**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**
**NATIONAL TECHNICAL UNIVERSITY OF UKRAINE**
**"KYIV POLYTECHNICAL INSTITUTE**
**NAME AND MOURNING OF KORSKY »**

APPROVED
Academic Council of KPI. Igor Sikorsky
(Minutes № ___ from "___" _____ 2021)

Chairman of the Academic Council

_____ Mykhailo ILCHENKO

# CHEMICAL TECHNOLOGIES AND INORGANIC CERAMIC MATERIALS IN

# CHEMICAL TECHNOLOGIESOF INORGANIC CERAMIC MATERIALS

## EDUCATIONAL PROFESSIONAL PROGRAM of the

## first (bachelor's) level of higher education

**majoring in 161 Chemical Technology and Engineering**

**fields of knowledge 16 Chemical and bioengineering**

**qualification: Bachelor of Chemical Technology and Engineering**

Put into effect by Order of the
Rector of KPI. Igor Sikorsky
from _____2021 № _____

Kyiv - 2021

## DEVELOPED by the project team:

***Project team leader:*** **Kornilovich Boris Yurievich**, Head of the Department of Chemical Technology of Ceramics and Glass, Corresponding Member of the National Academy of Sciences of Ukraine,

doctor of chemical sciences, professor

***Project team members:***

**Saturday Irina Sergeevna**, Associate Professor, Candidate of Technical Sciences, Associate Professor of Chemical Technology of Ceramics and Glass

**Spasyonova Larysa Mykolayivna**, Associate Professor, Candidate of Chemical Sciences, Associate Professor of the Department of Chemical Technology of Ceramics and Glass

## AGREED:

Scientific and methodical commission of KPI named after Igor Sikorsky, majoring in 161 Chemical Technology and Engineering

Chairman of the NMCU _____ Olga SANGINOVA
(Minutes № 5 of "07" _ 01_ 2021)

Methodical council of KPI named after Igor Sikorsky
Chairman of the Methodical Council _____ Yuriy YAKYMENKO (Minutes № ___ from "____" _____ 202__)

## INCLUDED:

Institutions and organizations that provided feedback on the educational program: PJSC "Vetropak Gostomel Glass Plant", LLC "ATEM GROUP", Institute of Sorption and Endoecology of the National Academy of Sciences of Ukraine, Glazura, Czech Republic.

Applicants for higher education who were directly involved in the development of the educational program: Zagorodniuk OV, Kotunova MO, Pylypaka MO, Basyuk AA, Bovsunivsky VV

Feedback reviews of stakeholders are attached

1. PROFILE OF THE EDUCATIONAL PROGRAM in the specialty 161

Chemical Technologies and Engineering

| 1 - General information | |
|---|---|
| Full name of ZVO and institute / faculty | National Technical University of Ukraine "Kyiv Polytechnic Institute named after Igor Sikorsky", Faculty of Chemical Technology |
| Degree of higher education and title of qualification in the original language | Degree - bachelor<br>Qualification - Bachelor of Chemical Technology and Engineering |
| The official name of the OP | Chemical technologies of inorganic ceramic materials |
| Type of diploma and scope of OP | Bachelor's degree, single, 240 credits, term of study 3 years 10 months |
| Availability of accreditation | Accreditation certificate issued by the Ministry of Education and Science of Ukraine ND 1192566, for the period from 2013 to 2023. |
| Cycle / level of VO | NRC of Ukraine - level 6<br>QF-EHEA - first cycleEQF-<br>LLL - level 6 |
| Prerequisites | Availability of complete general secondary education |
| Language (s) of instruction | Ukrainian / English |
| Validity of the OP | Until the next accreditation is valid until 01.07.2023 |
| Internet address permanent placement educational program | Posted in public access on the site: http://htks.kpi.ua;https:// osvita.kpi.ua/ section "Educational programs" |

**2 - The purpose of the educational program**

Training of a specialist capable of solving professional problems and problems, carrying out and ensuring professional cooperation of representatives of enterprises for the production of inorganic ceramic materials, business and the scientific community, aimed at forming a modern view of ceramics and glass in a sustainable innovative scientific and technological development of society and formation of high adaptability *applicants for higher education* in the context of labor market transformation through interaction with employers and other stakeholders.

