**Kazakh national research technical university named after K.I. Satpayev**
**Institute of Architecture, construction and energy named after T. K. Basenov**
**Department of Construction and building materials**

# EDUCATIONAL PROGRAM

# "CONSTRUCTION AND PRODUCTION OF BUILDING MATERIALS AND CONSTRUCTIONS"

**(profile direction (1.5 years)**

**Master of Engineering and Technology in the educational program "7M07302 - Construction and production of building materials and structures"**

1-st edition
in accordance with the state higher education standard 2018

**Almaty 2020**

**Программа составлена и подписана сторонами:**

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Approved at the meeting of the Educational and methodological council of the Kazakh national research technical university named after K. I. Satpayev. Protocol №4 from 14.01.2020.

**Qualification**:

Qualifications and positions are determined in accordance with the «Qualification directory of positions of managers, specialists and other employees», approved by the order of the Minister of labor and social protection of the population of the Republic of Kazakhstan dated May 21, 2012 №. 201-p-m (as amended on 17. 04.2013). Graduates of the specialty 7M07302 «Construction and production of building materials and structures» can work in the following positions:
- master of engineering and technology: design institutions; bureaus; companies, firms and organizations (enterprises) of construction, transport and communication, road construction, mining, oil and gas and military complexes; companies, firms and organizations (enterprises) of other economic infrastructures.

**Professional competence:** - training of specialists in the profile for work, regardless of the forms of ownership and subordination: in design institutions; in bureaus; in companies, firms and organizations (enterprises) for example, in companies, firms and organizations (enterprises) of other economic infrastructures. The inculcation of managerial skills and providing training for professional managers (the heads of the General profile on all aspects of management activity).

**Short description of the program:**

**The objects of professional activity** of the master are: design bureaus, design institutes; construction organizations and firms, akimats, ministries.

Masters of the specialty 7M07302 "Construction and production of building materials and structures" can perform the following **types of professional activities:**

- Calculation and design and technical and economic;
- organizational and managerial support;
- production, technological and operational;
- legal, expert and Advisory services;

Settlement and design and technical and economic activities:

- production of appropriate calculations of structural elements of buildings and structures of transport and communication and oil and gas complexes;
- preparation of projects and feasibility studies for the construction of new, repairs, current maintenance and reconstruction of existing objects of transport and communication and oil and gas complexes.

**Organizational and managerial activities:**

- organization of the work of the labor collective of performers with the creation of the necessary conditions, equipping (providing) production with labor and material resources, making optimal management decisions in various production conditions;
- finding optimal solutions in the event of labor disputes on staffing, wages, cost and quality of various types of work, ensuring the safety of life, labor protection and compliance with environmental safety in production areas;
- assessment of production and non-production costs to ensure the quality of products of construction and repair production;

**Production, technological and operational activities:**

- planning and solving technological problems encountered in the production process;
- efficient use of materials and raw materials, equipment, machinery, modern computer programs for calculating and designing parameters of technological processes;
- organization and effective implementation of input quality control of raw materials, production control of semi-finished products and parameters of technological processes, quality of finished products;
- engineering and technical operation of buildings and structures.

**Legal, expert and consulting activities:**

- possession of basic knowledge in the field of civil, financial, commercial and other branches of law;
- ability to navigate the current legislation and the ability to apply certain legal norms in practice;
- conducting expertise and providing consulting assistance in various production situations.

**PASSPORT OF THE EDUCATIONAL PROGRAM**

## 1. Scope and content of the program

The duration of the master's degree is determined by the amount of academic credits mastered. When the set amount of academic credits is mastered and the expected learning outcomes for obtaining a master's degree are achieved, the Master's degree program is considered fully mastered. There are 112 academic credits in the specialized master's program with a period of 1.5 years of study.

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

The master's program in the profile direction implements educational programs of postgraduate education for the training of managerial personnel with in-depth professional training.

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

1) theoretical training, including the study of cycles of basic and core disciplines;

2) practical training of undergraduates: various types of practices, scientific or professional internships;

3) experimental research work, including the implementation of the master's project;

4) final certification.

**Objectives of the educational program:**

The main objectives of educational programs of a magistracy in 7M07302 «Construction and production of building materials and structures» is to prepare highly competent specialists in the field of construction, calculation and design, reconstruction of buildings and constructions and production of building materials, products and structures capable of making the right decisions in the production process.

## 2 Requirements for applicants

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

The procedure for admission of citizens to the master's program is established in accordance with the «standard rules for admission to training in educational organizations that implement educational programs of postgraduate education».

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

At the «entrance», the master's student must have all the prerequisites necessary for the development of the corresponding educational program of the master's degree. The list of necessary prerequisites is determined by the higher education institution independently.

