 31 | 29 | 28 | 32 | 30 | 30 | 33 | 27 |
|                                          |                                                                        |   |            |   |     |         |     |   |  | 60 |    | 60 |    | 60 |    | 60 |    |

| <b>Number of credits for the entire period of study</b> |                                        |                         |                           |                           |  |            |
|---------------------------------------------------------|----------------------------------------|-------------------------|---------------------------|---------------------------|--|------------|
| Cycle code                                              | Cycles of disciplines                  | Credits                 |                           |                           |  | Total      |
|                                                         |                                        | Required component (RC) | University component (UC) | Component of choice (CCH) |  |            |
| GED                                                     | Cycle of general education disciplines | 51                      | 0                         | 5                         |  | 56         |
| BD                                                      | Cycle of basic disciplines             | 0                       | 96                        | 16                        |  | 112        |
| PD                                                      | Cycle of profile disciplines           | 0                       | 28                        | 36                        |  | 64         |
| <b>Total for theoretical training:</b>                  |                                        | <b>51</b>               | <b>124</b>                | <b>57</b>                 |  | <b>232</b> |
| FA                                                      | Final attestation                      |                         |                           |                           |  | 8          |
| <b>TOTAL:</b>                                           |                                        |                         |                           |                           |  | <b>240</b> |

**Decision of the Educational and Methodological Council of KazNRTU named after K.Satpayev. Minutes № 3 dated 20.12.2024**

**Decision of the Academic Council of the Institute. Minutes № 3 dated 28.11.2024**

**Signed:**

Governing Board member - Vice-Rector for Academic Affairs

Uskenbayeva R. K.

**Approved:**

Vice Provost on academic development

Kalpeyeva Z. E.

Head of Department - Department of Educational Program Management and Academic-Methodological Work

Zhumagaliyeva A. S.

Director - Geology and Oil-gas Business Institute named after K. Turyssov

Auyelkhan Y. .

Department Chair - Chemical and biochemical engineering

Mangazbayeva R. A.

Representative of the Academic Committee from Employers

Seytenova G. Z.

\_\_\_\_ Acknowledged \_\_\_\_