| 3 - Characteristics of the educational program | |
|---|---|
| Subject area | Objects of study and activity - technological processes and equipment of modern productions of ceramic inorganic ceramic materials.<br>Learning objectives - training of specialists capable of solving complex professional problems and problems of chemical technology and engineering, characterized by complexity and uncertainty of conditions.<br>Theoretical content of the subject area - concepts, categories, concepts, principles of chemical technologies for the production of ceramics and glass.<br>Methods, techniques and technologies: standardization, certification and physico-chemical methods of analysis of raw materials and finished products from ceramics and glass, thermal processes and units in modern technologies of ceramics and glass production; modeling and design of chemical plants.<br>Tools and equipment: devices and means for analysis of raw materials, intermediate and finished products from ceramics and glass, control and measuring equipment, specialized technological equipment, specialized software. |
| Orientation OP | Educational and professional |
| The main focus of the OP | Special education in the field of knowledge 16 Chemical and bioengineering 161 Chemical technology and engineering<br>Acquisition of educational qualifications for professional activities in the field of chemical and bioengineering.<br>The program is based on well-known scientific principles, taking into account the current state of development of chemical technology and engineering in the field of ceramics and glass. The program is aimed at forming such competencies of higher education students that enable their comprehensive professional, intellectual, social and creative development, taking into account new realities and current challenges for engineering, research and innovation (including international) activities.<br>Applicants for higher education have the opportunity to gain knowledge in related fields, to master modern computer tools for design and modeling of technological processes and other educational components.<br>The program orients applicants to current developments in the field of chemical technology of ceramic inorganic materials, within which further professional and scientific career is possible.<br>.Key words: natural raw materials, ceramic products for various purposes, household and technical glass. |

| | |
|---|---|
| Features of OP | Interdisciplinary and multidisciplinary training of specialists in the field of chemical technology and engineering.<br>Passage by applicants of higher education of practice on a profile at the specialized enterprises and mastering of modern engineering technologies of computer design of modern manufactures. The implementation of the program involves the involvement in the educational process of professionals - practitioners in the technology of production of ceramics and glass, experts in the field of inorganic ceramic materials, representatives of employers and others. stakeholders. |
| **4 - Suitability of graduates for employment and further study** | |
| Suitability for employment | Specialist trained to work in the field of chemical technology of inorganic ceramic materials in accordance with the State to the classifier of professions DK 003: 2010 (https://evrovektor.com/kved/2010/) may work in positions that meet the NACE DK009: 2010:<br><br>20. Production of chemicals and chemical products<br>23. Manufacture of other non-metallic mineral products<br>According to the International Standard Classification of Occupations 2008, graduates may work in positions corresponding to the groups:<br>21 Science and engineering professionals<br>2113 Chemists<br>2145 Chemical Engineers<br>31 Science and engineering associate professionals<br>3116 Chemical Engineering Technicians |
| Further training | Continuation of education at the second (master's) level of higher education or acquisition of additional qualifications in the system of postgraduate education. |
| **5 - Teaching and assessment** | |
| Teaching and learning | General learning style - task-oriented.<br>Teaching is carried out in the form of: lectures, seminars, practical classes, laboratory work, course projects and term papers, calculation, calculation and graphic, home tests, essays, practice, excursions, diploma project, independent work with the possibility of consultation with the teacher, individual to occupy. Application of information and communication technologies (e-learning, online lectures, OCW, distance learning courses) for individual educational components, blended learning technologies. |
| Evaluation | Current and semester control in the form of laboratory reports, presentations, written and oral exams, tests, tests, modular tests, defense of term papers and projects, as well as defense of qualifying work are evaluated according to certain criteria of the Rating system. |

| 6 - Program competencies | |
|---|---|
| **Integral competence** | Ability to solve complex specialized problems and practical problems of chemical technology and engineering, which involves the application of theories and methods of chemical technology and engineering and is characterized by complexity and uncertainty of conditions. K01. Ability to |
| **General competencies (K)** | abstract thinking, analysis and synthesis. K02. Ability to apply knowledge in practical situations. K03. Knowledge and understanding of the subject area and understanding of professional activity.<br><br>K04. Ability to communicate in the state language both orally and in writing.<br>K05. Ability to communicate in a foreign language.<br>K06. The desire to preserve the environment. K07. The ability to exercise their rights and responsibilities as a member of society, to realize the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine. K08. Ability to preserve and multiply moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the industry, its place in the general system of knowledge about nature and society and in the development of society.<br>K09. Ability to evaluate and ensure the quality of work performed<br>K10. Ability to organize the effective work of the structural unit of the enterprise, the staff, areas of production in accordance with the requirements of the law |
| **Professional competencies (FC)** | ΦK01. Ability to use the provisions and methods of basic sciences to solve professional problems. FK02. Ability to use methods of observation, description, identification, classification of chemical technology and industrial products.<br><br>FK03. Ability to design chemical processes taking into account technical, legal and environmental constraints.<br>FK04. Ability to use modern materials, technologies and designs of devices in chemical engineering.<br>ΦK05. Ability to select and use appropriate equipment, tools and methods for control and management of technological processes of chemical production.<br>ΦK06. Ability to use computer technology and information technology to solve complex problems and practical problems in the field of chemical engineering.<br>ΦK07. Ability to take into account the commercial and economic context in the design of chemical plants.<br>FK08. Ability to draw up technical documentation in accordance with current requirements.<br>ΦK09. Ability to master the theoretical foundations and practical skills in the technology of inorganic ceramic materials FC10. Ability to conduct educational and research experiments and master the basic techniques of work in a chemical laboratory |