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

## 3 Requirements for completing studies and obtaining a diploma

**Degree/ qualifications awarded**: a Graduate of this educational program is awarded an academic master's degree in engineering and technology in the field.

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

- the ability to independently acquire, comprehend, structure and use new knowledge and skills in professional activities, develop their innovative abilities;
- the ability to independently formulate research goals, establish the sequence of solving professional tasks;
- the ability to apply in practice the knowledge of fundamental and applied sections of disciplines that determine the orientation (profile) of the master's program;
- the ability to professionally choose and creatively use modern scientific and technical equipment to solve scientific and practical problems;
- the ability to critically analyze, present, defend, discuss and disseminate the results of their professional activities;
- proficiency in the preparation and execution of scientific and technical documentation, scientific reports, reviews, reports and articles;
- willingness to lead the team in the field of their professional activities, tolerantly perceiving social, ethnic, religious and cultural differences;
- readiness for communication in oral and written forms in a foreign language to solve problems of professional activity.

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

- *production activity:*
- ability to independently carry out production, field and laboratory and interpretation work in solving practical problems;
- the ability to professionally operate modern field and laboratory equipment and devices in the field of the master's degree program;
- the ability to use modern methods of processing and interpreting complex information to solve production problems;
- *project activity:*
- ability to independently draw up and present projects of research and production works;
- readiness to design complex research and production works in solving professional problems;
- *organizational and management activities:*
- readiness to use practical skills of organization and management of research and production works in solving professional problems;
- readiness for the practical use of regulatory documents in the planning and organization of scientific and production works;

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

## 4 Working curriculum of the educational program

4.1. Duration of training 1,5 years

| year of study | Code | Name of course | Component | Academic credits | lecture/ lab/ prac/MSIW | Prerequisites | Code | Name of course | Component | Academic credits | Prerequisites |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 semester | | | | | | 2 semester | | | | |
| | LNG202 | Foreign language (professional) | BD IC | 6 | 0/0/ 3/3 | | CIV249 | Professional computer programs | BD OC | 4 | |
| | MNG274 | Management | BD IC | 6 | 2/0/ 1/3 | | 1204 | Elective | PS OC | 6 | |
| | HUM204 | Management Psychology | BD OC | 4 | 1/0/ 1/2 | | 1205 | Elective | PS OC | 6 | |
| | 1201 | Elective | BD OC | 6 | | | 1206 | Elective | PS OC | 6 | |
| | 1202 | Elective | PS OC | 6 | | | 1207 | Elective | PS OC | 6 | |
| | 1203 | Elective | PS OC | 6 | | | AAP221 | Master's student experimental research work, including internship and master's project implementation | MSERW | 4 | |
| | | **In total** | | **34** | | | | **In total** | | **32** | |
| 2 | 3 semester | | | | | | | | | | |
| | AAP220 | Master's student experimental research work, including internship and master's project implementation | MSERW | 14 | | | | | | | |
| | AAP246 | Work placement | PS | 9 | | | | | | | |
| | ECA206 | Registration and defense of the master's thesis | FA | 12 | | | | | | | |
| | | **In total** | | **35** | | | | | | | |
| | | **In all** | | **101** | | | | | | | |

| Number of credits for the whole period of study | |
|---|---|
| **Cycles of disciplines** | **Credits** |
| The cycle of general education | 0 |
| A cycle of basic disciplines ( BD IC, BD OC) | 26 |
| A cycle of principal subjects (PS IC, PS OC) | 45 |
| **All on the theoretical classes:** | **71** |
| MSERW | 18 |
| Registration and defense of the master's thesis (RaDMT) | 12 |
| **In total** | **101** |

**THE CURRICULUM FOR MODULAR EDUCATIONAL SYSTEM**

Specialty: **7M07318 - "Construction and production of building materials and structures "**

Form of study: *full* Duration of training: 1,5 years Academic degree: Master of Engineering and Technology