## 7 - Program learning outcomes

PR01. Know mathematics, physics and chemistry at the level necessary to achieve the results of the educational program.
PR02. Correctly use in professional activities the terminology and basic concepts of chemistry, chemical technologies, processes and equipment for the production of chemicals and materials based on them.

PR03. Know and understand the mechanisms and kinetics of chemical processes, effectively use them in the design and improvement of technological processes and apparatus of the chemical industry. PR04. Carry out qualitative and quantitative analysis of substances of inorganic and organic origin, using appropriate methods of general and inorganic, organic, analytical, physical and colloid chemistry.
PR05. Develop and implement projects related to technology and equipment of chemical plants, taking into account the objectives, resources, existing constraints, social and economic aspects and risks.

PR06. Understand the basic properties of structural materials, principles and limitations of their use in chemical engineering.
PR07. Select and use appropriate equipment, tools and methods to solve complex problems of chemical engineering, control and management of technological processes of chemical production.
PR08. Use modern computer technology, specialized software and information technology to solve complex problems and practical problems in the field of chemical engineering, in particular, for calculations of equipment and processes of chemical production. PR09. Ensure the safety of personnel and the environment during professional activities in the field of chemical engineering.
PR10. Discuss the results of professional activities with specialists and non-specialists, argue their own position.
PR11. Communicate freely on professional issues orally and in writing in the state and foreign languages.
PR12. Understand the principles of law and legal principles of professional activity.
PR13. Understanding of chemical engineering as a component of modern science and technology, its place in the development of engineering, the Ukrainian state and world culture.
PR14. Knowledge of the basics of chemical production design of ceramics and glass production technology PR15

PR16. Knowledge of the basics of economic calculations for the production of ceramics and glass and determining the efficiency of the projected production, the basics of technical drawings with the help of graphic editors
PR17.Knowledge of the basic provisions of disciplines of professional training: technical analysis, standardization, certification of ceramics and glass
PR18. Ability to use regulatory and technical documentation and reference literature in the technical control department or specialized quality department to give a comprehensive assessment of materials and draw up control results according to the requirements of certification and standardization of materials and products for product quality control or technology examination
PR19. Ability to improve their professional level by getting acquainted with the latest scientific and technical information in the specialty; professionally search for such information using the appropriate software; prepare a report and abstracts based on the results of their own research to participate in a student scientific conference

| 8 - Resource support for program implementation | |
|---|---|
| Staffing | In accordance with the personnel requirements for ensuring the implementation of educational activities for the relevant level of HE, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine №347 dated 10.05.2018. |
| Material and technical software | In accordance with the technological requirements for material and technical support of educational activities of the relevant level of HE, approved by the Resolution of the Cabinet of Ministers of Ukraine from 30.12.2015 № 1187 as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine №347 dated 10.05.2018<br>In training specialists, modern equipment and software are used: Compass, Matkad, etc. |
| Information and educational and methodical software | In accordance with the technological requirements for educational and methodological and informational support of educational activities of the relevant level of HE (Annex 5 to the License Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine №347 10.05.2018<br>When organizing and conducting the educational process, the resources of the scientific and technical library of KPI are used. Igor Sikorsky (http:// www.library.kpi.ua/) and others. |
| **9 - Academic mobility** | |
| National credit mobility | Possibility of concluding agreements on academic mobility and double graduation, etc. |
| International credit mobility | Possibility of concluding agreements on international academic mobility (Erasmus + K1), on double graduation, on long-term international projects that involve the inclusion of students, etc. |
| Foreign training applicants IN | The training of English-speaking students has been announced, and Ukrainian is being studied as a foreign language |

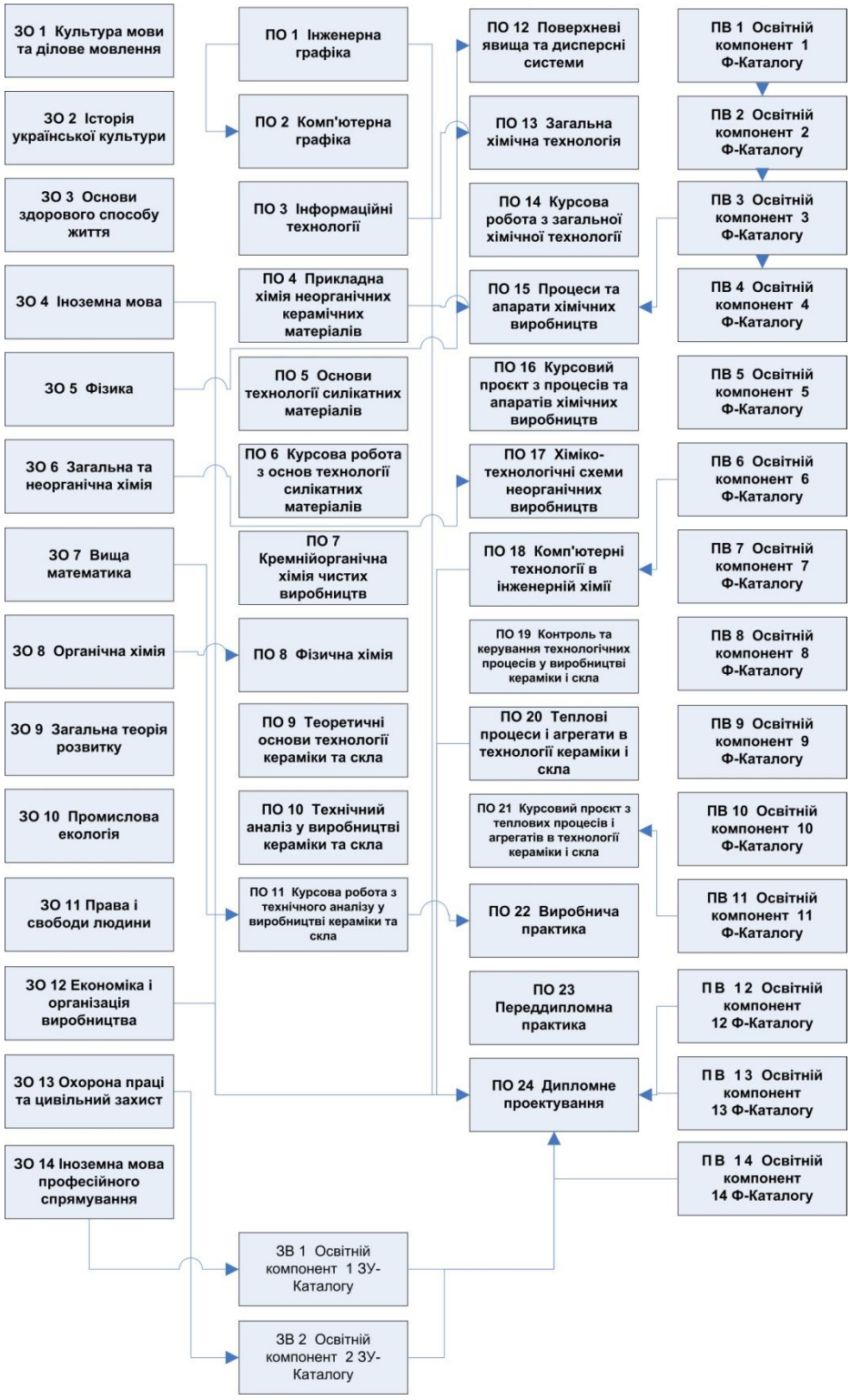
## 2. LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAM

| Code | Components of the educational program (academic disciplines, course projects / works, practices, qualification work) | Number loans ECTS | Form final control |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| **1. REGULATORY educational components** | | | |
| **I.1. General training cycle** | | | |
| ЗО 1 | Language culture and business speech | 2 | test |
| ЗО 2 | History of Ukrainian culture | 2 | test |
| ЗО 3 | Fundamentals of a healthy lifestyle | 3 | test |
| ЗО 4 | Foreign Language | 6 | test<br>test |
| ЗО 5 | Physics | 13 | examination |
| ЗО 6 | General and inorganic chemistry | 14 | examination |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 3O 7 | Higher mathematics | 13 | examination |
| 3O 8 | Organic chemistry | 5 | examination |
| 3O 9 | General theory of development | 2 | test |
| 3O 10 | Industrial ecology | 2 | test |
| 3O 11 | Human rights and freedoms Economics and | 2 | test |
| 3O 12 | organization of production Labor protection | 4 | test |
| 3O 13 | and civil protection | 4 | test |
| 3O 14 | Foreign language for professional purposes | 6 | test examination |
| **1.2. Cycle of professional training** | | | |
| ON 1 | Engineering graphics | 3 | test |
| ON 2 | Computer Graphics | 3 | test |
| ON 3 | Information Technology | 4 | test |
| ON 4 | Applied chemistry of inorganic ceramic materials | 5 | examination |
| ON 5 | Fundamentals of technology of silicate materials Course | 6 | examination |
| ON 6 | work on the basics of technology of silicate materials | 1 | test |
| ON 7 | Organosilicon chemistry of pure productions | 6 | examination |
| ON 8 | Physical chemistry | 6 | examination |
| ON 9 | Theoretical foundations of ceramics and glass technology | 6 | examination |
| ON 10 | Technical analysis in the production of ceramics and glass | 6 | examination |
| ON 11 | Course work on technical analysis in the production of ceramics and glass | 1 | test |
| ON 12 | Surface phenomena and dispersed systems | 6 | examination |
| ON 13 | General chemical technology | 5 | examination |
| ON 14 | Course work on general chemical technology | 1 | test |
| ON 15 | Processes and apparatus of chemical production | 8.5 | examination examination |
| ON 16 | Course project on processes and devices of chemical production | 1.5 | test |
| ON 17 | Chemical-technological schemes of inorganic productions | 5 | examination |
| ON 18 | Computer technologies in engineering chemistry Control and | 4 | examination |
| ON 19 | management of technological processes in the production of ceramics and glass | 5 | examination |
| ON 20 | Thermal processes and units in the technology of ceramics and glass | 5.5 | examination |
| ON 21 | Course project on thermal processes and units in the technology of ceramics and glass | 1.5 | test |
| ON 22 | Internship | 4 | test |
| ON 23 | Pre-diploma practice | 2 | test |
| ON 24 | Diploma design | 6 | protection |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **2. SELECTIVE educational components** | | | |
| ZV 1 | Educational component 1 ZU-Catalog | 2 | test |
| ZV 2 | Educational component 2 of the memory catalog | 2 | test |
| | **2.2. Cycle of professional training (Selective educational components withinterfaculty / faculty / departmentCatalogs)** | | |
| PV 1 | Educational component 1 of the F-Catalog | 4 | test |
| PV 2 | Educational component 2 F-Catalog | 4 | test |
| PV 3 | Educational component 3 F-Catalog | 4 | test |
| PV 4 | Educational component 4 F-Catalog | 4 | test |
| PV 5 | Educational component 5 F-Catalog | 4 | test |
| PV 6 | Educational component 6 F-Catalog | 4 | test |
| PV 7 | Educational component 7 F-Catalog | 4 | test |
| PV 8 | Educational component 8 F-Catalog | 4 | test |
| PV 9 | Educational component 9 F-Catalog | 4 | test |
| PV 10 | Educational component 10 F-Catalog | 4 | test |
| PV 11 | Educational component 11 F-Catalog | 4 | test |
| PV 12 | Educational component 12 F-Catalog | 4 | test |
| PV 13 | Educational component 13 F-Catalog | 4 | test |
| PV 14 | Educational component 14 F-Catalog | 4 | test |
| Total volume **mandatory components**: Total volume | | **180** | |
| **selective components**: The volume of educational | | **60** | |
| components, **providing extractioncompetencies defined by the SVO** | | **120** | |
| **TOTAL VOLUME OF THE EDUCATIONAL PROGRAM** | | **240** | |

# 3. STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL PROGRAM



## 4. FORM OF CERTIFICATION OF HIGHER EDUCATION APPLICANTS

Certification of higher education applicants under the educational-professional program "Chemical technologies of inorganic ceramic materials" in the specialty "161 Chemical technologies and engineering" is carried out in the form of public defense (demonstration) of qualification work and ends with the issuance of a standard document on bachelor's degree. chemical technology and engineering. Qualification work is checked for plagiarism and after the defense is placed in the repository of NTB University for free access.