| The cycle | code | Name of disciplines | Semester | Academ. credit | lec. | lab. | prac. | MSIW | Control type | Department |
|---|---|---|---|---|---|---|---|---|---|---|
| **Profile training module** | | | | | | | | | | |
| **Basic disciplines (BD) (26 credits)** | | | | | | | | | | |
| **Institute component (IC)** | | | | | | | | | | |
| BD 1.1.1 | LNG202 | Foreign language (professional) | 1 | 6 | 0 | 0 | 3 | 3 | Exam | FL |
| BD 1.2.1 | MNG274 | Management | 1 | 6 | 2 | 0 | 1 | 3 | Exam | RECUP |
| BD 1.3.1 | HUM204 | Management Psychology | 1 | 4 | 1 | 0 | 1 | 2 | Exam | RECUP |
| | | | | | | | | | | |
| **Optional component (OC)** | | | | | | | | | | |
| BD 14.1 | CIV244 | Theory of elasticity and plasticity | 1 | 6 | 2 | 0 | 1 | 3 | Exam | CEaBM |
| BD 1.4.1.1 | CIV220 | Mathematical modeling in the technology of construction materials | | | | | | | | |
| BD 1.5.1 | CIV243 | Spatial coverage | 1 | 6 | 2 | 0 | 1 | 3 | Exam | CEaBM |
| BD 1.5.1.1 | CIV240 | Modern standards for design calculation and design | | | | | | | | |
| **Profiling subjects (PS) (25 credits)** | | | | | | | | | | |
| **Institute component (IC)** | | | | | | | | | | |
| | | Computer simulation module | | | | | | | | |
| PS 2.1.1 | CIV249 | Professional computer programs | 2 | 4 | 1 | 0 | 1 | 2 | Exam | CEaBM |
| **Optional component (OC)** | | | | | | | | | | |
| | | Mathematical modeling module | | | | | | | | |
| PS 2.2.1 | CIV208 | Dynamic of structures | 1 | 6 | 2 | 0 | 1 | 3 | Exam | CEaBM |
| PS 2.2.1.1 | CIV222 | Modification in building materials technology | | | | | | | | |
| PS 2.3.1 | CIV246 | Seismic resistance of buildings and structures | 2 | 6 | 2 | 0 | 1 | 3 | Exam | CEaBM |
| PS 2.3.1.1 | CIV247 | Modern concrete | | | | | | | | |
| PS 2.4.1 | CIV207 | Geotechnical engineering state and perspectives of development | 2 | 6 | 2 | 0 | 1 | 3 | Exam | CEaBM |
| PS 2.4.1.1 | CIV248 | Physico-chemical basis of ceramic materials and glass | | | | | | | | |
| PS 2.5.1 | CIV211 | Finite element method in construction problems | 2 | 6 | 2 | 0 | 1 | 3 | Exam | CEaBM |
| PS 2.5.1.1 | CIV218 | Colloidal cement systems | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| PS 2.6.1 | CIV226 | Silicate-sodium composite binders and concretes on their basis | 2 | 6 | 2 | 0 | 1 | 3 | Exam | CEaBM |
| PS 2.6.1.1 | CIV470 | Project management | | | | | | | | |
| **Practice-oriented module** | | | | | | | | | | |
| PS | AAP246 | Work placement | 3 | 9 | | | | | Report | CEaBM |
| **Experimental research module (18 credits)** | | | | | | | | | | |
| MSERW | AAP221 | Master's student experimental research work, including internship and master's project implementation | 2 | 4 | | | | | Report | CEaBM |
| MSERW | AAP220 | Master's student experimental research work, including internship and master's project implementation | 3 | 14 | | | | | Report | CEaBM |
| **Final certification module (12 credits)** | | | | | | | | | | |
| FA | ECA205 | Registration and defense of the master's thesis | 4 | 12 | | | | | Defense of dissertations | |
| Total credits | | | | 101 | | | | | | |

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

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

The results of training are formulated both at the level of the entire educational program of the master's degree, and at the level of individual modules or academic discipline.

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

1) demonstrate developing knowledge and understanding in the studied field of science and technology related to the design, construction, operation of buildings and structures, civil and industrial purposes, as well as the production of building materials, products and structures, based on advanced knowledge of the construction industry, in the development and (or) application of ideas in the context of research;

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

3) collect and interpret information to form judgments based on social, ethical and scientific considerations;

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

5) training skills necessary for independent continuation of further training in the studied field of design, construction, operation of buildings and structures, civil and industrial purposes, as well as with the production of building materials, products and structures.

## 6 Competencies at the end of training

6.1 Requirements for the key competencies of graduates of the profile master's degree, must:

*1) to have an idea:*

- on current trends in the development of scientific knowledge;
- on current methodological and philosophical problems of natural (social, humanitarian, economic) Sciences;
- on the contradictions and socio-economic consequences of globalization processes;
- on the current state of the economic, political, legal, cultural and technological environment of the global business partnership;
- on the organization of strategic enterprise management, innovation management, leadership theories;
- about the main financial and economic problems of the functioning of enterprises.

*2) know:*

- methodology of scientific knowledge;
- the main driving forces of changes in the structure of the economy;
- features and rules of investment cooperation;

– at least one foreign language at a professional level that allows you to conduct scientific research and practical activities.

*3) be able to:*

- apply scientific methods of knowledge in professional activities;
- critically analyze existing concepts, theories and approaches to the study of processes and phenomena;
- integrate the knowledge gained in different disciplines, use it to solve analytical and managerial tasks in new unfamiliar conditions;

- conduct a microeconomic analysis of the company's economic activity and use its results in the management of the company;
- apply new approaches to the organization of marketing and management in practice;
- make decisions in complex and non-standard situations in the field of organization and management of the economic activity of the enterprise (firm);
- apply in practice the norms of the legislation of the republic of kazakhstan in the field of regulation of economic relations;
– creative thinking and creative approach to solving new problems and situations;
- conduct information-analytical and information-bibliographic work with the involvement of modern information technologies;
- summarize the results of experimental research and analytical work in the form of a master's thesis, article, report, analytical note, etc.

*4) have the skills:*

- solutions to standard scientific and professional tasks;
- scientific analysis and solution of practical problems in the organization and management of economic activities of organizations and enterprises;
- research problems in the field of management and marketing and use the results to improve the methods of enterprise management;
- professional communication and intercultural communication;
- oratory, correct and logical design of their thoughts in oral and written form;
- expanding and deepening the knowledge necessary for daily professional activities and continuing education in the doctoral program;
- use of information and computer technologies in the field of professional activity.

*5) be competent in:*

- research methodology in the field of specialty;
- in the field of modern problems of the world economy and the participation of national economies in world economic processes;
- in the organization and management of the company's activities;
- in the implementation of industrial relations with various organizations, including public service bodies;
- in ways to ensure constant updating of knowledge, expansion of professional skills and abilities.

**B-Basic knowledge, skills and abilities:**

B1 Be able to integrate knowledge gained in different disciplines to solve research problems in new unfamiliar conditions.

B2 Have the skills to use the acquired knowledge for the original development and application of ideas in the context of scientific research.

B3 Be able to make judgments and decisions based on incomplete or limited information through the integration of knowledge, be able to think creatively and creatively approach new problems and situations.

**P-Professional competencies:**

P1 the Ability to conduct surveys to assess the state of natural and natural-man-made objects, determine the initial data for the design and calculation justification and monitoring of objects, patent research, prepare design tasks.

P2 the Ability to conduct surveys to assess the state of natural and natural-man-made objects, determine the initial data for the design and calculation justification and monitoring of objects, patent research, prepare design tasks.

P3 ability to conduct the organization, improvement and development of new technological processes of the production process at the enterprise or site, control over compliance with technological discipline, maintenance of technological equipment and machines.

P4 Know modern technologies in construction production, new methods and methods in the technology of construction processes of buildings and structures, as well as in the production of building materials, products and structures.

The use of new materials and design of buildings and structures in transport construction; modern methods and techniques for the construction of buildings and structures on the transport.

P5 ability to organize the commissioning, testing and commissioning of facilities, samples of new and upgraded products manufactured by the enterprise.

P6 Know the basic principles of construction design, advanced methods of calculation and design of parts and assemblies, the basics of achieving maximum production efficiency and high quality of the final product.

P7 Know and use the latest achievements in the field of construction, determine the prospects for their use, carry out modeling of systems in the technology and organization of construction production.

P8 Be able to make qualified independent decisions based on the knowledge gained for subsequent practical justifications aimed at improving the functioning of construction industries, to introduce progressive forms of production organization at their enterprises.

**O-Universal, social and ethical competencies:**

O1 Have an idea of the role of science and education in public life, of current trends in the development of scientific knowledge, of current methodological and philosophical problems of natural (social, humanitarian, economic) Sciences.

O2 Willingness to work in a team, social interaction based on accepted moral and legal norms, showing respect for people, willingness to take responsibility for maintaining trusting partnerships

O3 Has a culture of thinking, is able to analyze, summarize information, set goals and choose ways to achieve them, has a culture of oral and written speech

C-Special and managerial competencies:

C1 Be able to economically justify and solve issues related to the organization of the production process, determine the volume and quality indicators of construction enterprises, process and analyze the results of theoretical and experimental studies on the technical level and operational condition of construction structures.

C2 be able to competently predict the work of construction using statistical and other data; technically and economically evaluate foreign and domestic projects, development programs, strategic plans and promptly draw conclusions and proposals for practical application; as well as methods of rational organization of production processes in the construction sector.

C3 be Able to make informed decisions on the choice of options for management structures for the effective operation of construction enterprises; to make the formation of management structures at all levels; to use modern technologies for strategic planning purposes.

**6.2 Requirements for experimental research work of a master's student in a specialized master's program:**

1) corresponds to the profile of the master's degree program, according to which the master's project is carried out and defended;

2) it is based on modern achievements of science, technology and production and contains specific practical recommendations, independent solutions to management tasks;

3) performed with the use of advanced information technologies;

4) contains experimental research (methodological, practical) sections on the main protected provisions.

**6.3 requirements for the organization of practices:**

The educational program of the profile master's degree includes industrial practice in the PD cycle.

Industrial practice in the PD cycle is carried out in order to consolidate the theoretical knowledge obtained in the course of training, acquire practical skills, competencies and experience of professional activity in the master's degree program being taught, as well as develop best practices.

**7 Appendix to the ects diploma.**

The application is developed according to the standards of the European Commission, the Council of Europe and UNESCO/sepes. this document serves only for academic recognition and is not an official confirmation of the document of education. It is not valid without a higher education diploma. The purpose of filling out the European Application is to provide sufficient data on the holder of the diploma, the qualification obtained, the level of this qualification, the content of the training program, the results, the functional purpose of the qualification, as well as information about the national education system. The application model that will be used for the transfer of assessments uses the European credit transfer or transfer system (ECTS).

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

**Foreign language (professional)**
CODE – LNG202
CREDIT - 6

PURPOSE AND OBJECTIVES OF THE COURSE
Thanks to this course, you will master specific terminology, be able to read specialized literature, get the knowledge necessary for effective oral and written communication in a foreign language in your professional activity.
BRIEF DESCRIPTION OF THE COURSE
In the course of training, students gain knowledge of a foreign language, including proficiency in specialized vocabulary, necessary for effective oral and written communication in a foreign language in their professional activities. Practical tasks and methods for developing the required language skills in the learning process include: case studies and role-playing games, dialogues, discussions, presentations, listening tasks, working in pairs or in groups, performing various written tasks, grammar tasks and explanations.
KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
As a result of mastering the discipline, the student will expand the professional lexical vocabulary, possess the skills of effective communication in a professional environment, the ability to correctly Express thoughts in oral and written speech, understand specific terminology and read specialized literature.

**Managment**
CODE MNG274
CREDIT 6
PREREQUISITE

The discipline is aimed at preparing graduates for:
- use of quantitative and qualitative methods for managing business processes and evaluating their effectiveness;
- design and management of any socio-economic system, part of the system, or process that meets the internal and external needs of the enterprise, organization;
- identification, formulation and solution of production tasks, including material, human and economic parameters;
- management of an enterprise; organization or institution, including institutions of higher professional education and scientific institutions, as well as their divisions, support of business processes in various areas of management, use of modern tools for diagnosing activities and developing a strategy for the development of the enterprise and organization;
- use of modern methods of evaluating the effectiveness of management programs, tasks, and activities;
- preparing graduates to work in the constantly changing conditions of the internal and external environment of the enterprise, the country and the world.

**Psychology of management**
CODE HUM204
CREDIT –4

PURPOSE AND OBJECTIVES OF THE COURSE

The main goal of the course is to study the characteristics of the behavior of individuals and groups of people within organizations; determining psychological and social factors influencing the behavior of employees. Also, much attention will be paid to the issues of internal and external motivation of people

The main goal of the course is to apply this knowledge to improve the efficiency of the organization.

BRIEF DESCRIPTION OF THE COURSE

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

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE

At the end of the course, students will know: the basics of individual and group behavior; basic theories of motivation; basic theories of leadership; concepts of communication, conflict management and stress in the organization.

they will be able to identify the various roles of managers in organizations; look at organizations from the point of view of managers; understand how effective management contributes to an effective organization.

**Professional computer programs**
CODE – CIV 249
CREDIT - 4

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The purpose of the discipline formation of the technological basis of competences, theoretical knowledge, practical skills and abilities in the specialized information systems support, analysis and research subject areas of the construction industry to obtain an objective evaluation of design, project activities, forecasting and planning science - based management decisions.

Mastering the methodology and technological tools of professionally-oriented computer programs to facilitate, accelerate and improve the quality of computational and analytical processing, modeling and presentation of information in the process of solving construction problems.

As a result of mastering the discipline, students should:

**know:**

- professionally-oriented computer systems and technology of

their application in the field of calculation and design of building structures of buildings and structures;

- key aspects of development of calculation complexes and technologies, opportunities

their use in the construction industry;

**be able to:**

- perform calculations of building structures of buildings and structures;
- apply modern calculation systems and programs for solving engineering problems in the field of calculation and design of building structures;
- work in the environment of specialized computer programs;

**to own:**

- skills of working with modern calculation systems for the calculation of building structures of buildings and structures, including spatial structures.

**Theory of elasticity and plasticity**
CODE – CIV 224
CREDIT - 6

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The purpose of the discipline "Theory of elasticity and plasticity" is the acquisition of knowledge, skills and abilities by undergraduates on the issues of ensuring the mechanical reliability of complex spatial structural elements in further practical work.

Tasks of studying the discipline. Acquisition of skills in calculating complex structural elements, spatial structures, structures, machine parts for strength, rigidity and stability.

The study of the discipline is aimed at the formation of the following competencies:

- the use of the basic laws of natural science disciplines in professional activities, the use of methods of mathematical analysis and modeling, theoretical and experimental research;
- the ability to identify the natural-scientific nature of problems arising in the course of professional activity, to attract the appropriate physical and mathematical apparatus for their solution;
- the ability to understand the essence and importance of information in the development of modern information society, to recognize the dangers and threats that arise in this process, to comply with the basic requirements of information security;
- knowledge of the main methods, methods and means of obtaining, storing, processing information, skills of working with a computer as a means of information management.

A master's student should know:

- the main provisions and calculation methods used in the discipline "resistance of materials", which is based on the study of special courses of all building structures, machinery and equipment.

Be able to:

- choose the right construction materials that provide the required indicators of reliability, safety, efficiency and efficiency of structures;
- analyze the environmental impact on the material and structures, set requirements for construction and structural materials and choose the best material based on its purpose and operating conditions;
- draw up a conclusion on the condition of building structures based on the results of the survey and process the results of static and dynamic tests of structures and building systems;
- develop design solutions for the simplest buildings and enclosing structures, conduct technical calculations according to modern standards.

To own:

- skills in calculating elements of building structures and structures for strength, rigidity, stability;
- the main modern methods of setting, research and solving problems of mechanics.

**Dynamics of structures**
CODE – CIV 208
CREDIT - 6

The purpose of mastering the discipline "dynamics of structures" is:

- formation of students ' complete and clear understanding of the principles of dynamic calculation of buildings and structures;

tasks of the discipline:

- teach methods of calculating buildings and structures for various types of dynamic loads;
- to form knowledge about the types of dynamic impacts, loads, structural measures to ensure the strength and stability of buildings and structures in the conditions of dynamic impacts;
- develop skills in performing simple dynamic calculations, applying existing calculation systems to dynamic calculations of buildings and structures.

Be able to:

- apply the regulatory framework and design principles when calculating buildings and structures under dynamic impacts;
- choose the calculation methods adopted in our country in the Appendix to the calculation of buildings and structures for dynamic impacts.

To own:

- methods of performing calculations of buildings and structures for dynamic impacts, including using automated calculation packages.

Know: the principles of collection and systematization of information source data for the design of buildings and structures with the subsequent development of technical documentation in accordance with regulatory documents.

**Seismic resistance of buildings and structures**
CODE – CIV 246
CREDIT - 6

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The purpose of mastering the discipline "earthquake Resistance of buildings and structures" is to acquire in-depth knowledge and skills necessary for a specialist in the design of buildings and structures in seismically active areas of the earth, to master the practice of calculating buildings and structures for dynamic loads, including seismic, including using software systems.

Know:

- types of dynamic loads, methods of their mathematical description;
- causes of earthquakes, seismically active areas of the earth, principles of seismic zoning and microseismic zoning, principles of classification of earthquakes by magnitude and magnitude;
- basic laws of dynamic equilibrium of systems, knows the rules for performing matrix transformations, basic methods for solving differential equations;
- regulatory framework for earthquake-resistant construction of civil and industrial buildings, structures, structures of increased responsibility, unique structures, including those working together with the ground and water environment.

Be able to:

- to present a design scheme for a building, structure, to present a method for calculating seismic loads, a method for determining the stress-strain state of the structure;
- use the apparatus of mathematical analysis in solving engineering problems.

Have the skills:

- determination of seismic forces by linear-spectral method (LSM), calculations of strength and stability of structures taking into account seismic forces;
- calculations of the strength and stability of buildings and structures for seismic loads determined by.

**Modern concretes**
CODE – CTV 247
CREDIT - 6

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The objectives of the development of the discipline are: to deepen the professional training of masters in the field of modern concrete and its production technology, to identify their role in construction.

The objectives of the course are: to study the technical and economic data of modern concrete, production technologies; to expand, systematize, deepen and consolidate theoretical knowledge; to develop the ability to independently solve a number of engineering and organizational problems related to the choice of modern materials, technologies and structures.

Know:

- methods of organizing production from the main production lines of a wide range of products;
- methodology of technical and economic calculations in the selection of modern materials, technologies and structures;

Be able to:

выбрать choose the necessary materials for the production of modern concrete, determine their suitability, taking into account economic and environmental factors;

- to carry out the justification and selection of rational technological and technical solutions;  to calculate technical and economic indicators in the design of construction industry enterprises;
- independently solve a number of engineering and organizational tasks related to the organization, planning and management of production processes of building materials, products and structures.

Possess:

- skills to adjust project and working technical documentation.

**Mathematical modeling in the technology of construction materials**
CODE – CIV 247
CREDIT - 6

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The purpose of studying this discipline is to master the methods of mathematical modeling of production processes of building materials and products.

Tasks:

- getting ideas about the main methods of mathematical modeling of the production of building materials and products, building mathematical models of the main processes using a software package that implements finite element methods (FEM).
- mastering the principles of development and features of the user interface of the software package;
- acquisition of skills in solving problems of mathematical analysis, in relation to modeling the processes of production of building materials and products;
- formation of prerequisites for computer research of the tasks of those areas of research that correspond to the scientific topic of the master's student.

The master's student should know

- the main provisions of the theory of similarity and the principles of mathematical modeling;
- fundamentals of the culture of scientific research;
- scientific basis for the integrated use of raw materials, local raw materials and man-made waste for the production of materials for construction products and structures;
- influence of technological impact modes on the structure of building materials;
- methodology for optimizing the production technology of materials of a given structure and properties;
- scientific basis for the selection of a material with specified properties depending on the specific conditions of manufacture and operation of products and structures;
- theoretical and applied problems of standardization of new materials and technological processes of their production, processing and processing;

be able to:

- plan and perform an engineering experiment;
- use information and communication technologies for scientific research;
- to select raw materials and design the composition of new building materials that have unique functional, physical and mechanical properties, optimal cost and environmental cleanliness (pc-1);
- perform the development of physico-chemical and physico-mechanical processes for the formation of the structure of materials with a given set of properties;
- establish the regularity and criterion for assessing the destruction of building material from the action of mechanical loads and the external environment.

**Geotechnics state and prospects of development**
CODE – CIV 207
CREDIT - 6

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The purpose of studying the discipline:

An idea of promising methods for calculating the foundations of foundations, taking into account nonlinear and rheological properties. summary: the formation of soil mechanics and the role of domestic scientists. Theory Of the ultimate stress state of soils. rheological processes in soils and their significance. Questions of dynamics of dispersed soils and methods of strengthening of bases and foundations. Features of The production of works on the construction of foundations. Foundations in special construction conditions.

Expected results: Optimization of the foundation of the annexed territories from the standpoint of foundation construction. automation of calculation of bases and foundations.

**Colloidal cement systems**
CODE – CIV 218
CREDIT - 6

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The purpose of teaching the discipline is to form a General understanding of the principles and methods of testing of building materials, to study the influence of the internal structure of the material on its construction and technical properties and rational use in construction, depending on the functional properties, as well as to train specialists who can use their knowledge and skills in professional activities.

**Spatial coverage**
CODE - CIV243
CREDIT - 4

Course outline: this discipline reflects the achievements of theory and practice in the field of spatial structures, as well as the results of new scientific research in accordance with the volume of the course program. In-depth training of building structures that have the prospect for further widespread distribution in the Republic of Kazakhstan.

Knowledge gained during the course:
- types of spatial structures, methods of forming double-sided curved surfaces;
- a state of full torque and without a torque moment;
- equilibrium equations, geometric, physical theory of shells;
- limiting conditions;
- theory of flat shells;
- calculation and design of permutation, rotation, suspension systems, Gaussian curves of positive and negative shells.

Skills and abilities obtained in the course of passing the discipline (professional, managerial, communication):
- to determine the forces in the shells under various limiting conditions;
- to determine the strength in deformable and non-deformable contoured shells according to the theory without a moment;
- calculation of momentterdi;
- to correctly design various spatial structures;
- uses reference and informative literature.

**Modification in building materials technology**
CODE - CIV222
CREDIT – 6

The purpose of mastering the discipline:

Formation of research competence through the development of theoretical knowledge and practical skills in the field of building materials science; To acquaint the undergraduates with the issues of technology and properties of building materials and products, the range of building materials, their structural features, technical characteristics, problems of using production waste and their application in accordance with operating conditions.

Objectives of mastering the discipline:

- to master the maximum of theoretical and practical knowledge necessary for the formation of technical and technological culture in the field of building materials science, to understand the essence of modern problems of obtaining new effective materials, to substantiate the interaction of natural and artificial components;
- master the terminology, methodology of modern materials science based on physical, chemical and other research methods and be able to use them to predict and assess operational reliability and durability.
- to actively use the basic scientific and practical principles and patterns of obtaining materials with specified characteristics;
- be able to competently assess the nature, direction and consequences of the impact of specific production and technical problems in compliance with the relevant theoretical and methodological concepts.
- be able to plan and organize work on the implementation of scientific developments in industrial practice, develop and make scientifically based decisions in accordance with specific production conditions.

**Project management**
CODE - CIV470
CREDIT – 6

The purpose and objectives of the discipline

The purpose of mastering the discipline "Project Management" is to develop students' comprehensive theoretical and applied knowledge on project management and create a methodological basis for the formation of professional competencies in the field of project management; mastering the knowledge of organizing the work of the project team for the implementation of specific projects; study of the types of efficiency of investment projects, methods of analysis and assessment of their commercial efficiency and study of the features of assessing the effectiveness of projects, taking into account risk factors and uncertainty.

The objectives of studying the discipline "Project Management" are:

disclosure of the essence and characteristics of projects; substantiation of the possibilities and limitations of project management;

research of the content of the category "project" as a socio-economic system;

acquaintance with the concept of the project life cycle and the possibilities of using project management functions at various stages of their development and implementation;

disclosure of methods and tools for structuring projects;

consideration of methods and conditions for effective management of the project team, taking into account the factors of group dynamics;

consideration of the basic principles, types and methods of assessing the effectiveness of projects;

consider the role of risk in project management, approaches and methods of analysis, assessment and risk management;

disclosure of the essence and capabilities of modern information technologies for project management.

The student must:

Know:

essence and characteristics of projects;

the content of the category "project" as a socio-economic system;

project life cycle and the possibility of using project management functions at various stages of their development and implementation; basic principles of project management;

project management processes, inputs and outputs of each process;

the main problems hindering successful project management and ways to resolve them;

foundations of public-private partnership.

Be able to:

evaluate the effectiveness of the project, taking into account risk factors and uncertainties;

evaluate the investment qualities of individual financial instruments and select the most effective of them;

develop a project estimate and budget that meets the specified constraints;

organize the implementation of the project;

organize effective completion of the project.

Own:

methods and tools for effective management of the project team;

the basic principles, types and methods of assessing the effectiveness of projects.

**Physico-chemical basis of ceramic materials and glass**
CODE - CIV248
CREDIT – 6

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When studying these disciplines, "input" knowledge, skills, experience and competencies are formed, which are necessary for the successful mastering of the discipline "Physicochemical Foundations of Ceramic Materials and Glass Production."

As a result of mastering the disciplines, the student must:

Know:

• regularities of the course of chemical processes, typical processes of chemical technology, appropriate devices and methods for their calculation;

• basic principles of organization of chemical production, methods for assessing production efficiency;

• types of resources in the chemical industry; principles of energy saving and rational use of raw materials in chemical technology;

• basic principles of organization of chemical production, its structure, methods for assessing production efficiency; general laws of chemical processes.

Be able to:

• Choose equipment for a specific chemical-technological process, calculate the main characteristics of a chemical process, choose a rational scheme for the production of a product, evaluate the technological efficiency of production;

• apply methods for assessing the resource efficiency of chemical technological processes and chemical industries;

• calculate the main characteristics of the chemical process, choose a rational scheme for the production of a given product, evaluate the efficiency of production;

Own:

• experimental methods for determining the physicochemical properties of inorganic compounds

• skills of designing the simplest devices of the chemical industry; methods for determining the optimal technological modes of equipment operation

• methods of analyzing the efficiency of chemical production, determining the technological parameters of the process

As a result of mastering the disciplines, the student must have the following general professional competencies:

• the ability and willingness to carry out the technological process in accordance with the regulations and use technical means to measure the main parameters of the technological process, properties of raw materials and products (PC-7);

• justify the adoption of a specific technical solution in the development of technological processes; choose technical means and technologies taking into account the environmental consequences of their use (PC-11);

• study scientific and technical information, domestic and foreign experience on the research topic (PC-25).

**Finite element method in construction problems**
CODE - CIV211
CREDIT – 6

Goals and objectives of the discipline

Study and practical development of the theory of numerical methods for calculating building structures, which are the basis of modern computing systems and applied programs used to develop optimal solutions for design problems.

Discipline summary

Numerical methods of linear algebra, numerical methods for solving differential equations with initial and boundary conditions, the use of numerical methods in solving specific technical problems on a computer.

As a result of studying the discipline, undergraduates must:

Know:

- basic mathematical relationships, basic provisions of mathematical analysis and modeling of building structures by means of a computer of higher mathematics.

Be able to:

- to calculate the elements of building structures using the principles and methods of structural mechanics.

Own:

- methods of algorithmicization of technical problems, the basic foundations of programming languages on a computer and methods of automated calculations of building structures based on applied software packages, skills in applying methods of computational mathematics to solve construction problems on a computer.

**Registration and defense of the master's thesis**
CODE – ECA205
CREDIT –

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

**SHORT DESCRIPTION**

Master thesis – graduation qualification scientific work, which is a generalization of the results of independent studies undergraduates one of the pressing problems of a particular specialty relevant branch of science that has internal unity and reflects the progress and results of the development of the chosen topic.

Master's thesis – the result of research /experimental research work of a master's student, conducted during the entire period of study of a master's student.

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

- the work must conduct research or solve current problems in the field of calculation and design of building structures, reconstruction of buildings and structures, technology of construction production, as well as the production of building materials, products and structures;
- the work should be based on identifying important scientific problems and solving them;
- decisions must be scientifically sound and reliable, have internal unity;
- the dissertation work must be written alone.

# Content