Graduation certification is open and public.

## 5. MATRIX OF CONFORMITY OF SOFTWARE COMPETENCES TO COMPONENTS EDUCATIONAL PROGRAM

| | ЗО1 | ЗО2 | ЗО3 | ЗО4 | ЗО5 | ЗО6 | ЗО7 | ЗО8 | ЗО9 | ЗО10 | ПО1 | ПО2 | ПО3 | ПО4 | ПО5 | ПО6 | ПО7 | ПО8 | ПО9 | ПО10 | ПО11 | ПО12 | ПО13 | ПО14 | ПО15 | ПО16 | ПО17 | ПО18 | ПО19 | ПО20 | ПО21 | ПО22 | ПО23 | ПО24 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| К01 | ± | | | | ± | ± | ± | ± | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| К02 | | | | | | | | | | ± | ± | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| К03 | | | | | | ± | | ± | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| К04 | ± | ± | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| К05 | | | | ± | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| К06 | | | | | | | | | | ± | ± | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| К07 | | ± | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| К08 | | | | | | | | | | | ± | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| К09 | | | | | | | | | | ± | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| К10 | | | ± | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ФК01 | | | | | | | | | | | | | | | | ± | | | | | | | | | | | | | | | | | | | | | | | | |
| FK02 | | | | | | | | | | | | | | | | | | | | | | ± | | | | | | | | | | | | | | | | | | |
| FK03 | | | | | | | | | | | | | | | | | | | | | | | | | | + | | | | | | | | | | | | | | |
| FK04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | + | | | |
| ФК05 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | + | | | | |
| ФК06 | | | | | | | | | | | | | | ± | ± | | | | | | | | | | | | | | | | | | | | | | | | | |
| ФК07 | | | | | | | | | | | | | | ± | ± | | | | | | | | | | | | | + | | | | | | | | | | | + | | |
| FK08 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | + |
| ФК09 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | + | + | | | | | | | | | |
| FC10 | | | | | | | | | | | | | | | | | | | | | | | + | | | | | | | | + | | | | | | | | |

# 6. MATRIX OF PROVIDING SOFTWARE LEARNING RESULTS BY THE RELEVANT

**KOHMPATNISNTANDMAnd OWITHINANDTNBATShe PPOGRAMAnd**

| | ЗО1 | ЗО2 | ЗО3 | ЗО4 | ЗО5 | ЗО6 | ЗО7 | ЗО8 | ЗО9 | ЗО10 | ПО1 | ПО2 | ПО3 | ПО4 | ПО5 | ПО6 | ПО7 | ПО8 | ПО9 | ПО10 | ПО11 | ПО12 | ПО13 | ПО14 | ПО15 | ПО16 | ПО17 | ПО18 | ПС19 | ПО20 | ПО21 | ПО22 | ПО23 | ПО24 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PR01 | | | | | + | + | + | + | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PR02 | | | | | | | | | | | | | | | | | + | | | | | | | | + | | | | + | | | | | | | |
| PR03 | | | | | | | | | | | | | | | | | | | + | | | | | + | | | | | | | | | | | | |
| PR04 | | | | | | | | | | | | | | | | | | | | | | + | + | | | | | | | | | | | | | |
| PR05 | | | | | | | | | | | | | | | | | | | + | | | | | | | + | | + | | | | | + | | | |
| PR06 | | | | | | | | | | | | | | | | + | | | | | | | | | | | | | | | | | | | | |
| PR07 | | | | | | | | | | | | | | | | | | | | | | | | | + | | | | | | + | | | | | |
| PR08 | | | | | | | | | | | | + | + | + | + | | | | | | | | | | | | | | | + | | | | | | |
| PR09 | | | | | | | | | | | + | | | | | | | | | | | | | | | | | | | | | | | | | |
| PR10 | | | | | | | | | | + | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PR11 | | + | + | + | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PR12 | | | | | | | | | | + | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PR13 | + | | | | | | | | | | | | | | | | | | | | + | | | | | | | | | | | | | | | |
| PR14 | | | | | | | | | | | | | | | | | | | | | | | | | | | + | + | | | | | | | | |
| PR15 | | | | | | | | | | | | | | | | | + | | | | | | | | | | | | | | | | | | | |
| PR16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | + | | + | | |
| PR17 | | | | | | | | | | | | | | | | | | | | | | + | | | | | | | | | | | | | | |
| PR18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | + |
| PR19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | + | + |